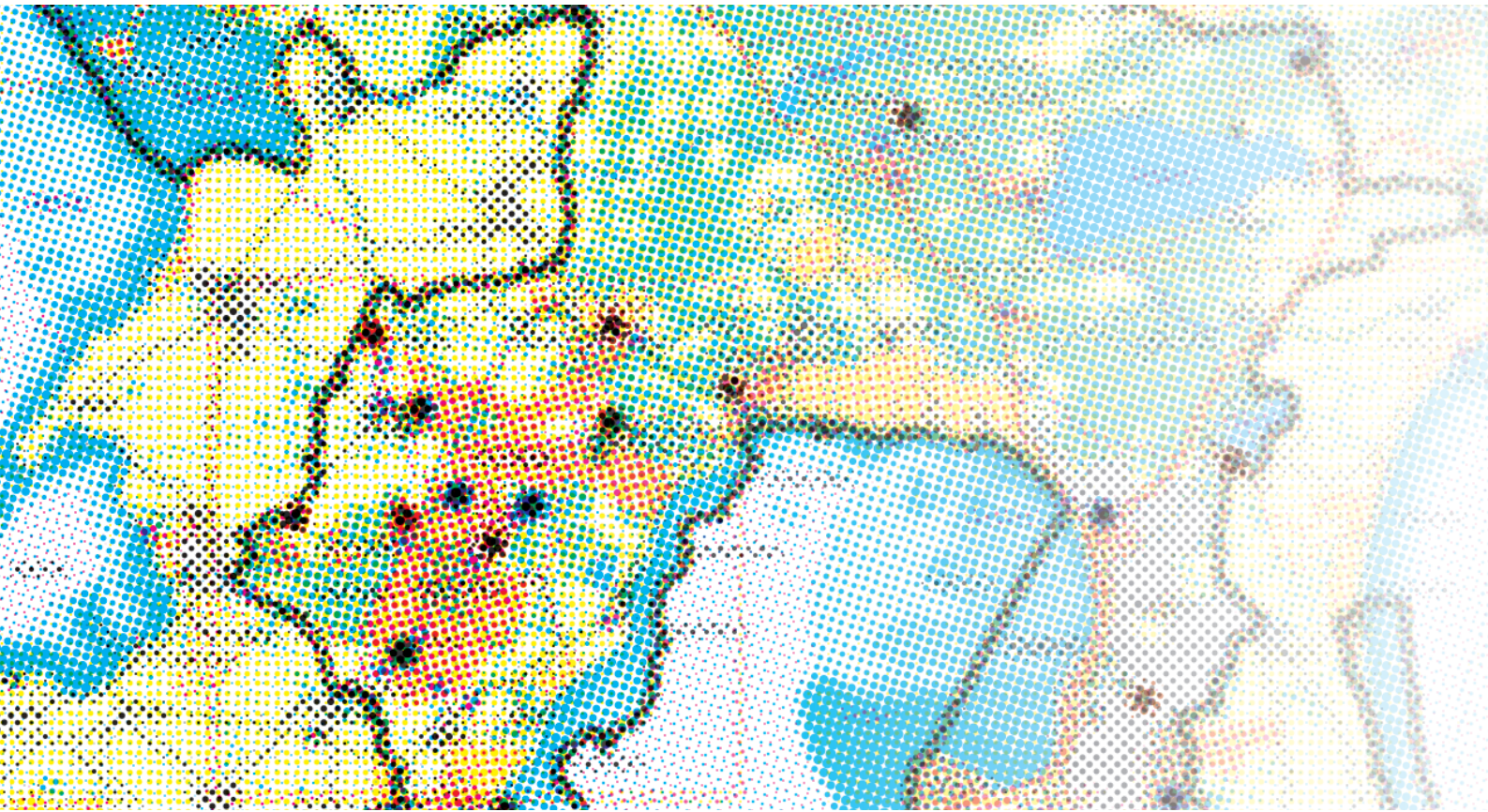# Situating Engagement
Ubiquitous Infrastructures for In-Situ Civic Engagement

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PhD Dissertation

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by
Matthias Korn
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Abstract

Our mobile phone is with us at all times. Habitually, we pick it up in the morning and carry it around on our daily routes and routines. Increasingly, we use it to locate ourselves and the things and people around us. With ubiquitous computing, technology is moving into the very fabric of our everyday lives and the spaces we inhabit. Where email and the telephone have broken down barriers of geography, the relationship of technology with physical locations in people's lives strengthens. From Occupy to the London riots and the Arab Spring, situated technologies offer new ways through which we can participate in the world. We experience a new participatory culture *on the go*.

These developments offer new possibilities for civic engagement in participatory land use planning: to engage people *where* they are. This dissertation coins the notion of *situated engagement*, which seeks to 'situate' civic engagement activities in those spatial contexts that are at stake in land use planning. This approach enables engagement activities to be better integrated with people's everyday lived experiences through connecting to the places that are personally meaningful and relevant to them.

A 'research through design' approach is applied across four participatory design experiments to explore how to design for situated engagement in land use planning. A notion of a situated engagement infrastructure made up of mobile, stationary, ubiquitous, and remote systems frames the design experiments suggesting a plethora of different means for citizens to engage with planning issues within a plethora of different contexts and situations.

The dissertation makes contributions of two kinds. *Conceptually*, it offers a richer understanding of what is implicated in the design of technologies for situated engagement. First, situationally appropriate forms of engagement that align well with citizens' own conceptions are necessary in order to provide relevance and meaning of issues in the moment. Second, situated engagement requires a technological setup which facilitates the co-location of people, place, and the planning issue at stake. Third, the mediating technologies need to intertwine physical and digital realms through a strong coupling with the particular place concerned. *Methodologically*, I argue for situated methods that can capture practices involving mobile behavior and allow for exploration of the field with sophisticated prototypes in the wild. It proposes walkshops as a technique for collaborative exploration within actual outdoor environments and the use of field trials as part of an iterative design process in order to look ahead toward use practices that are still in the making.

Résumé

Vores mobiltelefon er altid med os. Vanemæssigt samler vi den op om morgenen og har den med i vores daglige gøren og laden. Vi bruger den i stigende grad til at lokalisere os selv samt ting og mennesker omkring os. Med ubiquitous computing trænger teknologien ind i selve strukturen af vores hverdag og de omgivelser vi lever i. Mens e-mail og telefon har nedbrudt geografiske barrierer, styrkes forholdet mellem teknologi og fysiske steder i vores liv. Fra Occupy til optøjerne i London og det arabiske forår, tilbyder situerede teknologier nye måder, hvorved vi kan deltage i verden. Vi oplever en ny participatorisk kultur *på farten*.

Disse udviklinger giver nye muligheder for en borgers engagement i participatorisk areaplanlægning: at engagere folk, *hvor* de er. Denne afhandling introducerer begrebet *situeret engagement*, som placerer engagement i borgerlige aktiviteter i de rumlige sammenhænge som er på spil i arealplanlægning. Denne tilgang gør det muligt bedre at integrere borgerligt engagement i folks dagligdag ved at knytte det til steder der er meningsfulde og relevante for dem.

Metoden 'Forskning gennem design' anvendes på tværs af fire participatorisk design eksperimenter til at undersøge, hvordan man kan designe for situeret engagement i arealplanlægning. En forståelse af en infrastruktur for situeret engagement bestående af mobile, stationære, allestedsnærværende, og fjerntliggende systemer danner ramme for design eksperimenterne, og tyder på at der er en overflod af forskellige måder for borgere at engagere sig med planlægningsspørgsmål inden for en lang række forskellige sammenhænge og situationer.

Afhandlingen byder på to slags bidrag. *Begrebsmæssigt* giver den en rigere forståelse af, hvad design af teknologier til situeret engagement indebærer. For det første er passende former for engagement der er tilpasset situationen, og som stemmer overens med borgernes egne forestillinger nødvendige for at give relevans og betydning til tidens anliggender. For det andet kræver situeret engagement et teknologisk setup, hvilket muliggør co-location af mennesker, sted, og planlægningsspørgsmål som er på spil. For det tredje er de medierende teknologier nødt til at sammenflette fysiske og digitale domænerne ved at være stærkt forankret et fysiske sted. *Metodologisk* argumenterer jeg for situerede metoder, der kan indfange praksis, som involverer mobile adfærd og som muliggøre feltstudier med avancerede prototyper 'in the wild'. Afhandlingen præsenterer walkshop teknikken til kollaborativ udforskning i udendørs miljøer og brug af feltforsøg som del af en iterativ design proces med henblik på at se fremad mod brugsprakser under løbende udvikling.

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This dissertation would not have been possible had it not been for the help and support of numerous people over the last three years.

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I would like to thank the co-authors of the included papers. When I refer to what "I" have done in this dissertation, I really mean "we." I thank Susanne Bødker, Clemens Nylandsted Klokmose, Anna Maria Polli, and Susann Wagenknecht for reading versions of this summary, engaging in important discussions, and providing valuable comments and ideas.

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Matthias Korn
Aarhus, January 2013

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Abbreviations

apps   mobile phone applications

AR   augmented reality

GIS   geographical information system

GPS   Global Positioning System

HCI   human-computer interaction

MAR   mobile augmented reality

NFC   near-field communication

PP-GIS   public participation geographic information system

QR code   Quick Response Code

ubicomp   ubiquitous computing

wifi   *also known as*: wireless local area network (WLAN)

Part I

Summary

Chapter 1

Introduction

The narrative is well known. With web 2.0, the internet is arguably more participatory than ever. Mobile phones are in the hands and pockets of almost everyone, both in the developed and even more so in the developing world. Being carried around by us, they are with us at all times, on our daily routes and routines. As so called *smart*phones, they can be used for a wide variety of purposes. They have the potential to foster a participatory culture *on the go* (cf. Jenkins, 2006) for three basic reasons. First, social media is everywhere, especially on mobile phones. Second, mobile phone applications (apps) are often sensitive to the phone's geographical location, which is mostly also the user's location. Third, technology is increasingly moving into the environment itself, into our homes, into our cars, and into our cities: the air condition that we can program to cool our rooms before we come home, the traffic lights that adapt to actual traffic, or the new *VW Golf* that reads and interprets road signs to warn and help us in dangerous situations.[1] Technology is moving into the very fabric of our everyday lives and the spaces we inhabit, offering new ways through which we can participate in the world. Previously, the web, email, and the telephone have broken down barriers of geography. With location-aware mobile phones and computing embedded in the environment, in contrast, technology's relationship with physical locations in people's lives strengthens (Weise et al., 2012). Hence, technology increasingly is where *we* are – and employs its awareness about our locations to better serve us.

But new *technological developments* are not the only developments that fuel the timeliness and relevance of my research; neither are they the main cause for what is happening. Our *needs and use practices* have evolved as well. They need to be seen in a dialectical relationship with technological developments rather than in a causal one. Emerging and evolving needs and practices are the reason that some technologies get developed and not others.

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[1]See *Verkehrszeichenerkennung* at `http://de.onething.com/pages/onecar2.html`, last accessed: November 17, 2012.

We have developed the habit, and the need, to increasingly locate ourselves and things around us in a world that has become more global: from attaching locations to the words we write or the photos we take, to locating the files we need for our work, and locating our friends, family, or kids in the neighborhood and beyond.

The way we use the internet has changed as well. Increasingly, we no longer connect to it, we carry it with us at all times (de Souza e Silva, 2006). In the first ever decline of people reporting their time spent online, a recent *Forrester* survey shows a changing meaning of what is perceived as using the internet (Sverdlov, 2012; Melanson, 2012). Where being online was previously well defined, e.g., by starting a dial-up connection or using a web browser, the concept has become more elusive, and we less aware, due to a variety of different online activities and the various types of constantly connected devices we own. In a similar development, the internet is more and more about *here* than about *there*: checking local restaurant reviews on *Yelp*, communicating our whereabouts on *Facebook* and *Foursquare,* or finding the *Wikipedia* entry of the landmark we are standing in front of. Similarly, (hyper)local news websites counter the decline of local newspapers, especially in the U.S. (Miller, Rainie, Purcell, Mitchell & Rosenstiel, 2012). A new sensitivity to locate ourselves and the things around us in the world is motivating new uses of existing technologies and such technologies are reshaping the use practices that motivated them in the first place.

Civic participation can be profoundly amplified by new technological opportunities and emerging use practices.[2] We see participation emerge in, from, and about new areas of society that goes far beyond participation on the web (e.g., in blogs or on *Wikipedia*): hacker culture, do-it-yourself (DIY) movements, and grassroots initiatives to name a few. Major international movements, such as the *Arab Spring*, the *Occupy* movement, the London riots, or *Stuttgart21* stand witness for the increasing global connectivity combined, at the same time, with a local sensitivity and specificity. During these movements, mobile social media such as *Facebook*, *Twitter*, and *YouTube* were key to a visibility on a global scale that further fueled them at the same time. All of these movements had a major impact on the societies and contexts in which they were situated in, and beyond.

When citizens make use of the services of big corporations (such as *Facebook*, *Twitter*, or *Google*), fundamental tensions arise between their global setup and the local sentiments that are ushered through them and the local causes they are sought to empower. It seems as if the local circumstances are dominated and occupied by global corporations, where locally relevant information are both gathered and provided through entities that do, in fact, *not* have any relation to the locality. Indeed, ownership of and power over technological infrastructures are rarely in the hands of those that are affected by them (Weise et al., 2012). Local communities, however, remain relevant and a new loca-

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[2]The term civic participation has various meanings. I take it to denote the joint engagement of citizens in the realm of culture and/or politics widely understood.

tional awareness is emerging. These communities need to be empowered to control such data, algorithms, and infrastructure that are governing them and that they have, in part, helped to produce. Hence, developing infrastructures that generate such data must be critically reflected upon. We need to discuss how they empower local communities, or if they in fact support their weakening by favoring models where global entities exceedingly exert power over local areas, all over the world.

1.1 Situating Engagement

In the light of these societal and technological developments, this dissertation discusses and explores how technology can be productive within the field of civic engagement. My goal is to facilitate a form of civic engagement that is situated in and thus has strong ties to the places people traverse in the course of their everyday lives. This approach seeks to take the local specificity of places and the meanings associated with them into account. It, thereby, seeks to interweave participation on issues connected to the places under discussion with the everyday lived experience of citizens.[3] For situated engagement, place is both a resource for deliberation and the topic of civic discussion.

With the concept of situated engagement, I do not want to say that civic engagement is not always already situated or that individual activities take place *de novo*, outside of any specific circumstances. Clearly, these practices do take place somewhere. Rather, I want to suggest that engagement activities are not situated in the *particular* circumstances where the place under discussion, the actors, and the discussion itself come together. The conditions and circumstances that allow this kind of engagement to happen are exactly what I want to explore and study with situated engagement – to 'situate' engagement, so to speak, in the *right* contexts.

Several scholars have proposed these to be important phenomena to study. For example, McCarthy and Wright (2005) express the need to focus on place and situatedness: "When the technologies of interest are portable, distributed and embedded in our physical and social environment, people's experience of place and its mediation by technology becomes central" (p. 915). Dourish and Bell (2011) suggest how mobile phones are appropriate means to provide a personalized anchor into discussing various places one roams through and about: "Different places demand different forms of behavior, yet mobile technology suggests the possibility of a constant, fixed expectation about who one is and one's level of accessibility and engagement" (p. 118). This touches on individual identity, on the always-availability of mobile phones while exercising day-to-day life, and on the possibility for engaging with the environment

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[3]I use the term citizen throughout the dissertation to underline the civic context I am dealing with. However, I want to understand the term in its most open and inclusive definition – perhaps as inhabitants of a city – in which everyone who has a stake in a particular shared living environment is included (involving foreigners, homeless, etc.).

through them.

An obvious area where situated engagement is clearly of interest and substantial value is land use planning. The domain of land use planning lends itself to the study and application of the concept due to its central use of spatial references. Discussions in this domain primarily revolve around issues that are connected to a specific place or area. Hence, re-imagining the role of place in an endeavor to better involve citizens is a fruitful approach to further explore and study in this domain.

My work should be seen in the context of the many past, present, and future research projects that center around similar ideas of technology-mediated participatory land use planning (e.g., *Geodeliberation*, *IPCity*, *Pudas*, and *Urban Mediator*).[4] Gordon, Schirra and Hollander (2011), for example, argue for the immersiveness of experiences in civic participation processes, because this immersiveness (i.e., the feeling of being there) provides meaning and relevance to citizens with respect to their own lives. Studying citizens' attitudes toward public participation, Westholm (2002) reports that citizens prefer focused, selective, and limited involvement in political processes, mainly on the local level. Furthermore, evidence suggests that citizens are more likely to participate in decision-making on issues in their own proximity (Alt, Shirazi, Schmidt, Kramer & Nawaz, 2010). In my design experiments, I analyze the link between place, physical proximity (i.e., actually being there), and participation augmented by and mediated through technology. Land use planning, broadly understood, is the domain I situate these experiments in. In the larger frame, my research also contributes to the areas of participatory planning (Forester, 1999) and community development (e.g., Shaw, 2008).

Similar situated practices are already an integral part of land use planning. Site visits or walking tours (with and without citizens) are frequently used to gain a better understanding of the places under discussion. Already, they are typically mediated by some form of technology. Most importantly, geographical information systems (GIS) are an essential tool for urban planners, where geographical data come together to be integrated, stored, manipulated, analyzed, managed, and presented in an inexhaustible number of combinations and variations in order to inform decision making. Particularly interesting is the research community which is concerned with GIS for public participation (PP-GIS) in order to empower marginalized populations on a local level (Craig & Elwood, 1998; McCall, 2004; Sieber, 2006). Involving the public in acquiring and, potentially, deciding on spatial knowledge is a highly favorable endeavor for citizen participation. Even more so when web 2.0 principles, web-based maps, and mobile phones come together to *democratize* professional tools, e.g., in terms of access and usability for lay citizens (Nuojua & Kuutti, 2008; Zander & Bohøj, 2009).

A recent development is to use augmented reality on-site to visualize future

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[4]See `http://www.nsf.gov/awardsearch/showAward?AWD_ID=1211059`, `http://ipcity.fit` `.fraunhofer.de/`, `http://pudas.oulu.fi/`, and `http://mlab.taik.fi/urbanmediator/`, last accessed: November 16, 2012.

buildings within the actual environment – be that on mobile devices (Woodward & Hakkarainen, 2011) or in a temporary tent (Wagner et al., 2009). Additionally, a number of publicly available, largely commercial applications exist that feed into land use planning and directly address citizens (e.g., *SeeClickFix*, *Citizen Connect*, *FixMyStreet*).[5] They, for example, allow citizens on the go to report potholes, graffiti, or broken street lights to the municipality. By doing this, such location-based apps "provide the impression that simply being in a place is the first step toward interacting with urban data and therefore engaging with the city" (Gordon & de Souza e Silva, 2011, p. 122). Lastly, initiatives such as *Code for America* in the U.S.[6] strive to create numerous mobile apps for various purposes in the civic engagement domain from the bottom up. They are often focused on improving transparency of governments by making open data accessible and actionable for citizens.

The particular approach I have chosen for my dissertation is to employ mobile and ubiquitous technologies (e.g., smartphones, interactive public surfaces, augmented signs, and networking technology) to enable citizens to contribute to civic discussions while out and about and in proximity to objects of interest – that is, at times and places where it might be most personally meaningful and relevant, as well as the places under discussion immediately present to them. Examples are discussion topics concerning the playground next to their child's kindergarten, something on their commute to work, or the forest they run in twice a week.[7] If the place and its transformations are meaningful for citizens, so my hypothesis, they may be interested in and benefit from initially engaging with the discussions in-situ. Such an in-situ, in-the-moment engagement is sought to provide an initial trigger for more in-depth ex-situ reflection and discussion at a later time and place more amendable for more comprehensive deliberation (e.g., via the web at home or even during a town hall meeting). Furthermore, local contextual knowledge gathered through such an approach is valuable in the planning process and difficult to obtain for professional planners otherwise.

In my attempt to 'situate' civic engagement in such a way, I explicitly wish to distance myself and the work reported here from the discourses around *crowdsensing*, *crowdsourcing*, and *open data* (in connection with *civic apps*). Although they may be important developments, they are of little concern in the context of my dissertation. All three of them focus on (structured) data and information and its automated aggregation and analysis. By this, they relegate the human element to the periphery. Instead, I want to see human beings as proactive, will-full, creative, and intelligent actors that need to be involved in

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[5]See `http://seeclickfix.com/`, `http://www.cityofboston.gov/doit/apps/citizensconnect .asp`, and `http://www.fixmystreet.com/`, last accessed: November 13, 2012.

[6]See `http://codeforamerica.org/`, last accessed: November 13, 2012.

[7]A more concrete example from my research is the *Mening@Park* experiment that is situated in a Danish national park (see Chapter 4.3). Here, people living or working there have a strong interest in the development of their region because it currently undergoes great transformations. Making graspable what is at stake locally makes people more aware of the specificity of their local area and potentially also makes them more interested in what is going on and eventually participate in the discussion.

the discussions about issues close to them. I, furthermore, have a clear citizen bias in my research. My prime interest lies in creating better opportunities for citizens to participate, opportunities that are better integra*table* into everyday lived experience. In a future, more holistic endeavor this would also include questions of how government departments can make use of citizens' input – a question that is certainly also in the interest of citizens in the long run. This is, however, not a part of this dissertation.

In the following two sections, I want to motivate the title of this dissertation by briefly laying out the concepts of situated action and infrastructure that underlie and frame the work reported here. The tradition that penetrates these two positions is the focus on what people are actually doing, their actual everyday practices. What they have in common is not the least their understanding of action as an ever unfolding condition. This position has become one of the mainstreams at least in the field of computer-supported cooperative work. Afterward, I state my research objectives and provide the structure of the remainder of the dissertation.

1.2   Situated Action

Lucy Suchman's (1987) seminal book *Plans and Situated Action* provides the very foundations for the notion of situatedness in HCI. My notion of situated engagement is committed to her work. Suchman (2007) holds that "situated actions are always, and irremediably, contingent on specific, unfolding circumstances" (p. 27) – i.e., that action is always situated. And not only is every purposeful human action in itself dependent on its immediate circumstances, but also are these circumstances themselves constituted through practical action rather than being in any form pregiven or self-evident. Circumstances "are never fully anticipated and are continuously changing around us" (p. 26). Suchman (2007) goes on saying that this does not mean "that action is constructed somehow always de novo or in a vacuum. On the contrary, human activity invariably occurs in circumstances that include more or less long-standing, obdurate, and compelling layers of culturally and historically constituted, social and material conditions" (p. 52).

Such culturally and historically constituted social and material conditions defining the circumstances of action are thus unique from situation to situation. In my work, however, I want to adopt an angle that is wider than Suchman's situational contingency suggests. The conditions of action are not only different from person to person and time to time, but also from place to place. Different places present different social and material conditions under which action is enacted. Engagement and deliberation as the particular forms of action of interest here may thrive under some circumstances better than under others. Consequently, it is important to consider the circumstances engagement is located or embedded in – the place being one of them. The goal then has to be to enable people to carry out specific activities of engagement situated

in circumstances that are beneficial to the outcomes of this process – both on the side of the individual actor and the community benefiting from this activity in one way or the other. The immediate experience of place is, I argue, a unique resource for civic engagement and should thus be appropriately accounted for.

1.3   Infrastructur*ing*

The purpose of my work is to contribute to infrastructures for civic engagement. In the following, I will briefly explain what I mean when I talk about infrastructures.

Devices, systems, or applications cannot be seen as separate and independent from one another. They are alternative entry points to and touch points of a civic engagement infrastructure, where citizens may experience public screens or media architecture, interactive surfaces, and their personal mobile devices as alternatives to engage with civic discussions and with other citizens – in addition to town hall meetings, polls, hearings, and other traditional instruments. In a situated engagement infrastructure, each individual entity is embedded in a specific socio-spatio-temporal context and thus preserves its local specificity. In this light, it is relevant to dwell, for a moment, on the notion of infrastructures and how they emerge for people in practice.

Beyond the common understanding of the term, I take infrastructures to be more than the mere technological substrate on which ubicomp applications can be developed and deployed (such as for example network infrastructure). Rather, in line with Dourish and Bell (2007), I take the term to encompass all socio-technical structures that lie beneath applications and the interactions they support. Star and Ruhleder (1996) criticize that the common image of the term "presents an infrastructure as something that is built and maintained, and which then sinks into an invisible background. It is something that is just there, ready-to-hand, completely transparent" (Star & Ruhleder, 1996, p. 112). Rather, they put forward a different view of infrastructures fundamentally understood as an ongoing design process (see Table 1.1 for properties of infrastructure). Infrastructures are constantly emerging and evolving in use, in a dialectical relationship with the organized practices that they shape and are shaped by. These relations become central: "As we learn to rely on electricity for work, our practices and language change, we are "plugged in" and our daily rhythms shift" (p. 113). This evolving view of infrastructure opens up the concept and suggests participation and co-construction as central themes in infrastructure development. To underline this, Star and Ruhleder (1996) introduce the verb 'to infrastructure' (hence, 'infrastructur*ing*') to emphasis infrastructure's processual character and the tentative, flexible, and open nature of the activity – the constant creation, appropriation, and adaption of socio-technical infrastructures.

What is interesting in infrastructures that span physical, temporal, and social arrangements is also the interplay between local conditions and global

Embeddedness. Infrastructure is "sunk" into, inside of, other structures, social arrangements and technologies;

Transparency. Infrastructure is transparent to use, in the sense that it does not have to be reinvented each time or assembled for each task, but invisibly supports those tasks;

Reach or scope. This may be either spatial or temporal—infrastructure has reach beyond a single event or one-site practice;

Learned as part of membership. The taken-for-grantedness of artifacts and organizational arrangements is a *sine qua non* of membership in a community of practice (Lave and Wenger 1992; Star, in press). Strangers and outsiders encounter infrastructure as a target object to be learned about. New participants acquire a naturalized familiarity with its objects as they become members;

Links with conventions of practice. Infrastructure both shapes and is shaped by the conventions of a community of practice, e.g. the ways that cycles of day-night work are affected by and affect electrical power rates and needs.

Embodiment of standards. Modified by scope and often by conflicting conventions, infrastructure takes on transparency by plugging into other infrastructures and tools in a standardized fashion.

Built on an installed base. Infrastructure does not grow *de novo*: it wrestles with the "inertia of the installed base" and inherits strengths and limitations from that base. Optical fibers run along old railroad lines; new systems are designed for backward-compatibility; and failing to account for these constraints may be fatal or distorting to new development processes (Monteiro, et al. 1994);

Becomes visible upon breakdown. The normally invisible quality of working infrastructure becomes visible when it breaks; the server is down, the bridge washes out, there is a power blackout. Even when there are back-up mechanisms or procedures, their existence further highlights the now-visible infrastructure.

Table 1.1 Eight properties of emerging infrastructures (adapted from Star & Ruhleder, 1996, p. 113; references theirs).

needs, e.g., the simultaneous requirement for standardization and flexibility, functioning both in large-scale and in-situ, situated and generic (Star & Ruhleder, 1996). In their own words:

> "*An infrastructure occurs when the tension between local and global is resolved.* That is, an infrastructure occurs when local practices are afforded by a larger-scale technology, which can then be used in a natural, ready-to-hand fashion. It becomes transparent as local variations are folded into organizational changes, and becomes an unambiguous home—for somebody." (Star & Ruhleder, 1996, p. 114)[8]

With this regained emphasis on local settings when infrastructures are used and appropriated, Star and Ruhleder (1996) also warn of the consequences of building, controlling, managing, and talking about infrastructures from "a single, powerful group's agenda": "such talk may obscure the ambiguous nature of tools and technologies for different groups, leading to de facto standardization of a single, powerful group's agenda" (p. 114). That is, not only the

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[8]Emphases in quotes always from the original.

one who owns and controls the infrastructure has power, but also the one who defines it. Understanding infrastructures from a static mindset is therefore a dangerous endeavor and I have argued before to give control over (local) infrastructures to the people affected by them (Weise et al., 2012).

This infrastructural view frames my dissertation. I will come back to this perspective when discussing the contributions of the individual design experiments in Chapter 5. What I focus on throughout the dissertation are individual aspects of a situated engagement infrastructure, mostly with personal mobile devices as the central element. Yet, infrastructuring even in this constrained view concerns more than the devices themselves. It also concerns the environment (location, people, organizations, artifacts). In Chapter 6, I will collect these aspects back together into a more holistic view and unfold a larger situated engagement infrastructure that, in a first step, begins to encompass stationary, ubiquitous, and remote elements in addition to personal mobile devices.

1.4 Research Objectives

The overall research motivation of this dissertation is to explore and broaden our conceptual understanding of situated engagement. I approach this motivation through two connected research objectives that can be formulated as follows:

I. To explore (and conceptualize) the design of technology-mediated civic engagement opportunities in participatory land use planning that are better integrated into people's everyday lived experience.

II. To explore (and conceptualize) how such engagement activities can be made more pervasive (i.e., enabling engagement everywhere and through various means) and co-located with the referred-to places, i.e., the places that are personally meaningful and matter to citizens.

Additionally, new methods are necessary in order to be able to explore and study these phenomena, providing the following methodological research objective:

III. To enrich our available methods and techniques that enable us to capture practices of inherently mobile people and allow for exploration of the field with sophisticated prototypes *in the wild*.

In my conclusion, I will revisit these objectives and discuss in what respects my work has served their purpose.

1.5   Dissertation Structure

This is a cumulative dissertation consisting of a number of articles. It comes in two parts: a summary providing overview of the work in Part I, which is followed by four published papers and one draft that this summary is based on in Part II.

1.5.1   Part I: Summary

The summary acts at the same time as overview and framing of the work presented as well as a reading guide for the papers included in Part II.

Chapter 1: Introduction outlines briefly recent trends and developments in emerging practices and new technologies for geographically situated interaction, my endeavor to apply such a situated approach to the field of civic engagement in land use planning, and the resulting research objectives. It furthermore provides a foundation and frames the work carried out by introducing the concepts of situated action and infrastructuring respectively.

Chapter 2: Background describes the work that inspired this research and situates it within a critical discussion against this backdrop. The chapter reflects on the field of urban informatics, on mobile devices in public space and their conceptualization in terms of the notions of location and place.

Chapter 3: Method describes how I approach the stated goals with a design and research method influenced by research through design, participatory design, and iterative prototyping. It generally describes the research approach as experimental, exploratory, and designerly.

In the second part, the chapter provides the methodological contribution of this dissertation. It argues for situated methods that can capture practices involving mobile behavior and allow for exploration of the field with sophisticated prototypes *in the wild*. Lastly, it briefly reflects on the concrete methods applied throughout the design experiments conducted.

Chapter 4: Design Experiments provides a description of the four design experiments and their outcomes that form part and parcel of my research. It details the respective context and goals, the design process, and the design artifacts produced and utilized in each experiment.

Chapter 5: Conceptual Contributions summarizes and discusses the contributions of the individual design experiments. It compares them and reflects on their progression, thereby showing how the concept of situated engagement has evolved, providing the conceptual contribution of this dissertation. In the second part, it motivates an infrastructural perspective of situated engagement and how the individual design experiments have contributed to such a perspective.

Chapter 6: Related Work: *Elements of a Situated Engagement Infrastructure* situates my research within related work by unfolding and defining elements of a larger infrastructure for situated engagement that involves mobile, stationary, ubiquitous, as well as ex-situ or remote components. Pertinent examples from related work are provided within the individual categories.

Chapter 7: Conclusion and Future Work summarizes the dissertation, concludes and outlines possible future work and open questions.

1.5.2 Part II: Papers

Part II of this dissertation contains three refereed full conference papers, one refereed workshop paper, and one unpublished paper draft. They are ordered chronologically in the progression of the design experiments and will be referenced in Part I accordingly (i.e., as Paper 1, Paper 2, Paper 3, etc.).

Paper 1: Bohøj, Morten; Borchorst, Nikolaj Gandrup; Bødker, Susanne; Korn, Matthias & Zander, Pär-Ola (2011). **Public Deliberation in Municipal Planning: Supporting Action and Reflection with Mobile Technology**. In *Proceedings of the 5th International Conference on Communities and Technologies (C&T 2011)*, June 29-July 2, Brisbane, Australia, 88–97. ACM Press.

The paper presents work from the first design experiment, *Mobile Democracy*. It introduces and discusses the distinction between in-situ and ex-situ reflection and action that is supported by a mobile and a web-based desktop app. This allows citizens to engage in continuous reflection-in and on-action as a collaborative activity with other citizens. The paper further details and reflects on the extensive participatory design process carried out to this end.

Paper 2: Korn, Matthias & Zander, Pär-Ola (2010). **From Workshops to Walkshops: Evaluating Mobile Location-based Applications in Realistic Settings**. In *Proceedings of the Workshop on Observing the Mobile User Experience at NordiCHI 2010*, October 16-20, Reykjavik, Iceland, 29–32. OFFIS.

The paper presents and discusses the walkshop technique that has first been developed in the first design experiment. This technique has later on been used in the two subsequent design experiments as well.

Paper 3: Korn, Matthias & Kjærgaard, Mikkel Baun (2012). **Making Sense of Green Boxes: A Study on People's Understanding of Augmented Buildings on Mobile Phones**. Unpublished paper draft, 1–5.

The paper presents the research in the second design experiment, *AR City*. It details a mobile augmented reality system that visualizes planned buildings within the real environment on people's smartphones. The main part concerns a study on the sense people make when confronted

with such augmented buildings. The study makes use of the walkshop technique.

Concerning the status of the manuscript: The paper has been rejected from the *CHI 2013* conference, where it was submitted in the very dense and challenging four-page *Note* format. It is now included in this dissertation in a revised and expanded version, and currently in preparation to be submitted to another conference.

Paper 4: Korn, Matthias & Bødker, Susanne (2012). **Looking ahead – How field trials can work in iterative and exploratory design of ubicomp systems**. In *Proceedings of the 14th ACM International Conference on Ubiquitous Computing (Ubicomp 2012)*, September 5-8, Pittsburgh, PA, USA, 21–30. ACM Press.

The paper critically discusses the merits of fields trials as part of, rather than as an assessment of, an iterative design process. The central argument is that field trials in design should be used to look ahead rather than back in order to facilitate further exploration of the field. The paper also extensively introduces the third design experiment, *Mening@Park*.

Paper 5: Korn, Matthias & Back, Jon (2012). **Talking it Further: From Feelings and Memories to Civic Discussions In and About Places**. In *Proceedings of the 7th Nordic Conference on Human-Computer Interaction (NordiCHI 2012)*, October 14-17, Copenhagen, Denmark, 189–198. ACM Press.

The paper presents the fourth and last design experiment, *I'm Your Body*. It provides insights on and discusses appropriate forms of engagement, in this case for marginalized youth. It does so through the analysis of actual usage data of a pervasive, location-based storytelling and story experiencing application for mobile phones. The paper argues for an approach to civic engagement systems that takes a vantage point in emotions rather than a very rational and dry approach to deliberation.

Chapter 2

Background

In this chapter I elaborate on the traditions and reflections which have had a major impact on my work and to which, in part, I wish to contribute. This includes the fields of computing in the city and urban informatics. It further involves reflections on the role of mobile phones (the most mainstream manifestation of ubicomp today) as constant companions in our traversal of the city. It finally concerns how situated mobile devices are currently conceptualized regarding notions of location and place. Within these topics, I will present and critically discuss different streams of research.

2.1   Computing and the City

When ubicomp is concerned with technology moving into our environment and into the fabric of our everyday life (Weiser, 1991), this is not limited to the home, to work, or to retail spaces. It also concerns the public realm, the city at large. When publicly available infrastructures such as GPS, Wifi hotspots, or mobile networks were deployed in the 1990s and 2000s, technology increasingly moved into the fabric of the city, into the spaces and in-between spaces through which we transit, where we amble and linger, mingle and dwell. Mobile phones have been particularly enabling in this respect. Recent efforts seek to move the participatory and social aspects of Web 2.0 to mobile devices, where such services become aware of and situated in their surroundings. A plethora of recent books has looked at the intersection of mobile and ubiquitous or pervasive technologies, architecture, and public urban spaces demonstrating a heightened interest in this area (e.g., McCullough, 2004; Ito, Okabe & Matsuda, 2005; Greenfield, 2006; Kitchin & Dodge, 2011; Shepard, 2011; de Souza e Silva & Frith, 2012). Furthermore, the emerging field of 'urban informatics' is concerned with the risks and opportunities of technology interweaving with our day-to-day urban life, not the least in the domain of civic engagement (Foth, 2009; Foth, Forlano, Satchell & Gibbs, 2011; Foth, Choi & Satchell, 2011).

2.1.1 Urban Informatics

The field of 'urban informatics' is the stream of research on cities that I largely subscribe to in my research. The field works at the nexus of technology, people, and spaces (Foth, Choi & Satchell, 2011). At this intersection, it has civic engagement as one of its core concerns – that is, people forming and shaping the spaces around them facilitated by largely mobile and ubiquitous socio-technical systems. Marcus Foth and his colleagues have coined the term to distance themselves from the field of urban computing. In their work, they intend not to stress so much the technological innovation of new computing devices, but the implications of such interventions for the individual and city life at large (Foth, Choi & Satchell, 2011). Resting analysis and design at the scale of the individual up to the community level allows us to focus on re-engineering an infinite number of small-scale relationships in contrast to brushing over civic life with a few large-scale strokes of city redesign (like, for example, major infrastructural projects would be) (Townsend, 2009, p. xxiv). The field of urban informatics is concerned with instrumenting our cities and the individuals inhabiting them with possibilities for data gathering, data visualization, and the therefrom arising action possibilities. It is concerned with creating more active forms of citizenship, a cultural citizenship where new socio-technical aspects enter our day-to-day life in the city. Urban informatics favors a decentralized, bottom-up approach which places people into the center of urban technology. I share these basic sentiments and values.

Two seminal (hand)books have been published under the urban informatics trope. To demonstrate the breadth and diversity of this research, I briefly outline these two volumes here. The first, the *Handbook of Research on Urban Informatics* (Foth, 2009), seeks to provide an overview of the field. It spans topics such as wireless and mobile culture in the city ranging from community wireless networks (Forlano, 2009) to location-aware mobile applications for community engagement that are enabled by such infrastructures (Carroll & Ganoe, 2009). It further discusses how the physical and digital worlds in the urban environment converge and are navigated (Kostakos & O'Neill, 2009; Willis & Geelhaar, 2009). Lastly, it specifically goes into civic engagement and participation as central topics of an urban informatics research agenda. It provides contributions such as tool-supported placemaking in participatory planning (Beyea, Geith & McKeown, 2009), ways to trigger civic participation at the urban level (De Cindio, Di Loreto & Peraboni, 2009), as well as engaging an intercultural community in inner cities through computer clubs for children and parents (Veith, Schubert & Wulf, 2009).

The second compilation, entitled *From Social Butterfly To Engaged Citizen* (Foth, Forlano et al., 2011), focuses more closely on facilitating (civic) engagement of people with communities, cities, and spaces as a central tenet of urban informatics research. The book looks at this challenge from a number of perspectives such as social media (e.g., Dourish & Satchell, 2011; Hirsch, 2011), ubicomp (e.g., Halegoua, 2011), and mobile technology (e.g., Paay & Kjeldskov, 2011; Wong & Ling, 2011). It considers quite concrete urban interfaces

(Fritsch & Brynskov, 2011), interesting infrastructures such as a city fitted with a number of interactive public displays (Ojala et al., 2011), the 'open-source city' enabled by mobile and wireless technologies (Forlano, 2011), and other possible future projects. Besides presenting examples and concrete projects, the book also seeks to lay out theories for engagement and foundational conceptualizations for the field (e.g., de Waal, 2011).
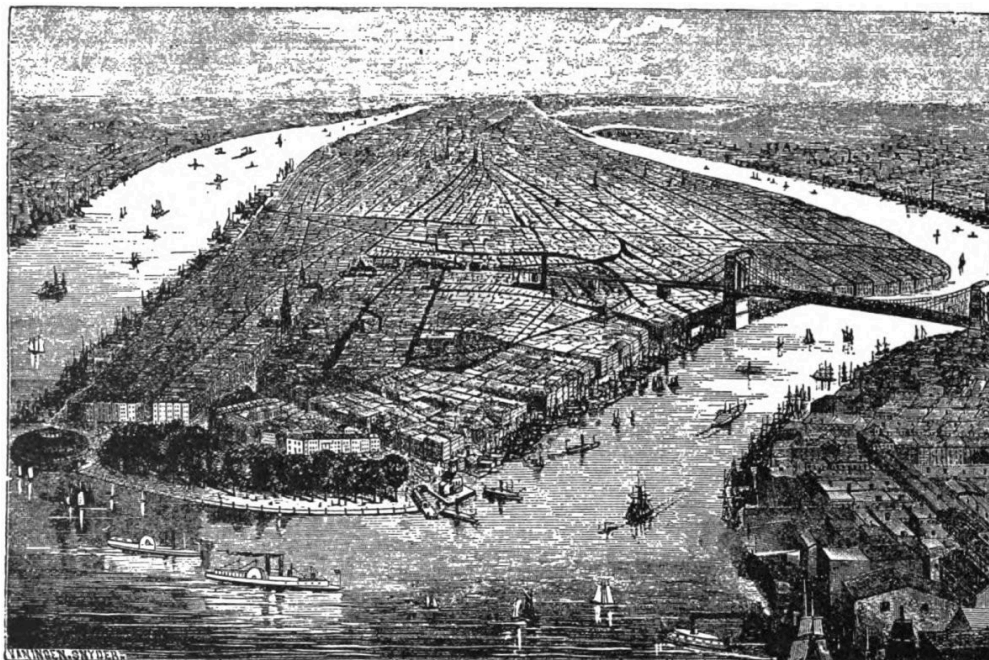
2.1.2   Images of 'The City'

I propose to have a closer look at the different meanings of and perspectives on urban life and the city as such. In his book, *Images of the American City*, Anselm Strauss (1961) offers a socio-psychological account of different perceptions of American cities throughout their brief history since the beginnings of the urbanization. His descriptions are evocative of what helps us to see and comprehend (or not comprehend) a city, our city – as a whole and in its parts, especially highlighting the spatial and temporal aspects of that urban imagery (see Figure 2.1). The urban informatics trope similarly rests atop a number of images of the city. Some of which have been criticized for being one-sided. All are painting a very distinct picture of the city and its dwellers. I look at these images and their criticism in the following.

The rationalist city.   According to Dourish and Bell (2011, Chapter 6) the very notion of ubicomp moving into the city is nothing surprising or new. They say, "technology and the urban experience have always been deeply entwined" (p. 120) as the city embodies the modernist ideals of rationalization and industrialization. Technological infrastructures such as transportation, communication, and utilities pervade the city and keep it alive. This image is a strong influence on the field of ubiquitous computing, which has traditionally been driven by computer science and other engineering disciplines. Hence, early forays into ubicomp in the 'rationalist city' have been concerned with very practical applications aiming to make everyday life more efficient such as wayfinding, people finding, time management, or resource consumption (Dourish & Bell, 2011, Chapter 6).

Large parts of the 'smart city' trope reflect this rationalist image of the urban environment. Infrastructures, mainly those already in place, are instrumented with sensors gathering millions of data points every second (sensing, e.g., traffic, flows of various kinds, or radio waves) – invisible structures that collect information about our day-to-day behavior and routines without our knowing. The data is aggregated and made available to city departments with the goal to understand, monitor, and control the inner workings of a city and potentially its population. Sensor networks, crowdsensing, and big data are the dominant means in this direction (e.g., O'Neill et al., 2006; Zheng, Liu, Yuan & Xie, 2011; Ganti, Ye & Lei, 2011). Fancy, often interactive visualizations are one of the results (see Figure 2.2).
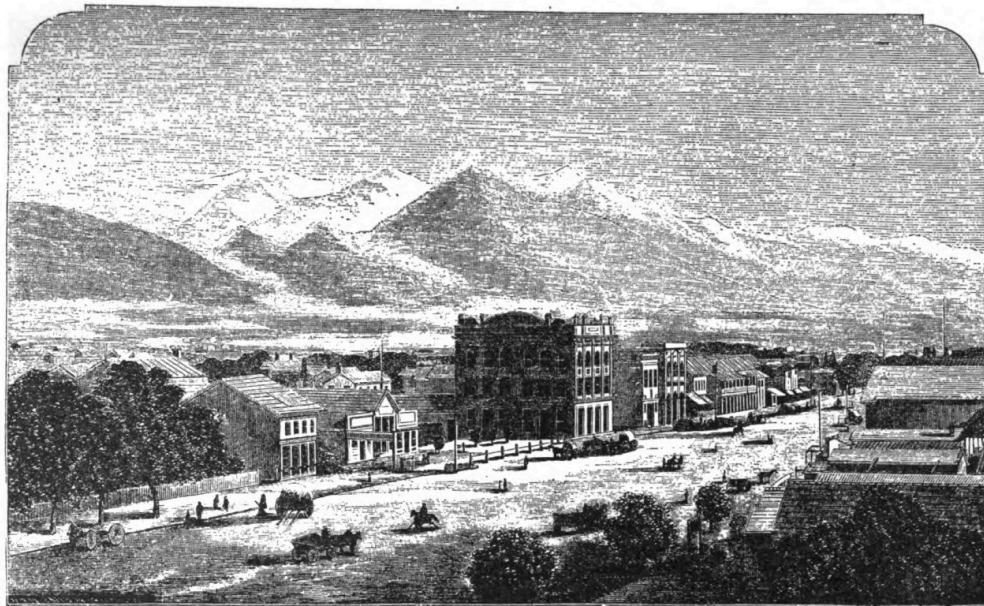
Main Street, Salt Lake City in 1867.   W. H. Dixon, New America, 1867

Bird's-eye view of New York, 1880.   J. D. McCabe, New York by Sunlight and Gaslight, 1881

Figure 2.1 Different views of the city, such as skyline (top) or bird's-eye (bottom) view, provide different images of what a particular city is about. *(License: Public Domain, Strauss (1961, pp. 7+10))*

For example, the idea and promise of the real-time city, as brought forward by the *SENSEable City Lab* at *MIT*, is a notion where complex urban systems can be modeled and simulated in near real-time (Townsend, 2000; Sevtsuk, Huang, Calabrese & Ratti, 2009; Calabrese, Kloeckl & Ratti, 2009). The operations control center of Rio de Janeiro developed by *IBM's Smarter Cities* initiative is a

good and already implemented example of such a vision. Here, a multitude of wall-sized as well as individual screens showing annotated maps, closed-circuit television (CCTV) footage, and live visualizations embody the idea of total control over every function of the city and, unavoidably, its city dwellers (see Figure 2.3).

It could be argued that *IBM* and other corporate smart city visions have merely transferred the products they have developed for big corporations over to city governments. These products have no notion of citizenship, and they are construed in a top-down manner. However, citizens are not employees, neither are they customers. They primarily pertain to other, more humane characteristics (Townsend, 2012). Similarly, Erickson (2010) criticizes most corporate-led, technology-focused smart city visions, where "people are typically relegated to the periphery. They are often treated as passive subjects, as the recipients of the benefits of 'smart technology'" (p. 1). Instead of seeing people as such, "the vision is that smarter cities can offer a variety of ways for humans to act as first class participants, contributing their abilities to sense, analyze and act" (Erickson, 2010, p. 1).

Yet, Erickson does not go far enough, in my opinion, when he suggests (geocentric) crowdsourcing as a remedy. For me, this is just as degrading of humans as spontaneous and creative beings with opinions, attitudes, and emotions of their own. Especially when applied to the context of civic engagement is crowdsourcing a derogatory term. It literally suggests the *extraction* of knowledge out of a crowd of people. The term is targeting an anonymous crowd rather than the individual. It is extracting knowledge out rather than letting them participate. The term does not speak of collaboration, neither between governments and citizens nor among citizens. Rather, it is a uni-directional process where knowledge is transferred from citizens to government. It does not speak of empowerment either. While interesting and certainly in various respects useful approaches exist (e.g., Brabham, 2009; Erickson, 2010), I do not regard crowdsourcing as a big step up from, e.g., passive crowd*sensing* (Burke et al., 2006; Ganti et al., 2011).

While ventures such as cowdsensing might be promising in terms of understanding patterns of mobility and flow, they should not be left standing alone. Such ventures see human subjects merely as an entity to monitor and describe in all their (aggregated) movements. Hence, this image of the city is largely void of human values, of lived experience, affect, and the mundane nuances of everyday life. It sees the city as a machine that needs to be controlled by its master(s). It is not an image that I want to reify in my work.

The prototypical city.   Research and design of urban technology has been criticized for using too blindly notions of the prototypical and generic world city and the life in them. For example, Williams, Robles and Dourish (2009) observe a tendency in urban informatics related areas "to construe the city as an economically and spatially distinct social form" (p. 1), i.e., as something that is somehow consistent in itself and, at the same time, of the same kind anywhere
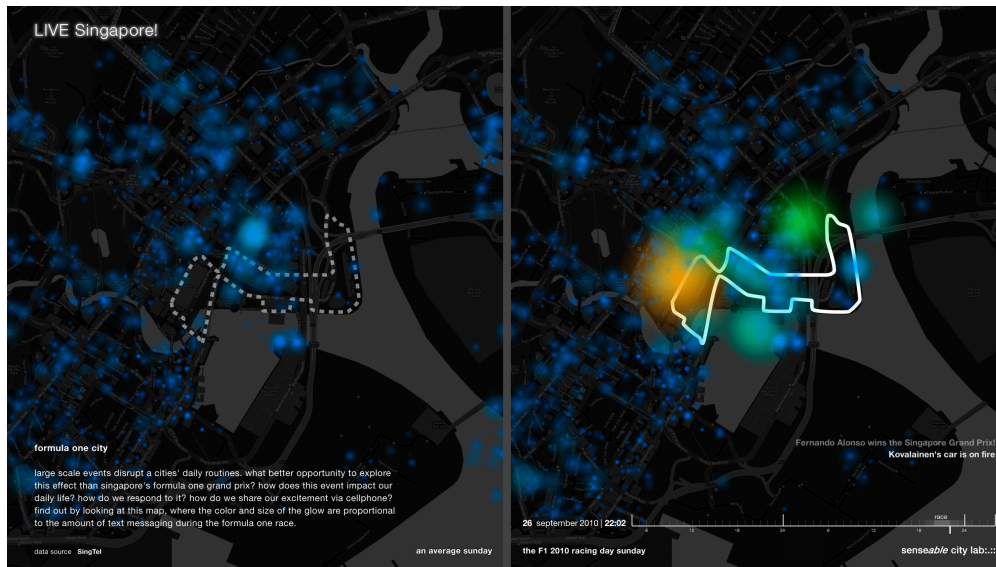
Figure 2.2 Text messaging during a formula one race in Singapore. *(Source: LIVE Singapore! project by the MIT SENSEable City Lab)*

Figure 2.3 Rio Operations Center. *(License: CC BY 3.0 Brazil, Centro de Operações, Prefeitura do Rio de Janeiro)*

in the world. They speak of the generic world city that is usually marked by Western culture, lined by covered walkways and shopping centers that are replicated all over the world making certain areas of distinct cities look and feel very similar. In his novel *Invisible Cities* (1974), the Italian writer Italo Calvino has romanticized a notion of cities as mystical and unique places. In the book,

the Venetian merchant traveller Marco Polo tells of the cities he has visited and thereby stimulates the reader in imagining of how cities can be. Yet, in the end, it is unclear whether these descriptions are actual impressions from places visited, imaginations, or if they are in fact various details and observations of one and the same city, Polo's native Venice. Not unlike this poetic account of cities' similarities and uniqueness, Williams et al. (2009) criticize that the focus of research in urban informatics has largely overlooked "accounting for local particularities between cities as well as the broader global networks of connection between these sites" (p. 1).

More particularly, Williams et al. (2009) identify a common theme of the city as a place full of strangers. During the turn of the century when the rapid urbanization started, city life was seen as simultaneously dense and isolating (e.g., Simmel, 1950; Durkheim, 1964). By blindly transferring these notions into contemporary contexts, systems designers often merely focus on connecting people (e.g., friend finder apps) rather than acknowledging the anonymity that the city both affords and requires, and what this anonymity actually does for life in the city (Williams et al., 2009). They argue that there are many positive aspects of urban anonymity. Paulos and Goodman (2004), for example, explore the contributions of *familiar strangers*, i.e., of those recognizable but unknown figures one meets on the daily commute, to a sense of place and even a sense of safety. Cities are not only made up of friends and acquaintances, of like-minded people and familiar strangers. They consist of a rich mix of both residents and non-residents. Cities are domesticated (personal) spaces where private interactions take place, just as they are public spaces as well.

In accordance with this criticism, I want to bring more attention to the people actually living in cities, to citizens, residents, visitors, and passers-by, who appropriate the city on their own terms. By advocating a perspective that "foregrounds the experience rather than the form of the metropolis" (Williams et al., 2009, p. 1), I want to focus "on what it is like to move through and live in contemporary cities, [which] brings the multitude of experiences co-existing within even the same urban space into plain view" (p. 2).

The flâneur as the idealized city dweller. Finally, I portray an image of the urban dweller, the actual inhabitants of cities. There is a tendency in urban informatics research to characterize potential users of urban applications as being "mobile, young, affluent, cosmopolitan and technologically savvy" (Williams et al., 2009, p. 3). This is the group of people that is often targeted with new technology for everyday life in the city. The notion implicitly, or even explicitly, underlying this characterization is the image of the *flâneur*. The notion of the flâneur, brought to scholarly interest by Walter Benjamin (1999) based on Baudelaire's poetry, stems from the time when shopping arcades and the wide boulevards emerged in Paris after Haussmann's renovation of the city. The flâneur is a characterization that is deeply rooted in these historic and economic circumstances. It is a person who wanders the streets aimlessly yet highly attentive and thoughtful of his surroundings, whose fodder is the crowd

(Williams et al., 2009). The flâneur is looking for the excitement and spectacle of mundane observations and imaginings about everyday life in the city. The prime spaces for the flâneur being the shopping arcades and boulevards with their glass storefronts, Williams et al. (2009) (dis)affectionately translate the term as the 'mall rat' of modern times occupying the shopping malls of the days back then.

The flâneur as the prototypical user of urban computing technologies is widely popular. Most distinctively, Paulos and Beckmann (2006) call for designing for daydreaming, astonishment, and wonderment of the ordinary and mundane; people living in cities being "creatures of boundless curiosity" finding themselves "astonished and in awe of not just the extraordinary, but the ordinary" (p. 881). Williams et al. (2009), however, warn about blindly reifying these patterns of behavior through designing not only for the contemporary flâneur but also through applying flâneur-inspired methodology, e.g., by superficially privileging passive voyeurism and ignoring alternative mobilities, inhabitations, and appropriations in and of the city (Williams et al., 2009). They suggest that focusing only on this particular brand of engagement with the city "seriously under-represents the diversity of social practices endemic to the city" (p. 3). The notion of people living in the city needs to be more diverse, more closely representing the realities of inhabitation and social practices in cities around the world.

My image of the city and its inhabitants. By summarizing the criticism above, I want to bring forward an image of my own that the rest of the dissertation can build upon. In this image, cities are an amalgamation of local communities and neighborhoods (Jacobs, 1961) – i.e., a number of joint and disjoint communities individual citizens are involved in. Furthermore, "cities are fundamentally comprised of the people who live and work in them, and the health of cities ultimately depends on the structure of opportunities available to those people" (Greenfield, 2012). In that sense, what is relevant are the people *and* the infrastructure to support them and their activities, i.e., the basis on which they can act.

I have argued previously to bring the citizen into focus, to focus on the experience of the metropolis rather than its form (cf. Williams et al., 2009). Hence, to cater to my goals, I want to see the city as a place for public debate, as a living habitat with its many facets and perspectives that can be formed and mended by inhabitants according to their needs. Rather than understanding citizens as a cogwheel in the city machine by passively monitoring and studying their movement and data shadows throughout the city (e.g., through sensing their patterns of movement, their visible behaviors), I want to understand citizens as active participants in city life and in the forming of their city. I want to learn of their opinions, their attitudes, and emotions. I seek to actively and creatively involve citizens in the discussions rather than merely extracting everything they know about the subject matter.

Taking part in the forming and development of a city can take place both

through appropriation by everyday live choices or through direct (and indirect) influence on municipal decision making processes. While many wish to take an active stake in the shaping and development of their living spaces, others may prefer to leave such duties and responsibilities to professionals, to their delegates. However, this stance may also change over time. For example, people may wish to routinely delegate the work to others, but may seek more active influence on breakdowns, i.e., when they perceive a strong discrepancy between their own expectations and actual change. The pivotal element, however, is to make people aware, to get them interested in the first place.

2.1.3 Rural Excursions: A Note on Rural or Remote HCI

While cities are positioned as the up and coming human habitats, they are not the only places and they are not for everyone. Rural and remote areas of the western world *are* inhabited and thriving – especially in Denmark. Similarly, the experimental settings that form part of this dissertation pertain not always to the most urban and dense places. In *Mobile Democracy*, they concern land use planning in large, yet sparsely populated municipalities with large agricultural areas and many smaller townships (see Chapter 4.1). In *Mening@Park*, they concern the forming of a national park where, next to people living and working there, nature is in focus (see Chapter 4.3). Hence, a brief word on designing for rural and remote areas is necessary.

This is an important and largely neglected field in existing research. If rural HCI is a topic, then it is almost exclusively in the context of developing nations such as in Africa or India. But it is also important to consider this topic in Western Europe (for one of the few examples, see Taylor & Cheverst, 2010). While the majority lives in cities, cities are more than their urban centers. They are in a dialectical relationship with other cities and, more importantly for me, with their surrounding hinterlands (Williams et al., 2009). They are fundamentally interconnected and located within a network of other cities and towns, villages, and other spots in the area. "The critical, life-enriching diversity of place emerges by way of juxtaposition that flourishes within global inclusivity, where city and country have mutual potency in an interrelated dance" (Bidwell & Browning, 2010, p. 27). In Denmark, and more so in the national park that I have studied, people have cottages in these areas, they vacation their, they visit these areas for a brisk walk, and on the weekends – apart from the many people living and working their 'full time.' Rural and remote areas are of importance, particularly in the Western world.

Two value sets are dominating rural natural fantasies: One follows imperialist ideas about taming, consuming, containing, instrumentalizing, or transforming nature, and the other is the idea of *Arcadia*, the rural idyll that the natural world offers a better, simpler, and harmonious life (Bidwell & Browning, 2010). Such views tend to sanitize "human-nature relationships by consigning interactions to ludic pursuits, sheltered from the grubby, nitty gritty of ordinary rural life" (p. 21).

Designing for rural and remote areas poses quite different challenges as opposed to designing for the city. Bidwell and Browning (2010) have written a seminal article on what it means to design for natural places. They base their reflections on a literature review and compare their experiences from rural Africa with Bidwell's own native rural Australia. They note that, unfortunately, designers merely transfer their experience from urban perspectives to rural areas – i.e., that "the monoculture of technology design tends to perpetuate models arising in urban locales" (p. 16) – without indeed deeply experiencing the natural places they are designing for firsthand. Hence, urban ideas and perspectives such as rationalization, points-of-interest databases, or wayfinding are infiltrating design for experiencing natural places. The blind transfer is problematic because of an "inseparability of meanings and corporeal experience of natural places for design" (p. 15), so Bidwell and Browning (2010) argue. Natural places can only really be understood and designed for through actual long-term bodily experiences in them.

Methods such as participatory design are being adopted for the purpose of designing for natural places (e.g., Taylor & Cheverst, 2010). Such methods, however, need to take into account the diverging understandings and appropriation of natural places depending on which relation one has to them:

> "The meanings that urban and rural dwellers couple with natural places differ [79], for example visitors concepts of 'nature', 'wildlife' and 'landscape' diverge from rural residents [44], which thus exerts a call to situate accountability within the locale of natural places and with their resident, floating and itinerant populations." (Bidwell & Browning, 2010, p. 17; references theirs)

Mentioned in this quote are the different actors whom I want to address in my work – i.e., where it concerns residents just as it concerns cottage owners and visitors. Bidwell and Browning (2010) care to discern between various forms of permanent habitation and visiting (i.e., people with ancestral, generational, recent, or transient histories in rural places), who, they argue, have fundamentally different relationships to nature. Especially in the setting of the national park in *Mening@Park*, we may also consider how technology gets out of the way of experiencing nature in recreational moments. Bidwell and Browning (2010) call this "revealing and receding": "design must simultaneously fade into the background and provoke seeing natural places differently" (p. 15). This is markedly different to common approaches in urban computing – to which I now return after this brief excursion.

2.2   Mobile Phones as Interfaces to Public Space

We take our phones everywhere we go. We pick them up, as part of our morning rituals, together with our wallet and keys before leaving the house and have

them with us when we traverse the city in our day-to-day life. They are woven into the fabric of our everyday lived experience and thereby increasingly into the fabric of the spaces we inhabit. The mobile phone is *the* ubiquitous computing device that is already widely happening. Mobile phones nowadays go well beyond the mere telephony they were initially designed for (Brown, Green & Harper, 2001; Ito et al., 2005). They are more than a portable telephone; they are a mobile computing device. They allow us to send text messages, take photos, do calendering, notes, and reminders, and increasingly to be located, to access the internet, and email.

Mobile phones are increasingly being used to document the world around us and to interact with our immediate environment. They are interfaces to the world and increasingly to our immediate environment around us (de Souza e Silva & Frith, 2012; Farman, 2012). While the vision of computing dissolving into the environment, of computing becoming invisible is a potential future, mobile computing devices are already here and can be utilized and appropriated today. They are the most mainstream manifestation of ubiquitous computing and a key element in a ubiquitous computing infrastructure – a part of the overall vision that has, for a while, almost seemed lost or at least underemphasized.

Mobile computing and mobility were not part of Weiser's original vision for ubicomp. Dourish and Bell (2011) point out that Weiser understood computing as always being linked to particular places (e.g., the home or the car). In contrast, today, computing has become mobile and untethered in our pockets and purses. Hence, research quickly (re-)discovered the mobile phone as one of the primary platforms for ubicomp applications.

As deeply embedded as it is in our everyday culture, the mobile phone has frequently become subject to social criticism. As Gordon and de Souza e Silva (2011) point out, numerous scholars have argued that technology hinders the formation of strong local ties in a community or neighborhood. In general, Putnam (2000) has argued that the decline of civic engagement in the everyday life of Americans is caused by developments such as suburbanization, the television, and, potentially, every other technology that is separating people from one another. For example, in the 1920s it was found that the telephone, while having many positive effects on social interaction, resulted in people talking more, but not to those right next to them (Park, McKenzie & Burgess, 1925). Such criticism seems to come up with every new technology that is introduced. The television was blamed for isolating people (Meyrowitz, 1985; Spigel, 1992), and the web was blamed for affording connections with those outside of and far away from people's local environments (Kapor, 1993). More recently, the mobile phone is seen as the culprit in the decline of public places because they prioritize the distant over the proximate (Katz & Aakhus, 2002; Moores, 2004).

Gordon and de Souza e Silva (2011) are skeptical toward such techno-determinism. They note that "too often, this anti-technology sentiment relies on a faulty premise of technologically aided communication replacing an ideal form of community that existed before it" (p. 107). They make use of Tönnies' (2001)

notion of *Gemeinschaft* that describes such an ideal form of community that is based on feelings of togetherness and on mutual bonds such as the family or a neighborhood in a pre-modern (rural) society. The opposite of Gemeinschaft is *Gesellschaft,* the anonymous life in the metropolis "characterized by differentiation, dissimilar ways of living, and rational interactions that occur largely through self-interest and formal contracts" (p. 107). Gordon and de Souza e Silva (2011) argue that a "narrative of 'community lost'", that is, that Gesellschaft increasingly replaces Gemeinschaft is too simple: "It is deeply problematic to assume that all technological additives to community life destroy the underlying cohesion of community" (p. 107). With this, they highlight the fact that most technologies have played some part in reorganizing social life, "connecting people through physical and virtual space *and* providing justification for disconnection. They have, each to a certain extent, increased social connectivity *and* social isolation at the same time" (p. 107).[1]

In their book *Mobile Interfaces in Public Spaces*, de Souza e Silva and Frith (2012) conceptualize personal mobile technologies beyond their material form and technical functionality as how they are employed by people as "filters, control devices, organizers of social networks, locative technologies, and information access platforms" (p. 4). They want to understand mobile technologies as interfaces, as "something that is between two other parts or systems, and helps them to communicate or interact with each other" (pp. 1-2). In their case, the two parts being the socio-material world on the one side and the person that employs different technologies to control and filter her interactions with the world and the people around her on the other.

Under the notion of cultural interfaces, which also includes books and cinema (Manovich, 2002), de Souza e Silva and Frith (2012) suggest that such "material devices are not only mediators between a person and a machine, but, most importantly, they are also filters for culture, defining and influencing how people interact with the world around them" (p. 3). This insight allows us to go beyond the traditional man vs. machine dualism and rather understand such interfaces as "systems that include the user, as well as the space around the user" (p. 3). Including the immediate environment allows us to see how it is perceived differently by people when mediated through mobile technology: "interfaces influence our perceptions of the space we inhabit, as well as the types of interaction we have with other people we connect with in these spaces" (de Souza e Silva & Frith, 2012, p. 4).

de Souza e Silva and Frith (2012) trace the role of mobile technologies as interfaces back to the popularization of paperback novels and the use of newspapers in public spaces (especially train compartments) during the growth of the modern city at the beginning of the nineteenth century (cf. Schivelbusch, 1986). As they demonstrate, people used these technologies with a "desire to avoid interactions with strangers and the need to selectively filter the over-stimulation of the urban environment" (p. 5). Still today, people listen to music, read the

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[1]Gordon and de Souza e Silva (2011) particularly talk about the telephone, the telegraph, the automobile, the elevator, and the mobile phone.

newspaper or a book on the subway in order to not needing to talk to with strangers. This shows that people have always sought to create some private sphere around themselves employing various technology when urban density increases. This practice was not introduced through mobile technologies itself, but is a capability that people in cities have developed from the beginning of the rapid urbanization (Simmel, 1950). Mobile phones are not disconnecting us, as some have argued (e.g., Katz & Aakhus, 2002; Turkle, 2011); rather, they act as filters and control devices that people use to *selectively* interact with their environment, the people and spaces around them (de Souza e Silva & Frith, 2012) – just as has been the case with books and newspapers earlier.

Hence, de Souza e Silva and Frith (2012) introduce the notion of mobile technologies as *interfaces to public space*, that is, "systems that enable people to filter, control, and manage their relationships with the spaces and people around them" (p. 5). Countering the very notion that technology is disconnecting us, they put forth that "people do not detach themselves from the places they physically inhabit, but rather develop new types of relationships with them" (p. 6). The technology is not controlling us, but we are using mobile technology for our purposes.

If mobile phones are interfaces to public spaces through which people act with the space and people around them, then we can use them to enable people to more profoundly influence the environment they know best, their neighborhood. In my work, I employ personal mobile devices as interfaces to the physical environment in order to initiate practices of situated engagement.

2.3   Location

In this section, we retreat even deeper into what it means to interact with the environment through the digital tools we use. It looks at the notion of location and explores what it actually means to be aware of ones location through technology and what it does to our interaction with it.

2.3.1   The Rise of Location-based Systems

The rise of location-based systems and services is de Souza e Silva and Frith's (2012) strongest aspect in their argument for mobile technologies as interfaces to public spaces. Such systems are made possible by modern-day smartphones that come with GPS receivers, Wifi, Bluetooth, and other means to physically locate the user in the world. Location-aware technologies allow people to attach information to places, to find friends, strangers, and things around them. They actually "strengthen people's connections to their surroundings because they help people to locate other people and things around them" (de Souza e Silva & Frith, 2012, p. 6; cf. de Souza e Silva, 2006; Humphreys, 2007; Gordon & de Souza e Silva, 2011). Individual location-aware technologies allow us not only to attach but also to selectively access different information about a

space. In this sense, they "promote important new ways people can filter public spaces" (p. 7), that is, they act even more so as interfaces between people, space, and technology.

de Souza e Silva and Frith (2012) rightly note that "with the increasing pervasiveness of location-aware technologies, public spaces are altered" (p. 7). "When somebody carries a book, a Walkman, or an iPod, their perception of space is changed, but the space itself remains unchanged for other people in the surroundings" (p. 7). In contrast, by attaching information to locations accessible for others (e.g., a picture, a restaurant review, or tips), others will perceive the space differently based on this information and may change their use of the space as well. We may see examples for this in the influence *Yelp* reviews or our friends' *Foursquare* recommendations have on our choice of the 'right' place to have a drink or eat. As a consequence of this additional information and the associated potential behavior change, the space changes not only for users of such services, but arguably also for non-users (de Souza e Silva & Frith, 2012). Social activity and information residing in the digital realm (e.g., on *Foursquare*) might explain why one pub is more frequented, while the one next door is empty – information that is opaque for some people in these spaces, while the consequences are not.

Gordon and de Souza e Silva (2011) call sites where located, digital information and physical spaces are enmeshed *networked localities* (cf. also Gordon, 2008). Some of the proponents of 'good public spaces' hold that such are characterized by people engaging with them fully, with mind and body, and with all their attention (e.g., Whyte, 1980; Goldberger, 2007). Gordon and de Souza e Silva (2011), however, see networked localities, or net localities, as a further social advancement of what Simmel (1950) has described as the "blasé attitude." During the turn of the century's rise of the metropolis, Simmel found that people living in cities developed a capability to 'block things out at will' in order to cope with the 'rapid increase in external stimuli' that comes with city life. While being concerned with this new development, Simmel also noted the unprecedented freedom it created for people living in cities, that is, to escape the small town life and become something different. Now with location-based technologies, so Gordon and de Souza e Silva (2011) argue, "traditional metropolitan public space is perhaps becoming like the small town, where pure physically co-present social circles seem oppressively small" (p. 89). Instead, the technologies affords new practices: "the person participating in a net locality is not limited to what immediately surrounds her; she has the ability to associate with a much wider swath of information and people" (p. 89). The technology augments the situated, local perspective, reaching into a global network of, yet still, localized information: "Having access to a global network of information while situated within a local street, neighborhood, town, or city, potentially realigns how the individual deals with the scale of user experience. The street is no longer limited to the perceptual horizon of the person walking down it. A network of information that is accessible through a mobile device augments it" (p. 3).

Hence, Gordon and de Souza e Silva (2011) see net localities as sites where physical spaces and access to digital, location-based information through mobile devices come together. While they are supported by the proliferation of location-based technologies, "the mere existence of location-aware devices in cities does not create net localities; net localities are practiced spaces – they develop over time, through social practices with technology" (p. 86). Rather than being determined by new technological developments, net localities are "emerging out of a cultural need to contextualize ourselves within a growing network of information" (p. 13) – such as sharing where we are with friends, geo-tagging our photos, or finding a good restaurant in the vicinity. In the sense of net localities, location-based technology expands and augments the experience of local space, rather than dragging people away or disconnecting people from it.

It should be noted that, as a concept, net localities are meant to describe not only the people using location-based technologies, but "they [also] include all those people who are co-present in the physical space who are not accessing digital information" (Gordon & de Souza e Silva, 2011, p. 86). This means that the conceptual shift toward net localities is not totalizing. It is based on emerging practices and wider cultural changes:

> "Even if one doesn't carry around an iPhone or Blackberry, as normative understandings of situations shift to accommodate new practices, network locality operates outside of the tools that enabled the practices in the first place. The tools are themselves just a medium to address much wider cultural changes around what it means to occupy space, to be with others, and to be local in a world where everything from the spectacular to the mundane has global reach."
> (Gordon, 2008)

In addition, net localities bring with them an expansion of the local situation and a blurring of feelings of distance and nearness. "The purview of what is near has expanded beyond that which is right next to you, and paying attention to an anonymous user at a neighboring street corner, visualized on a mobile map, is just as likely as paying attention to the stranger across the street" (p. 86) – i.e., the 'local situation' has expanded to include digital information. Gordon and de Souza e Silva (2011) further describe a distinct quality of locatedness, of being located on a map and in relation to other things: "When one is inserted into a map and placed into a geographical relationship to things mapped, there is a sense of distancelessness, in that there appears to be universal access to everything, but there is also a sense of nearness, in that everything is measured in actual distance from the observer" (p. 12, cf. Couldry & Markham, 2008). Distance and nearness are growing closer together. We have access to everything at the same time as everything is related to us, to our location.

Gordon (2008) argues, based on Heidegger's (1962) notions of *ready-to-hand* and *ready-at-hand*, that located, digital information flows can be just as near to

us as physical spaces we pass by. We are not immediately conscious of location-based information attached to places but they are available to us or ready-at-hand until we access them, where they then become immediately apparent to us or ready-to-hand – both are near and immediately accessible. "The local is that which is near – having files, pictures and people accessible regardless of physical location fundamentally alters what it means to be near" (Gordon, 2008). Things which we may have perceived as distant in the past, form now part of what we perceive as local.

2.3.2   The Changing Meaning of Location

de Souza e Silva and Frith (2012) see this popularization of location-aware technologies contributing to a "changing meaning of locations" (p. 7). In their sense, locations are geographical latitude/longitude coordinates attached with a multitude of digital information about the referred-to space. They thereby extend the very notion of location by another dimension: "Locations become dynamic and embedded with digital information, acquiring discursive and symbolic meaning, and cultural significance" (p. 10). The authors further explain this new dynamic meaning and what it means for our experience of space:

> "The meaning of each location [..] is [..] constantly shifting and being constructed by the increasing amount of location-based information that is attached via location-aware technologies. As a result, finding a location no longer means only finding its geographic coordinates, but also accessing an abundance of digital information that now belongs to that location. This information is always dynamic because it is constantly being created, deleted, and edited. Additionally, the information that belongs now to locations is user-specific. Depending on the type of hardware and software a person has, she will access different aspects of that location." (de Souza e Silva & Frith, 2012, p. 9)

Not only how she accesses this information is pivotal (i.e., the hard- and software she uses), but also what search terms she employs or which filters she applies will provide her with different facets of the space (de Souza e Silva & Frith, 2012). de Souza e Silva and Sutko (2011) call this, based on Deleuze (1995), *virtualization* and *actualization*. The information remains virtual until it is accessed, where it becomes actual. Not all (but only some) virtual information is ever accessible by any one user. People will download different information corresponding to their filters, but never the whole database. Net localities have a 'virtual' potential that is 'actualized' differently by different actors.

Eventually, however, de Souza e Silva and Frith's (2012) notion of location is premised on a technical understanding of the class of systems they are interested in, on the underlying technology such systems are based on, rather than on concepts that are socially and culturally meaningful to people (such as

space, place, or mobility). They set the stage for their argumentation with areas of interest such as location-based social networking (LBSN), location-based advertising (LBA), and location-based services (LBS) (p. 7). Succinctly, they use 'location' because it is the common denominator that underlies all these technologies and therefrom put a close focus on the notion as their primary object of interest for conceptualization.

I argue, however, that the actual example systems and services they provide use quite different terms and concepts to communicate the referents those information are about to their users. For example, *Foursquare* uses the concept of 'venues' that people check in to, leave tips for, or add photos to from their mobile phones, while *Gowalla* had the notion of 'spots' that could additionally be linked together to form 'trips.' The actual geographical position of spots or venues is just one of many aspects. Along with the unique place information these services provide, the places themselves are merely *located* on a map. The notion of those referents communicated to users takes precedence over the place's actual geographic position. In sum, few of these services seem to actually use the notion of location as a primary means to portray the engagement with places to their users. Hence, I would argue that richer concepts are necessary to conceptualize what is happening from a socio-cultural perspective.

I further disagree when de Souza e Silva and Frith (2012) note that in every way we interact through such technologies, we interact with locations: "people check into locations, they are concerned about locational privacy, they have their location tracked, they attach information to locations, and they are even able to 'create' new locations" (p. 7). With this understanding, they stretch the notion of location too far giving it a primacy that it does not have. It leads de Souza e Silva and Frith (2012) to conclusions such as that "*many places do become locations*, that is, the locational aspects of many places acquire relevance" (p. 10). I would argue that 'where something is' has always been there, it has always been an aspect of place – sometimes more at the fore and sometimes less so. With location-aware technologies, we are still interested in the places itself, we still experience and talk about the places as a whole and not about its abstract position in space or its pin on the map. The digital information attached to locations profoundly enriches the existing understanding of the place rather than fundamentally transforming the very nature of it.

Arguing for the opposite is playing into the hands of digital dualists, a position that de Souza e Silva and Frith (2012) rather seem to want to reject. Digital dualists hold that the digital or online world exists in parallel and independent of the 'real' or offline world (Jurgenson, 2012). Accordingly, terming the web a cyberspace is prominent with them – a space that we retreat to. Now, even the science fiction author William Gibson (2010), who has originally coined and later popularized the term in his 1984 novel *Neuromancer*, has retreated from it in a September 2010 op-ed in the *New York Times*: "Cyberspace, not so long ago was a specific elsewhere, one we visited periodically, peering into it from the familiar physical world. Now cyberspace has everted. Turned itself inside out. Colonized the physical." The web and the physical world can no longer

be easily separated. Or, as Dourish and Bell (2011) put it from the perspective
of actual practice: "The technologically mediated world does not stand apart
from the physical one within which it is embedded; rather, it provides a new set
of ways for that physical world to be understood and appropriated" (p. 132).
Similarly, not seeing places as an holistic entity but rather as the 'digital' loca-
tion being somehow separate from it seems to be just that – where the digital
information are in some way separated from physical, cultural, social, political,
and historical aspects of a place.

In sum, I doubt that location is, after all, the right notion we should be
working with – especially in technology-mediated civic engagement for land
use planning. Is it not more than mere locations we are after? Instead of
trying to ascribe new meaning to the notion of locations as such, we should
try to understand the concepts that location-based systems indeed represent.
We should move to a (people-faced) notion of *place-specific* technologies rather
than a (technology-originated) notion of *location-aware* systems. We first and
foremost want to engage with the places these locations represent. Hence, we
should rather apply a notion of place.

2.4   Place

The notion of place is nothing new in scholarly research. Place has a long-
standing tradition in the fields of architecture, geography (Tuan, 1977), and
sociology (Gieryn, 2000), and has slightly more recently been introduced into
HCI (Harrison & Dourish, 1996; Dourish, 2006; Fitzpatrick, Kaplan & Mans-
field, 1996; Fitzpatrick, 2003).

The notion of place is frequently conceptualized in relation to a notion of
space. Simply put, space, according to Harrison and Dourish (1996), is the
physical, three-dimensional environment that we live in – a geometric account
of space. It is the frame in which actions and practices can arise. Harrison and
Dourish (1996), hence, call it the opportunity for practices to emerge. Spaces
exist through social practice of power and control (e.g., politics, urban plan-
ning, architecture). And, spaces are geographically located (Dourish, 2006).

Places, then, are spaces invested with meaning and understandings of role,
function, and nature that frame appropriate behavior – an experiential account
of space. For example, we have the notion of a behavior being 'out of place.'
Places are spaces that people put to use, adapt, and appropriate. They are val-
ued and meaningful for people. As Harrison and Dourish (1996), put it, they
are the understood reality. Places exist through social practices of use.

There may exist many places for each and everyone of us at the same time –
physical and digital, real and imaginary, etc. The concept is not confined to any
specific form or materiality. Yet, places is what gives space a social, cultural,
and historical meaning for people.

Mobile and wireless technologies play in interesting ways into the equa-

tion of space and place, of spatiality, practice, and mobility. As Brewer and Dourish (2008) state: "Mobile technology is not [..] simply operating within a spatial environment; it is implicated in the production of spatiality and spatial experience. Our ideas of how spaces are organized are mediated by technologies and the representations they produce" (p. 965). That is, mobile technology influences how we understand, put to use, and experience the physical environment around us. Through mobile technology, we re-encounter everyday space, it transforms our spatial understandings and concepts (Dourish, 2006), because new aspects of space become of interest (e.g., the next power outlet, availability of wifi, the use of GPS indoors, or mobile phone reception).

A notion of place whose character is crucially determined by a hybridity of physical and digital aspects (de Souza e Silva, 2006) is central to my explorations into situated engagement as the site and topic of civic discussions.

2.5 Summing Up

The chapter has elaborated on a number of current developments and concepts against the backdrop of which the following reflections unfold. I have begun this chapter with a presentation of the urban environment as the primary domain of research pertinent to my work and its growing penetration with technology and new socio-technical practices. I have questioned the different assumptions that underlie these ambitions, i.e., the different images of the city and its inhabitants. By thoroughly criticizing the common perspectives on the role of technology in urban environments, I have provided my own image where the diverse and constantly evolving socio-material structure of the city provides the foundations on which its inhabitants can engage as active and creative actors in the forming and mending of their own living environment. This image informs the design processes of the four experiments (see Chapter 4). It is reflected in the way my perspective on people's role throughout the experiments progressed – i.e., from the early *Mobile Democracy* with its focus on rational deliberation to the late *I'm Your Body* with a focus on affect and emotions through storytelling (see Chapters 4.1 and 4.4). Lastly, I have taken a brief digression into rural and remote HCI. Designing for natural places poses quite different challenges. *Mobile Democracy* and *Mening@Park*, whose experimental settings deal with sparsely populated areas and a national park respectively, illustrate that (see Chapters 4.1 and 4.3).

In the second part of this chapter, I have focused on personal mobile devices as they are carried around at all times and provide a personal anchor into located issues to allow for initial engagement in-situ. This branch of technology is at the center of my design experiments. Mobile phones are an integral part in enabling situated engagement with urban planning discussions. Their functioning as interfaces to public space is pivotal for a concept of situated engagement, where citizens are encouraged to engage with the physical space and the people around them.

The third part of this chapter provided a critique of the notion of location to explain people's engagement with the environment through digital technology. Instead of location-aware, I seek to develop place-sensitive systems. Situated technologies have the potential to alter the meaning and the experience of place. Hence, I take a notion of place, perhaps hybrid, to undergird my idea of situated engagement. Before delving into the design experiments I have undertaken and their contributions in Chapters 4 and 5 respectively, I outline my general research approach in the following method chapter.

Chapter 3

Method

The research approach that forms this dissertation can be described as experimental, exploratory, and designerly (cf. Brandt & Binder, 2007). Fundamentally, I employ practical design experiments to probe and challenge current use practices and help formulate hypotheses for how future technology may develop such practices further. I do so by building prototypes of various forms and confront them with real world settings. I employ the means of design and design thinking to bring this about.

To this end, my approach is influenced by (1) research through design as a basic understanding of how research can be informed by design, especially when tackling wicked problems; (2) participatory design as a fundamental value orientation (even more so for civic engagement); and (3) iterative prototyping as the concrete approach to designing artifacts for exploration. Together, these three commitments inform both my research and my design method as outlined below.

My particular aim of designing and exploring mobile situated technologies poses new methodological challenges to capture and study the practices of inherently mobile people in real world settings. These challenges are faced by many scholars in, e.g., mobile HCI and ubicomp research. To cater to my own studies, I have discussed and adapted existing methods and techniques in the light of new methodological requirements, providing a methodological contribution to the field. This, I will outline in the second part of this chapter. In the end, I reflect on the concrete activities carried out and their appropriateness for my set research objectives.

3.1   Research Through Design

Engaging citizens in participatory urban planning during their day-to-day life is a wicked problem (Rittel & Webber, 1973). My efforts to design socio-technical

systems that mediate such situated engagement are complicated by a number of entangled and intertwined factors concerning the specific domain, new technological possibilities, and citizens and their evolving practices. Research through design has been proposed to tackle wicked problems (Zimmerman, Forlizzi & Evenson, 2007; Zimmerman, Stolterman & Forlizzi, 2010). It is a holistic approach of designerly thinking and design activities that integrates knowledge and theories from across many disciplines. Research through design seeks to integrate design (and interaction designers) more equally in HCI research endeavors beyond doing 'decoration' or pure (design) methods research.

At the core of this approach is the desire to design the *right* thing (as opposed to, e.g., designing commercially viable things) by formulating a preferred state of the world and designing toward it. Therefore, it "forces researchers to focus on research of the future, instead of on the present or the past" (Zimmerman et al., 2010, p. 310). The future at which my research aims is a future in which interested citizens are more actively and creatively involved in the design of their immediate living environment.

The research through design model is described by the authors as follows:

> "Interaction design researchers integrate the *true* knowledge (the models and theories from the behavioral scientist) with the *how* knowledge (the technical opportunities demonstrated by engineers). Design researchers ground their explorations in *real* knowledge produced by anthropologists and by design researchers performing the upfront research for a design project. Through an active process of ideating, iterating, and critiquing potential solutions, design researchers continually reframe the problem as they attempt to make the *right* thing. The final output of this activity is a concrete problem framing and articulation of the preferred state, and a series of artifacts—models, prototypes, products, and documentation of the design process." (Zimmerman et al., 2007, p. 497)

In my research approach, this is aided by participatory design and iterative prototyping. The design artifacts produced are valuable outcomes that embody theory and technical opportunities working toward the preferred state of the world (Zimmerman et al., 2007). They become design exemplars that may transfer research findings to other researchers and to practitioners. They can be seen as a proposition for a preferred state that is open for inspection, interpretation, and critique, or "as a placeholder that opens a new space for design, allowing other designers to make artifacts that then better define the relevant phenomena in the new space" (Zimmerman et al., 2010, p. 311).

In order to evaluate a contribution made through research through design, Zimmerman et al. (2007) suggest a set of criteria. These include detailed documentation of the design process; significant innovation through novel integrations of theory, technology, user need, and context; relevance to the real world; and extensibility of the outcomes.

3.2   Participatory Design

Participatory design is a fundamental value in my research approach. It puts strong emphasis on involving actual users (even citizens) in the design of new technologies. Yet, this should come natural when working with civic engagement. Fittingly, the Scandinavian tradition of participatory design itself has democratic roots, namely in the empowerment and emancipation of workers in the 1970s and 80s (Bjerknes, Ehn & Kyng, 1987; Greenbaum & Kyng, 1991). At the time, the rapidly progressing introduction of computers in the workplace was seen by many in society as a threat. These machines, one feared, might come to steer and control human factory workers and office employees to an extent which eventually might make humans superfluous. Hence, participatory design sought to involve workers bottom-up (i.e., through trade unions) in the design of their own work environments and more specifically their (active) place in an expanding computing infrastructure. Instead of deskilling workers, participatory design sought to act skill-enhancing. It provided workers with resources to be able to act in their respective situations beyond the duration of the particular co-design process.

With the turn of the century came a new wave of technological and methodological challenges (Bødker, 2006): Technology became increasingly mobile, use situations moved from work to the rest of human lives, and the idea that technologies were designed and deployed as systems one at a time no longer functioned as a basis for design. Today, participatory design needs to handle ever more complex settings outside of work and operate with new forms of participation and emerging social practices (e.g., in social media). The pervasiveness of information technology in human life poses new challenges for the way participation occurs, is supported, and understood.

A specific set of aims is central to a participatory design approach. The early *Utopia* project emphasized the need for technical and organizational alternatives. This is achieved by providing hands-on experience for workers during the design process (Bødker, Ehn, Kammersgaard, Kyng & Sundblad, 1987). Through this hands-on experience, users as well as designers explore and seek to understand the future use situation. A rich toolbox of methods has been developed throughout the years. For example, in participatory design workshops, researchers or designers utilize a number of different design artifacts such as scenarios, mock-ups, and prototypes to engage with the different stakeholders in the project.

In my research through design approach, I apply participatory design to learn more about the domain, about future use practices, and about how these might evolve and develop further. I will detail later in the individual design experiments (Chapter 4) the number of concrete design activities and artifacts that I have used to facilitate this co-exploration of the field.

Technology-mediated civic engagement is a domain where participatory design is already applied and explored (e.g., Merkel et al., 2004). Because of the

heterogeneous and partly open and public nature of the domain, stakeholders are not easily identifiable anymore. Hence, identifying potential stakeholders has been a challenge in my experiments (see Paper 1). My eventual goal is to empower stakeholders more generally and sustainably instead of merely meeting their needs with a bespoke technical solution. For such purposes, infrastructuring and artful integration are increasingly seen as important themes in participatory design research (e.g., Karasti & Syrjänen, 2004).

Within the frame of my first design experiment, participatory design has been discussed in the context of designing for e-government by my co-investigators Bødker and Zander (2012). Furthermore, the use and role of personas in this particular design endeavor are critically reflected upon by Bødker, Christiansen, Nyvang and Zander (2012).

3.3   Prototyping

Iterative design and prototyping has dominated my research. Accordingly, I see all designs as part of an iterative design process, where the prototypes, for a period, hold on to design decisions (Lim, Stolterman & Tenenberg, 2008), are vehicles for communication in the project, and serve users' hands-on experience (Bødker & Grønbæk, 1991). Prototypes stimulate reflection and are used to frame, refine, and discover possibilities in a design space. They are intermediate outcomes that in various forms capture what we know about the product, the use situation, and the design process.

Some of these prototypes are versions of the final product that are in various ways fully functional, while others at the other extreme are experimental and throw-away prototypes formed in materials and software that has little to do with a final product (e.g., mock-ups or paper prototypes). In general, an iterative design process moves from primitive and ad-hoc prototypes toward something that is increasingly sophisticated and reliable. Yet, there are also movements in the reverse direction, such as when particular elements of a sophisticated prototype fail and need to be re-iterated in a more exploratory manner. Prototypes may be used both to explore settings and to provide answers regarding future designs.

Lim et al. (2008) see prototyping as "framing and exploring a design space." By traversing the design space, we create prototypes that are "purposefully formed manifestations of design ideas" (see Table 3.1). Lim et al. (2008) view prototypes as filters that allow designers to explore and focus on specific aspects of the design space (e.g., in terms of appearance, data, functionality, interactivity, or spatial structure). At the same time, prototypes manifest certain aspects of a design idea while considering the dimensions of material, resolution, and scope (Lim et al., 2008).

Interestingly, some of these design ideas are also manifestations of research. Prototypes may hold assumptions of and propositions for the field and for fu-

Fundamental prototyping principle:
Prototyping is an activity with the purpose of creating a manifestation that, in its simplest form, filters the qualities in which designers are interested, without distorting the understanding of the whole.
Economic principle of prototyping:
The best prototype is one that, in the simplest and the most efficient way, makes the possibilities and limitations of a design idea visible and measurable.
Anatomy of prototypes:
Prototypes are filters that traverse a design space and are manifestations of design ideas that concretize and externalize conceptual ideas.

Table 3.1 The Principles of Prototyping and the Anatomy of Prototypes (Lim et al., 2008, p. 4).

ture use practices. Through participatory design, they are brought into the world and used to co-explore relationships between people, technology, and the respective domain. Prototypes are incomplete portrayals of design and research ideas and may further be utilized to challenge current and future practices through *provotyping* (Mogensen, 1992).

3.4 Method Contributions: A Need for 'Situated' Methods

Exploring an emerging field usually makes an innovation in methods and techniques necessary. With use being increasingly mobile, people carrying around and interacting with technology embedded in the environment, existing field methods have difficulties at following and observing this new and flexible use. In addition to not scaling up, the in-situ character of this use also brings about new qualities of human life that need to be studied in new ways. Laboratory experiments are less meaningful and helpful to this end. Instead, such studies are increasingly sought to be conducted *in the wild* (Rogers et al., 2007; McMillan, Morrison, Brown, Hall & Chalmers, 2010; Brown, Reeves & Sherwood, 2011). Yet, there is plenty of room for method innovation around in-the-wild studies for mobile and ubiquitous systems.

Bannon (1991) argued in his paper "from human factors to human actors" for the need to understand technology situated in realistic use situations and the need to work with users in design. However, this becomes increasingly difficult in ever more complicated use settings outside of the workplace. Earlier, use situations and communities of practice, e.g., within organizations, were rather well-established and could thus often function as a unit of analysis. Grudin (2002) addressed some of these new challenges of ubicomp, in particular that applications are no longer about the 'here and now,' meaning that use situations stretch into everywhere and forever. This has consequences for the methods with which we analyze and design ubiquitous technologies, because many of the methods deployed hence far were addressing situations where people act, perhaps together, within quite well-understood settings, time spans, and locations. In contrast, ubiquitous technologies are often designed for use

situations that are not well understood and in the making.

Field methods have been widely discussed in terms of evaluating systems in the field (e.g., for identifying usability issues). Multiple conference workshops on methods for studying mobile user experience have taken place (e.g., Nakhimovsky, Eckles & Riegelsberger, 2009; Poppinga, 2010). More general literature reviews have provided an overview of the methods used in mobile HCI (Hagen, Robertson, Kan & Sadler, 2005; Kjeldskov & Paay, 2012). Additionally, the topic is also of wide interest in the ubicomp community (e.g., Consolvo et al., 2007). What I am, however, more directly concerned with is using participatory methods for exploration in the field, that is, as a design activity that opens up the design space rather than closing further exploration down by evaluating or testing a 'finished' application. This need for a rich understanding of the field and its spatio-temporal rhythms and intricacies is echoed and even more pronounced when designing for natural places (cf. Bidwell & Browning, 2010, pp. 24-25).

3.4.1   Walkshops

Walkshops are a variation of classical participatory design workshops. The technique originated out of a desire to explore situated technologies (such as, e.g., mobile location-based systems or ubiquitous technologies) together with participants out in the field, where people can actually try prototypes out by interacting with the rich environment. Any kind of design artifact can be used and brought outdoor. Yet, walkshops work best when the artifact actually reacts to aspects of the environment – e.g., when a running prototype reacts to a GPS position or the user takes a photo through it. Merely situating participants in the actual context, however, already invigorates and inspires their thinking and reflections in a way that may be complementary to indoor activities.

Walkshops provide hands-on experience in more realistic use settings (than, e.g., workshop rooms) by urging participants to carry out concrete tasks on a prototype while out on a 30 to 45-minute scenario-based walk together with the investigators. The primary goal is to explore and understand the design space in such particular settings. The focus of the technique, however, lies on *understanding the mediating technology* within these settings, rather than the environment as such. Hence, with this approach, we strive to bring the design work into the context of use, rather than bringing the use context back into the workshop room (cf. Oulasvirta, Kurvinen & Kankainen, 2003; Eriksson, Ludvigsen, Lykke-Olesen & Nielsen, 2006). Walkshops employ walking (i.e., as in going for a walk) as a thinking tool to stimulate reflection as well as, through its in-situ nature, a tool for closer relation to the use context. Through bringing participants into the environment, we encourage reflections on and reminiscences of everyday lived experience.

Rather than standing on its own, we conceptualize walkshops as a part of and complement to traditional workshops, where they can be embedded as one of the activities on the agenda. Walkshops are thought to consist of at least

three parts: (1) A briefing where, e.g., aim of the study and the design artifact are briefly introduced. (2) The outdoor walk itself, where participants interact with the environment, e.g., through prepared points-of-interest or problem-centered tasks. And, (3) a follow-up discussion in a more relaxed (indoor) setting, where some of the ideas, suggestions, and tensions from the walk are discussed in more depth. This last part can be facilitated by materials produced by participants during the walk (e.g., photos taken, topics created, or screenshots of the application). This way, the activity may facilitate further discussion and co-exploration based on the gathered hands-on experience.

The walkshop technique is presented and discussed in more detail in Paper 2. It has been applied extensively and in several variations for different purposes in three of the four design experiments included in this dissertation (see Chapter 4 and Papers 1, 3, and 4).

3.4.2 Exploratory Field Trials

In Paper 4, we discuss very specifically the merits of fields trials as part of an iterative design process in a specific case (i.e., the *Mening@Park* experiment; see Chapter 4.3). A major concern of 'evaluating' ubicomp systems is to study how practices and context of use emerge and develop over time when new technology is introduced. When a sophisticated prototype of a situated technology can stand on its own two feet, we want to see how people would actually use it in more realistic settings and over time. The central aim of our field trials, however, is to facilitate further exploration of the field with such a prototype rather than its evaluation.

My discussion of exploratory field trials adds to the renewed interest in method and the value of field trials, and how such experiments should (or should not) be conducted in more naturalistic settings (Kjeldskov, Skov, Als & Høegh, 2004; Rogers et al., 2007; McMillan et al., 2010; Brown et al., 2011). In general, I agree with Brown et al. (2011) that we need "much greater innovation in methods around trials, a break away from the assumption that trials should be as 'natural' as possible" (p. 1665). I argue for an approach that does not seek to be 'natural' in a mimetic sense, i.e., that does not regard field trials as simulations of use as it would allegedly occur outside and independent of field trials.

In the paper, we hence investigate in which forms field trials are a workable model as part of an exploratory design process, specifically, for sporadic, mobile, non-work settings. Regarding our own efforts, it turned out to be surprisingly difficult to study our prototype in a setting that stretches over time, place, and without a preselected set of users. Analyzing our difficulties, we developed a general model for methods studying ubicomp systems. The model takes the following five dimensions into account: the use situation, the involvement of the investigator, the participants, time, and the sophistication of the prototype (see Figure 3.1). What is typically understood as a ubicomp trial use exists at one end of these dimensions where the finished prototype is used
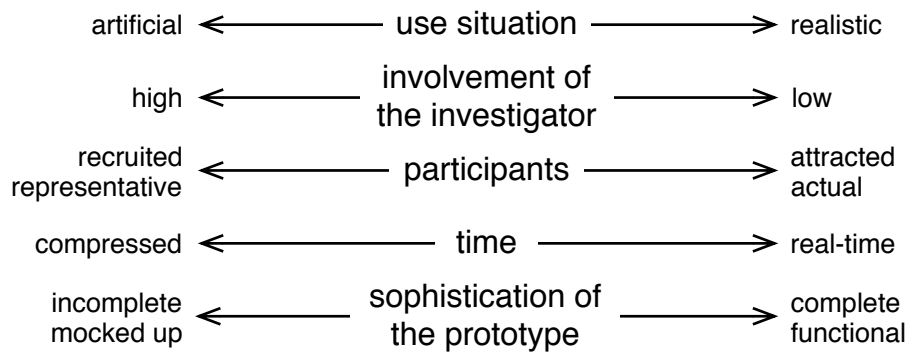
artificial ⟵————— use situation —————⟶ realistic

high ⟵————— involvement of
the investigator —————⟶ low

recruited
representative ⟵————— participants —————⟶ attracted
actual

compressed ⟵————— time —————⟶ real-time

incomplete
mocked up ⟵————— sophistication of
the prototype —————⟶ complete
functional

Figure 3.1 A model of five dimensions for methods studying ubiquitous computing systems.

by voluntary users in real, un-tampered use situations at a safe distance from designers and researchers. On the other extreme, we typically find mock-up prototypes used in workshop settings in close interaction with the investigators. However, there are many other ways in which these dimensions may be combined.

The model helps to gauge the number of individual activities carried out in an iterative design process by moving back and forth along these dimensions. How we may position a specific activity is a methodological choice. Yet, this is not an either-or. Our model helps to bridge the gap between prototyping and workshops on the one hand and full-blown field trials on the other by locating critical aspects of these methods on the individual dimensions.

On the basis of this model, we formulate an openly interactive approach to field trials, which we think might prove to be both more viable and more insightful. Pursuing this approach, we attract, rather than recruit, actual future users to an open system. We interact with (some of) them directly and take their experiences of using the system as a springboard for in-depth explorations of their perspectives and insights about the concrete system, the broader concept, and potentials and tensions for future approaches in general.

There are fundamental epistemological issues underlying the challenges of field trials in iterative design. Traditionally, field trials have looked at use as it is here and now, and possibly as it has developed to become what it is. Design needs to work with fully functional prototypes to look ahead and explore what participants might do toward use practices that are still emerging and in the making. We thus argue that field trials might be better thought of as a part of, rather than as an assessment of, an iterative design process.

3.5   Method Reflection

In this chapter, I have described and motivated my general research and design approach. The included papers and the following chapter on the individual

design experiments of my dissertation will provide more detailed information on the concrete techniques, activities, and artifacts utilized in the processes. First, however, I want to briefly reflect on the appropriateness of the methods and techniques applied throughout the work reported here.

Throughout my work, I have employed various methods to obtain results of varying character. With *Mobile Democracy* as the initial design experiment, we have entered a completely new field. At its core, this field has the values of participation and civic engagement. Due to the novelty of the field and its core values, we have been interested in a deep and comprehensive exploration of the opportunities and tensions mobile location-based technologies pose for civic engagement in land use planning. Therefore, an open-ended, largely undirected participatory design process with citizens and planners and a plethora of different design activities has been employed. We have made use of iterative prototyping to co-generate various design artifacts of varying sophistication that filtered different aspects of the design space. This has served us well and we have been able to formulate relevant implications for the technology and the field, to come up with concrete design ideas manifested in prototypes, and to provide conceptualizations contributing to the notion of situated engagement. The experiment informs the very foundations of my dissertation and initiates the concepts that have been further spelled out in later experiments. Among these concepts are the notions of in-situ and ex-situ reflection and action, and thereby a first hint at a notion of situated engagement infrastructures.

Emerging from an idea in a participatory design workshop, we initiated the *AR City* design experiment. It has sought to explore technical possibilities of place mediation. As a result, the experiment has provided a proof-of concept prototype that has demonstrated the possibilities of augmented reality for urban planning. Additionally, analytical walkshops with the prototype have helped me to obtain a richer conception of place mediation and to understand the properties of situated immersion, i.e., the feeling of actually being there, mediated by technology.

With *Mening@Park*, we have brought the previously developed prototypes back into the field and, through their introduction, have explored the potentials and tensions of such kinds of technologies for civic engagement integrated into people's everyday lives. Furthermore, *Mening@Park* has sought to directly experiment with new forms of strongly coupling digital topics to physical places. This has been achieved by proposing various new design ideas manifested in the prototypes to participants. We have sought to employ the field trial method as an instrument for further exploration of the field with sophisticated prototypes. Yet, we fell slightly short of reaching the goal of meaningful further exploration, as we discuss extensively in Paper 4. In reflection, a more open and interactive approach to field trials, as we have proposed in Paper 4, would have been more beneficial to our goal.

In *I'm Your Body*, my goal has been to understand how people, youth in this case, actually use such a system in the real world. To this extent, the experiment has provided a fitting complement to the other design experiments

by uncovering ways in which civic discussions are emerging in the wild. It has studied actual and emerging use practices as well as appropriation of the system. To this end, analyzing actual content and usage data has been very fruitful. Further relevant aspects could have been explored if the study was followed-up with interviews with participants – for example, how using the system (potentially) integrated with their everyday life. Yet, this has not been intended and not possible within the frame and setup of that research project.

In general, the participatory design methods that I applied have suggested potentialities for future use practices and underlined them with concrete manifestations of design ideas through prototypes and other design artifacts that explicate conceptualizations for the field. However, participatory design as a tradition seeks to trigger questions which go beyond the mere scholarly desire to gain knowledge of a domain. What are the actual outcomes of these (design) processes for participants? Have we indeed empowered participants for their future life (e.g., enhanced their skills)? Has the project in that regard been sustainable? Such questions are important – even more so in a political domain such as mine. Yet, it has not been my aim to change existing practices radically. None of the prototypes has actually been directly implemented into production systems or led to changes in existing systems to the best of my knowledge. Yet, those that participated (both planners and citizens) certainly obtained new perspectives on what it means to participate in civic engagement processes – a new sensitivity and awareness for listening to the opposite side and a demonstration of new possibilities for participation.

Chapter 4

Design Experiments

Four experimental cases inform this dissertation. These design experiments are of varying nature in order to probe and explore different aspects of mobile technology for situated engagement.[1] They explore technical, empirical, and/or conceptual aspects of the field (see Table 4.1). They also use different methods, where participatory design and prototyping are at the core. Together, they contribute to an overall understanding of the concept of situated engagement. Furthermore, the design experiments make clear the need for an infrastructural perspective, which I will approach in the coming two chapters.

The design experiments have been named according to the prototypes or systems built: *Mobile Democracy*, *AR City*, *Mening@Park*, and *I'm Your Body*. The individual experiments build up on each other and are thus presented in chronological order. They show a progression in the way my thinking and reflection around situated engagement developed and evolved. The experiments

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[1]I have come to call them design experiments instead of cases in the vein of experimental design research as brought forward by Brandt and Binder (2007). By calling them experiments, I do not suggest that my work would provide unequivocal yes/no-answers to clear cut, narrowly defined research questions. Rather, I want to emphasize the exploratory and empirical character of my studies, which I have conducted in settings which were temporally, spatially, and socially well confined.

Experiment	Empirical Focus	Methods
Mobile Democracy	co-design process	extensive participatory design process
AR City	field use	analytical walkshops
Mening@Park	co-design process/ field use	exploratory field trial, interviews, workshops, exploratory walkshops
I'm Your Body	actual usage	field trial, analysis of usage data, reflection on design

Table 4.1 Overview of the individual design experiments and their setup.

have in common an interest in how location-aware personal mobile devices can be employed to allow various groups of citizens to engage in conversations about their environment *on the go*. Each experiment looks at this theme from a different perspective.

For each experiment, I provide a brief general description and context, the specifics of the respective design process, and the prototypes that were developed and used for exploration of the field. Findings and contributions out of the individual experiments, together with their contribution to an infrastructural perspective, are then presented in the following chapter.

4.1   Mobile Democracy

Mobile Democracy is the last of three cases within the *eGov+* research project at Aarhus University, and the first experimental case I was involved in after the start of my Ph.D. Two other Ph.D. students, one postdoc, and one professor/principal investigator have been involved. The design experiment set out to explore a gap in the literature where public participation geographical information systems (PP-GIS) could be accessed and used through mobile devices that people already carry around with them (Zander & Bohøj, 2009).

Mobile Democracy is (mostly) an empirical design experiment, where prototyping is employed throughout an extensive participatory design process. It explores how mobile phones could be used to allow citizens to participate in civic discussions around land use planning while being on-site, at the location of interest (e.g., at the proposed building site of a new public library). The hypothesis is that this would provide better motivated and, through collaboration among citizens and between citizens and planners, more qualified contributions (proposals, comments, objections) as was the case before. Another intention is to enable participation all year around and independent of institutions that would require citizens to be present at a specific place during a specific time (e.g., town hall meetings or hearings). Yet, our forays in this domain should be seen as an addition to such existing instruments rather than as a substitution for them.

Of central interest for civic participation is the development of a municipal plan ("Kommuneplan" in Danish). A new municipal plan is created every twelve years and 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. How and at what stages this involvement of different stakeholders exactly should take place has been interpreted in various ways. The plan itself 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. Consequently, in this experiment, we explore the fruitful

combination of maps, geographical information, public participation, and personal mobile devices.

The largest, yet most sparsely populated municipality in Denmark (Ringkøbing-Skjern Kommune in Western Jutland) constitutes the setting of *Mobile Democracy*. The municipality encompasses various different areas from small villages, to towns, and mid-sized cities as well as large areas of agriculture, nature, and recreation. This presents an interesting counter notion to the dense urban areas that are much more prevalent in recent discussion within urban informatics.

Mobile Democracy has mainly been reported in Paper 1. The paper describes the design and research process, the prototypes developed and employed, and the insights concerning digital mediation through mobile technology in municipal planning that we gained from this. The walkshop technique from Paper 2 originated from this experiment, and the experiment forms part of two other dissertations. Morten Bohøj (2011), on the technology side, focused on architectures and social technologies for engaging citizens through collaborative, mobile, and web-based public services. Nikolaj Gandrup Borchorst (2011) brought forward a notion of participatory citizenship where collaboration between citizens and the municipality as well as among citizens is at the core in order to empower citizens. Additionally, Susanne Bødker and Pär-Ola Zander (2012) and Bødker et al. (2012) have explored the role of participatory design, web 2.0, and mobile technology in an e-democracy context.

Mobile Democracy has been a springboard for further design experiments. *AR City* is a technical experiment on mediated experiences of future places that provides a plug-in functionality for the *Mobile Democracy* prototype. *Mening@Park* is a true follow-up of *Mobile Democracy*. It transfers the ideas and the prototype into a new context and domain.

4.1.1 Design Process

In the traditions of participatory design, prototyping, and research through design, the design process is marked by the involvement of various stakeholders in a number of design activities making use of a number of design artifacts. Table 4.2 gives an overview of the activities and respective participants. Figure 4.1 shows how these activities are connected and which design artifacts were employed within and throughout these activities as vehicles for communicating ideas, hypotheses, and possible future scenarios. As this is the initial experiment on which some of the other experiments are built upon, the process is presented in more detail.

Largely, two main groups have been involved in the process: (1) planners and other professionals from the municipalities as well as (2) individual citizens and citizens already engaged in interest groups. While we are concerned with the municipality's needs, wishes, and requirements (they are our primary partner after all), we have had a clear citizen-bias throughout the process con-

	Activity	Participants (external)	Design Artifacts
A1	3 hour meeting	4 municipal employees	
A2	1 hour interview	1 citizen involvement expert	scenarios
A3	3 hour workshop/ focus group	4 citizens from a camping ground interest group	scenarios, cultural probes
A4	3 hour workshop/ focus group	7 citizens from a parish interest group	scenarios, cultural probes
A5	4 hour workshop and walkshop	4 municipal planners	web-based mobile prototype, storyboards
A6	2 hours of pluralistic walkthrough[a]	3 young citizens	storyboards, various paper prototypes of mobile app, desktop app,[b] and specific aspects thereof, native mobile prototype
A7	3,5 hour workshop and walkshop	4 individual citizens	native mobile prototype, AR prototype,[c] interactive paper prototype of desktop app, storyboards, scenarios
A8	4 hours of qualitative interviews	2 individual citizens	scenarios, storyboards
A9	2,5 hour workshop and walkshop	4 municipal planners	running mobile and desktop prototypes, storyboards, scenarios

[a]Pluralistic walkthroughs are a version of cognitive walkthroughs, an inspection method for analytical usability evaluation, that involve actual users next to developers and usability experts (Sharp, Rogers & Preece, 2007, Chapter 15.3).

[b]Here, with 'desktop,' we are merely referring to a more stationary use situation (e.g., at home) where the application is accessed through a full-size web browser (e.g., on a tablet, a laptop, or a desktop computer) in contrast to a smartphone and its limited capabilities.

[c]See the *AR City* experiment.

Table 4.2 List of design activities and their participants in *Mobile Democracy*.

centrating on how to best involve citizens in digitally mediated planning discussions rather than concentrating on how the outcomes of these discussions could be operationalized and integrated into the planners' back-end for supporting their decisions (e.g., their specific GIS system). Planners generally wished for more and more varied voices in the process – if not only to receive some qualitative and more direct feedback from the people they are actually planning for. Hence, the citizen-bias is not problematic within the frame of this research cooperation. The bias is further reflected in the general approach of the entire dissertation.

During the activities outlined in Table 4.2, we utilized a broad set of design approaches including brainstorming techniques, 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. Concurrently with the paper prototypes, we started developing functional software prototypes for smartphones and the web (i.e., for the desktop). With the mobile prototypes, we
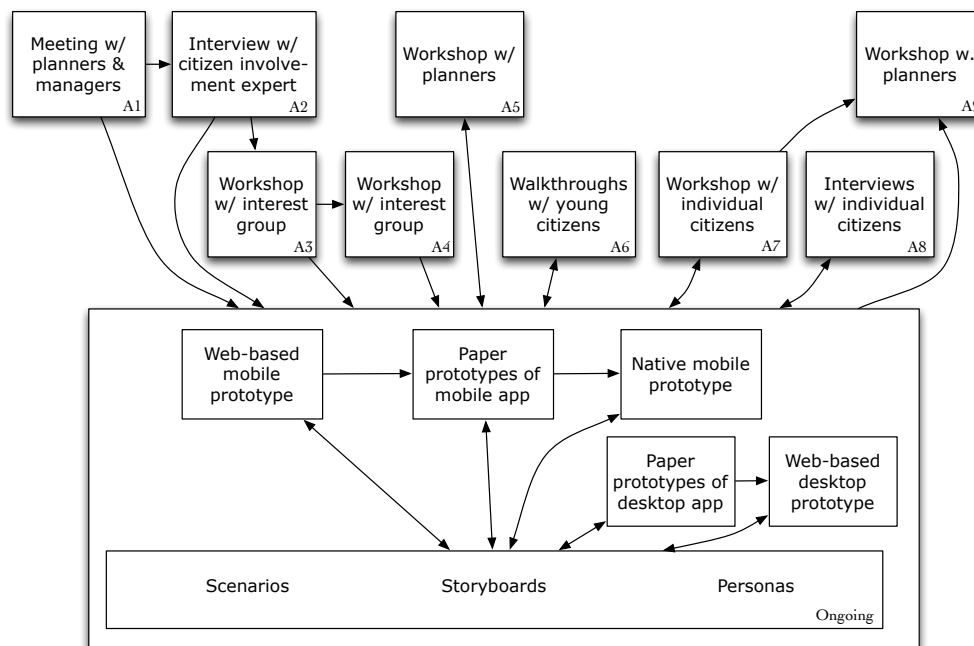
Figure 4.1 Relational overview of the design process in *Mobile Democracy* (activities, participants, and design artifacts). The upper and middle levels show activities with planners and citizens respectively. The bottom level illustrates the combined use of scenarios, storyboards, and personas as well as prototyping on different technological platforms. The direction of time is from left to right.

conducted walkshops (in A5, A7, and A9; as described in Chapter 3.4.1 and Paper 2), 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. All of the activities contributed to the iterative design process. The prototypes were used as alternative suggestions providing potential users with the possibility of exploring issues hands-on. Moreover, the prototypes served as a way of probing the context of citizen participation in municipal planning.

More details on the design process and the insights we gained can be found in Paper 1.

4.1.2 Design Artifacts and Prototypes

Figure 4.2 shows a selection of concrete design artifacts that have been used throughout the design process. Our design ideas and our understanding of the emerging field manifest themselves in the concept of two interconnected prototypes: (1) a native, *Android*-based mobile phone prototype for in-situ reflection and action, that is, while citizens are physically close to the planning object (see Figure 4.3); and (2) a browser-based desktop prototype for ex-situ reflection and action on proposed plans, when citizens are remote to the plan-

Figure 4.2 A selection of design artifacts (from top left to bottom right): scenarios, personas, storyboards, mock-ups, and paper prototypes.

ning object, e.g., at home or work (see Figure 4.5). The central idea is to initiate a dynamic between in-situ and ex-situ reflection and action. We conceptualize this dynamic in two steps. First, we provide 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 browser-based desktop application visited remotely.

Manifested in the mobile prototype are a number of design ideas that are reflective of (and spawned by) the in-situ nature it is conceived to be used in (cf. Figure 4.3):

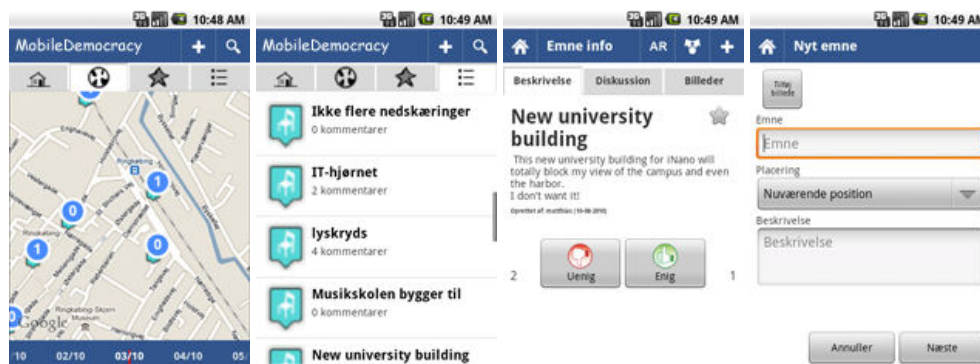**New topics** can be added by citizens *here and now*.

Figure 4.3 Screenshots of the native mobile prototype showing (from left to right) the map view, the list of topics, viewing topic details, and creating a new topic.

The map provides context by locating oneself as well as the topics around. One is placed into a geographical relationship with the topics mapped. As a result, "there is a sense of distancelessness, in that there appears to be universal access to everything, but there is also a sense of nearness, in that everything is measured in actual distance from the observer" (Gordon & de Souza e Silva, 2011, p. 12). The map provides context.

Photos from the current site can easily be attached when creating a topic or added to existing topics by everyone else. A photo, in itself, can give a better impression of a situation on-site (i.e., a problem or an opportunity). In this sense, photos can be used as a communication tool to remote parties who are *not* in the situation.

Expressing agreement or disagreement (through thumbs up or down) allows for a particularly quick and easy way of engaging with the topic, which one can then follow-up on later. As we realized through our interventions, this is not a feature valuable for discussions or for the forming of opinions, but rather it presents a prime means for engaging and involving citizens in the first place.

Topics are automatically favorited when one is interacting with them in any way (creating, agreeing/disagreeing, commenting, uploading a photo). They are saved for later to be more readily available for a follow-up (on the mobile or the desktop) – again, a means for engaging citizens in the first place.

Topic filters allow citizens to provide personalized interests so they only see and get notified of what they are interested in when out and about (eg., topics on traffic, facilities for children, the environment, culture, …).

A user account is required to link the mobile app to the desktop version and to remember these personalization choices (i.e., filters, favorites, etc.).

Expressing one's mood when making a comment is a capability of the mobile prototype (only) that is aimed at capturing specific aspects of the situation
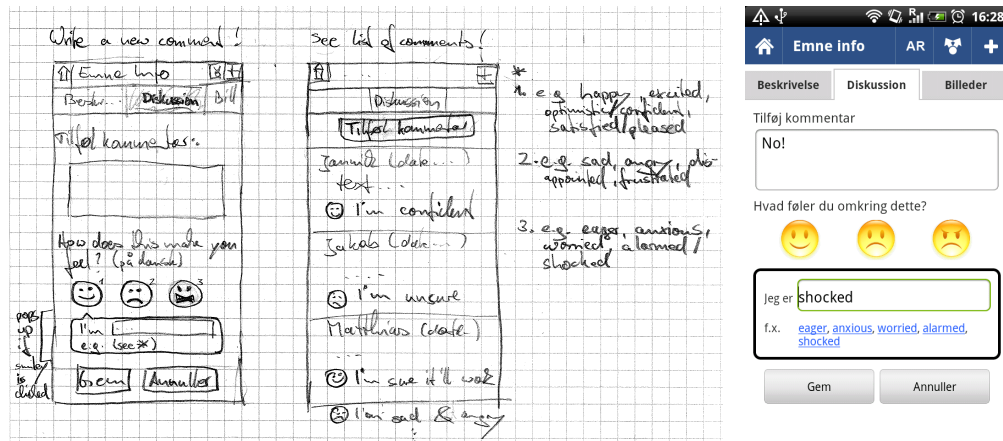
Figure 4.4 Paper prototype (left) and screenshot (right) for expressing one's mood when adding a comment to a discussion in the mobile prototype (only).

(see Figure 4.4). Our hypothesis is that capturing people's mood will not only help people to express themselves more clearly and lead them to reflect on their comments later on, but also provides additional context information for those reading and reacting to the comment. It puts the specific comment into some perspective. In our implementation, citizen can first choose from three general emoticons (happy, sad, and angry) and then provide a more detailed description of their mood in that moment by completing the sentence 'I am …,' either through predefined selection possibilities (based on the general emoticon) or by entering a descriptive string of their own. The emoticon and the free text (e.g., 'I am shocked!' or 'I am optimistic.') are shown below each comment in the list of comments to a topic (cf. Figure 4.9d on page 58).[2]

All this functionality in the mobile prototype is geared (1) toward engaging citizens in the moment where they might experience a higher personal relevance of the topics, (2) toward capturing and communicating some aspects of the specific locale and the situation for later and for others, or (3) toward not overloading citizens with information on the go by, e.g., providing context. Further aspects of the experiment such as collaboration among citizens and with the municipality, proposal quality and usefulness for planners, experience of democracy, as well as time-based exploration of topics have been discussed elsewhere (e.g., Bohøj, 2011; Borchorst, 2011; Zander & Bohøj, 2009; Bødker & Zander, 2012; Bødker et al., 2012).

The web-based desktop prototype, to be accessed through the browser at home or other places, provides largely the same features as the mobile prototype (see Figure 4.5). However, the increased screen real estate and the better

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[2]Capturing mood and emotions in mobile settings has been explored for various purposes (e.g., Isomursu, Tähti, Väinämö & Kuutti, 2007; Sundström, Ståhl & Höök, 2007; Church, Hoggan & Oliver, 2010). With this design idea, we explore how the concept may be applied to civic engagement systems.
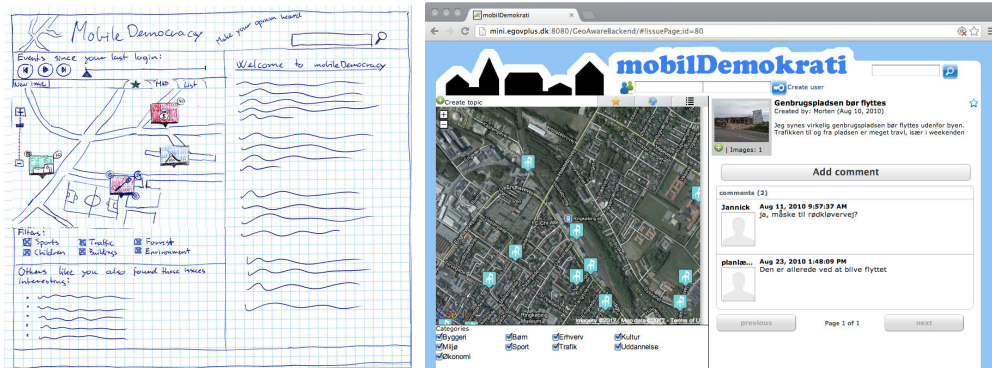
Figure 4.5 Interactive paper prototype and screenshot of the desktop prototype, here, with a map with topics (left) and a topic detail view with comments (right).

multi-tasking capabilities of full-size browsers afford a better interlinking and usage of additional resources outside of the application itself (e.g., referring to relevant laws and regulations, or linking to *Wikipedia* articles). Where we consider the physical environment (i.e., the local situation) as the primary resource for the mobile prototype, the realm of information and knowledge, e.g., on the web, is the primary resource for the desktop prototype. Furthermore, so the hypothesis, the potentially more relaxed and retreated environment in which the desktop prototype could be used allows for a deeper engagement with topics (where desired) rather then having to engage with them when being mobile, moving around, and on our way to somewhere. To make this follow-up possible, the desktop prototype is directly connected to the mobile app, meaning, earlier favorited topics can be directly accessed through it in order to be able to continue on the discussions.

4.2 AR City

AR City is a technical experiment exploring a specific feature idea for situated engagement. It originated out of *Mobile Democracy*. Starting out as a course project, it was motivated by an idea in a future workshop with planners (A5 in Table 4.2), who suggested 'interactive 3D holograms' of buildings that have not been built yet. From there, the idea to employ augmented reality (AR) on mobile phones to do just that emerged. The initial implementation was carried out by a Master's student and me. Mikkel Baun Kjærgaard from Aarhus University acted as an advisor throughout the project.

Mobile augmented reality (MAR) is a promising tool for urban planning as it allows a wide audience to experience future changes to the cityscape firsthand and on-site through their smartphones. Although changes to the cityscape are usually announced in the press and other outlets by the municipality, citizens are still often unaware of them or the implications they may pose. Architectural drawings and textual descriptions are often unapt or insufficient in com-
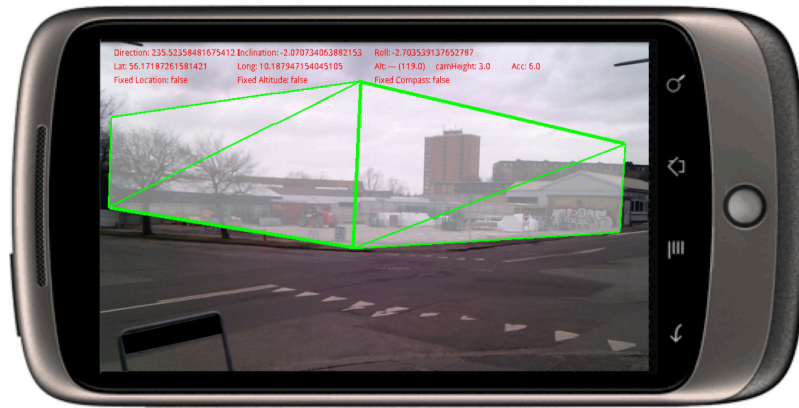
Figure 4.6 Screenshot of the *AR City* system showing outlines of a planned building through the phone.

municating these plans to interested residents, who may not always be able to read and understand them. Furthermore, they are often published for the city as a whole rather than being filtered according to the areas a citizen may be interested in (e.g., close to home or work). Architectural models can neither appropriately communicate the actual impact new buildings might have within lively and real rather than stylized surroundings. With *AR City*, we envision that a MAR approach to urban planning may improve the awareness and understandability of municipal plans by visualizing planned buildings anchored in reality and aligned with the actual current surrounding cityscape in real-time. Such a situated approach to communicating these changes clearly has its advantages for citizens to better fathom the complex impacts new buildings might have on a particular site in their immediate living environment.

For this purpose, we are building the *AR City* system (see Figure 4.6 for a screenshot). We employ MAR building visualization in order to engage more people to experience and participate in urban planning of their own everyday living environment. Our approach enables augmented buildings in every person's pocket without any required calibration or preparation of the site as would usually be the case with other outdoor MAR techniques. We enable citizens to just point their phone at any future building site and see what is planned to be built there.

In addition to making citizens aware of and informing them about changes to their immediate living environment *on the spot* and *while out and about*, the design experiment connects to the theme of this dissertation in yet another respect. It explores citizens' relationship and engagement with places mediated through the smartphone and the *AR City* application. Through this mediation, it explores properties such as the spatial location and the surrounding environment of a place. It integrates the actual with projected properties of the place. This tight integration of the surrounding environment and the digitally mediated engagement with places and planned buildings extends the focus of the previous *Mobile Democracy*.

Figure 4.7 First mock-up of the idea for *AR City*. *(Photo Source: Google Streetview)*

4.2.1 Design Process

The idea for *AR City* emerged in a future workshop with planners (A5 in Table 4.2) and has subsequently been presented and discussed at later workshops with both planners and citizens. Mock-ups, paper prototypes, and numerous versions of a running prototype were used to communicate and explore the idea as well as for hands-on experience (see Figures 4.6 and 4.7). Beyond this workshop use, a final version of the running prototype has eventually been used in dedicated, analytical walkshops with five individual citizens to investigate their sense-making of augmented buildings on mobile phones. This last study is reported in Paper 3 together with more details on the system itself.

4.2.2 Design Artifacts and Prototypes

AR City is an AR application for *Android* smartphones that visualizes future planned buildings aligned with reality on top of the phone's live camera feed. To enable a widespread adoption, *AR City* visualizes buildings using only the sensors available in current *Android*-based smartphones (i.e., accelerometer, magnetic field, and GPS). It further uses basic wireframes to visualize future buildings (cf. Figure 4.6), which only provide rudimentary information about size and location of a building, refraining from, e.g., textures and more detailed shapes. Mainly, this is aimed at encouraging citizens to participate and give feedback on planned buildings early in the planning process, where low-fi visualizations may be less intimidating and may appear less as already finalized and polished (cf. Ehn & Kyng, 1991). See Paper 3 for implementation details and the system's architecture.

AR City provides a plug-in functionality for the *Mobile Democracy* prototype. Whenever a building model associated with a topic is available (e.g., a new or modified building or some other new structure at the site), an AR button will appear in the topic detail view of the mobile prototype that launches *AR City* with the given model (cf. Figure 4.3, second screenshot form right). Citizens

can then interactively inspect and explore the new structure on the spot, in its actual environment. This way, they have another means to obtain a better picture of a topic and its potential impact in the area.

4.3   Mening@Park

Mening@Park is a true follow-up of *Mobile Democracy*. The aim was to deepen and transfer the insights gained from the earlier design experiment over to a new domain. After a longer initial ethnographic study period of the setting, this was achieved through deploying a repurposed version of the eventual mobile prototype from *Mobile Democracy* after adapting it for the new domain and setting. *Mening@Park* offers new perspectives and new foci to the study of situated engagement – this time in an arguably even more remote setting, in a Danish national park (cf. Chapter 2.1.3). The experiment is a collaboration between *Nationalpark Mols Bjerge* and my advisor Susanne Bødker and me.

Three aspects make *Mols Bjerge* national park particularly amenable for my study of situated engagement. First, the park is a cultivated and inhabited area rather than a sparsely populated, sporadically visited nature reserve. People live, work, and recreate in the park. Furthermore, many people own summer cottages and pieces of land there. Hence, local residents have a strong interest in the park's development. It often concerns their own property and life. Second, the park's rural/remote character makes it distinctly different from the urban settings so prevalent in most discussions. The setting is even more rural than *Mobile Democracy* that was already situated in a sparsely populated municipal setting. Third, the park is still about to be established, defined, and institutionalized. Many aspects of the park, such as future boundaries or infrastructural issues, are are still undecided. Therefore, it attracts a lot of attention. Many citizen involvement initiatives to create a national park plan for the first six years of the park's official existence were already underway when we studied it.

Mening@Park has been reported in Paper 4, which details an extensive field trial of the application that we conducted during a festival in the national park. The paper reflects on field trials as an appropriate method for iterative and exploratory design of ubiquitous computing systems.

4.3.1   Design Process

The development of the national park has been followed and studied by us for over a year (see Figure 4.8 for a timeline). Well aligned with its development, we conducted exploratory, qualitative interviews with the national park secretariat (the executing body of the citizen involvement process) and participated in public hearings in a first hearing phase for the national park plan. The aim was to establish an in-depth understanding of the ongoing citizen involvement process. In a second public hearing phase citizens had the opportunity
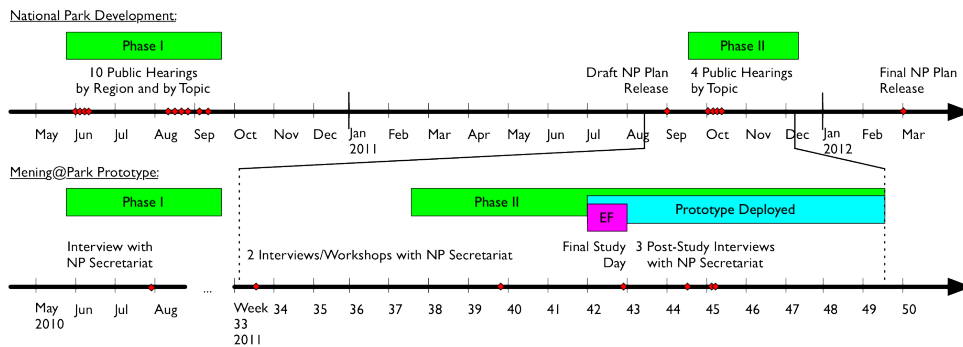
Figure 4.8 A timeline of *Mening@Park* (bottom) and how the intervention is embedded into the development process of the national park (top). It denotes the two public hearing phases, the prototype deployment, and other distinct events in the park's development as well as our study (NP = National Park; EF = Ebelfestival).

to dispute and submit proposals to a draft of the plan for about three months. Before the actual start of the second phase, we reconvened with the secretariat in two sessions to brainstorm and discuss possibilities for concrete interventions. The result was to conduct a 'field trial' with an adapted version of the *Mobile Democracy* mobile prototype. I adapted and prepared the prototype for the study and setting. Additionally, it underwent a major iteration driven by the insights from the previous experiments and by the findings from the ethnographic study so far. The 'field trial' eventually took place as a deployment of the now called *Mening@Park* system, which was strategically kicked off at the *Ebelfestival*, an annual and week-long local folk and harvest fair in Ebeltoft, the biggest city in the park. A number of study activities accompanied the deployment at the festival site – among them walkshops. Further details on the particular study can be found in Paper 4.

4.3.2   Design Artifacts and Prototypes

After some consideration and discussion with the national park secretariat, the starting point was the mobile prototype of *Mobile Democracy*. Transferring the prototype included, among other things, branding it for the national park, implementing various additional features crucial for the experiment (see below), and removing obvious usability problems and other small bugs identified through heuristics so as to not have them distract from our actual goals. We polished the prototype for real use by real users in the field and added initial content that was 'real' and meaningful rather than no or mock-up content. Figure 4.9 shows screenshots of the final prototype.

A special focus in this iteration of the mobile prototype is on facilitating citizens to establish a connection between digital topics and physical places and *vice versa*. I approach this through two simple concepts: access (getting from a place to a topic) and representation (getting from a topic to a place). More precisely, this encompasses (1) how digital topics can be accessed from
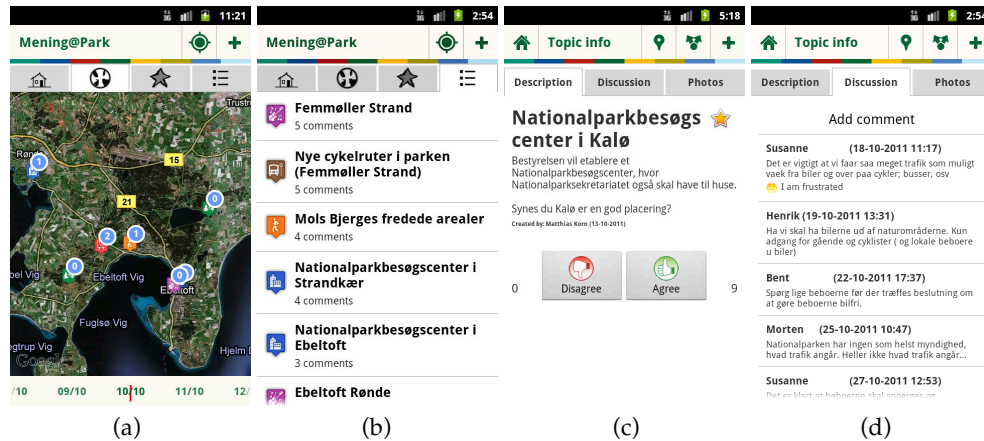
| (a) | (b) | (c) | (d) |

Figure 4.9 The *Mening@Park* app allows users, while out and about, to explore topics around the park through location-specific QR codes, location-based notifications, maps, and lists (a, b); to add topics of their own; and to favorite a topic, express agreement or disagreement, comment, and upload photos (c, d).

physical places, (2) how digital topics can be represented in the physical world, and (3) how physical locations can be represented in the digital realm. The aim is to emphasize and strengthen the link between topics and places, thereby suggesting that they are intimately entwined and eventually contribute to the same planning process.

A number of new design ideas are conceived and largely implemented to explore potential relationships between places and topics with citizens (cf. Table 4.3). Using the prototype as a probe, citizens and national park staff had additional ideas and suggestions in interviews, during the field trial, and at the walkshops on the festival site. They are summarized below:

Location-specific QR code signs directly link physical places to digital topics (see Figure 4.10, left). They provide access from a place to a topic. Scanning one of our QR codes at a specific location would lead a citizen directly to the topic about that location, if the app is installed. If not, it was conceived that the QR code would lead to the topic on a mobile website with similar yet limited functionality. During the field trial, we hung-up QR code signs at various popular places throughout the park (see Figure 4.10, right).

While they do attract attention in a nature setting, there is a generally low literacy among citizens on how to use them. QR codes are technocratic and directed toward being readable by machines. Citizens know them from billboards and magazine ads, if they know them at all.

Hence, participants have suggested other means to link topics and places, such as birdcalls or the noise level of a place.[3] Other potential technolo-

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[3]For an example, *Chirp.io* is an interesting new app for the *iPhone* that transfers data through computer-generated birdcall sounds. It is created by researchers from University College London. See http://chirp.io/.

Figure 4.10 A QR code sign leading to a topic about a new visitor center in Kalø (left) and the place it was hung-up, the entrance gate to the Kalø castle ruin peninsula (right).

gies are, e.g., near-field communication (NFC) or image recognition (e.g., Büttner, Cai, Cramer, Rost & Holmquist, 2011). National park staff, on the other hand, applauded QR codes as a way to counter what they called 'sign pollution,' i.e., too many physical signs in the park. In QR codes, they see the possibility to link a wealth of information to particular places without the need for big signs.

Location-based notifications create awareness about topics of interest in the own everyday living environment. When a citizen passes by a location with a topic in proximity, a notification about the topic will pop up on the citizen's phone allowing her to interact with it (or dismiss it). The notifications are personalized not only by location, but also through categories of interest a citizen can choose from. In addition to creating awareness, these notifications serve as a reminder of topics one has previously engaged with, as one citizen noted. Yet, they may also be disturbing in higher density areas.

Locating a topic on the map lets one see a topic's location when tapping the push-pin button that is available in a topic's detail view. This sends one back to the map view and shows the selected topic highlighted within the context of the surrounding area and the other topics there. It points from the topic to the geographical place. Alternative representations of place are explicit place names, small maps within the topic, or maps in the background of the topic view (as suggested by national park staff).

Sharing or recommending a topic points others to accessing this particular topic. Sharing is implemented via *Android*'s build-in share interface. Frequent

access (from place to topic)	representation (from topic to place)	action
QR code signs	topic location	creating a topic
notifications	in topic title	agree/disagree
map	in topic description	commenting (incl. mood)
lists	photos	uploading a photo
sharing/recommending	AR view	sharing a topic
my location		favoriting a topic

Table 4.3 List of (implemented) design ideas relating to the aspects of access, representation, and action respectively.

sharing targets are mail, text messages, or social media services. If sharing takes place via printouts such as posters or leaflets to be distributed at meaningful places (e.g., the local grocery store), the physical/digital is bridged once more. The printout idea is a result of the workshops, where people suggested to hang up dossiers of topics and their discussions at the grocery store to connect to the local (offline) community. Further ideas are digital signs with e-ink displays updated through a cellular network connection that show discussions in the park on the spot.

Table 4.3 shows an overview of the design ideas (including those from previous experiments) that relate to access, representation, and action, as a third category, respectively. This presents one way in how they have been conceptualized. Access should be understood in the sense of how citizens can get to topics. How can they explore, find, and access discussion topics that refer to physical places? Representation should be understood in the sense of how places are represented in topics. How can topics refer back to the physical place? And, thus, how can citizens get from a topic to a place? How can the system stimulate a sense of place to emerge? Lastly, action should be understood in the sense of how citizen can take action through and even beyond the app. How can we stimulate action in offline and with other people? This ranges from creating awareness and stimulating conversations to collaborative action and proposal writing. It is about seeing the system not as a dead-end, but offering points of departure for acting beyond the system. Such action could include connecting citizens to other people and events, utilizing established channels of communication and action (e.g., mail, phone, consultations, websites, organizations, social and traditional local media). It is about creating awareness outside of the platform and bringing topics back into the offline realm as well (e.g., through the sharing and recommendation facilities outlined above).

4.4   I'm Your Body

In contrast to the previously presented design experiments, *I'm Your Body* has been an occasion for me to reflect on and question the underlying assumptions inherent in the previous systems. In that respect, *I'm Your Body* functions as a corrective to the three other studies informing my dissertation. I have studied the system during my visit at the *Mobile Life Centre* in Stockholm. Having thus neither been involved in the setup of the project nor in the design of the system, I draw my insights from a design analytical perspective as well as from an analysis of how the system has been used during its deployment. This enables me to compare with my previous projects and generally reflect on the insights I have gained thus far.

I'm Your Body is a participatory art project that involved the *Mobile Life Centre* in Stockholm in corporation with *Kista Teater* and a local artist. Set in a Stockholm suburb, the *I'm Your Body* smartphone app as part of this seeks to interweave location-based storytelling with gameplay, sculptures, film, performance art, and theater play connecting physical and digital realms. It lets participants collect their stories, present them to others, and experience the stories of others. *I'm Your Body* is based on the idea of the city as a common body. Through it, people can act in and interact with public space. *I'm Your Body* creates a digital and physical net of stories, comments, and interventions tied to physical locations. The system is based on a novel concept of pervasive play where stories emerge and develop on several dimensions – most notably a geographical one.

The system was designed for and deployed in Järva, a suburban region in Stockholm that consists of largely immigrant and lower-income neighborhoods. The area is politically challenging. Large cultural divides and different agendas among inhabitants, commercial forces, and politicians create tensions. Hence, it is crucial that the system creates close ties to the physical area in which it is staged.

With *I'm Your Body*, we explore play as empowerment where we put close focus on personal experiences of people in civic engagement processes. Specifically, we seek to enable youth to express these experiences through feelings and memories supported by playful and locative storytelling. Our aim is to give youth in a largely immigrant and lower-income area in Stockholm a voice. In *I'm Your Body*, playful experiences are situated in everyday contexts, they can be continuously ongoing, and they take place in the 'real world' rather than on a screen or a designated playground. *I'm Your Body* is reflective of a form of *pervasive* play and storytelling (Montola, Stenros & Waern, 2009). It presents an approach to civic engagement of youth that is based on play and emotions. The project entails a clearly situated nature, where the prototype enables civic discussions *in and about place*.

I'm Your Body has been reported in Paper 5, where we draw insights on appropriate forms of engagement for marginalized youth through the analysis
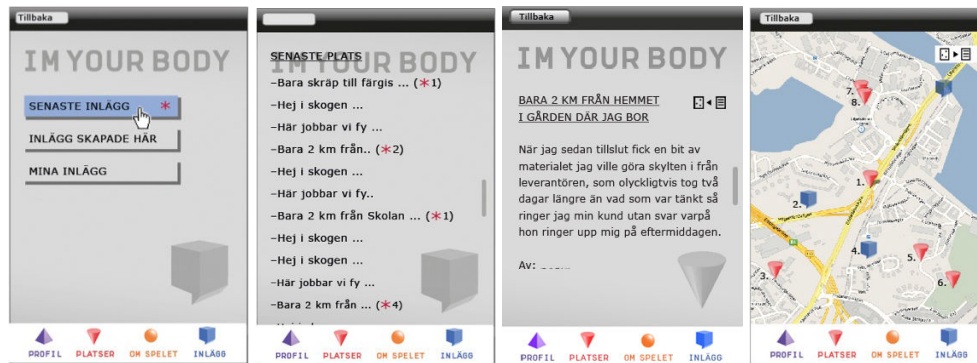
Figure 4.11 The main screens in the application (from left to right): menu for choice of view ('Latest Comments', 'Comments Created Here', 'My Comments'), list of comments, comment details, and map-view accessible from a comment or the list of comments.

of actual usage data from a (main) usage period of four months.

4.4.1   Design Process

The system has been designed and built at the *Mobile Life Centre*. A participatory action research approach was employed which followed the steps Lewin proposes (cf. Adelman, 1993). The intervention was created in a cyclical process, a "spiral of self-reflection" (Kemmis & McTaggart, 2005) where one plans, acts and observes, reflects, and then goes back to re-plan. As part of this approach, a participatory design process was carried out that involved the theater group, independent artists, and youth from the area. As mentioned, I did not personally take part in this design process. The insights I derive from the experiment pertain to a comparison with my previous experiences and, especially, through a qualitative analysis of the contributions made through the system during its deployment. The results of the latter are reported in Paper 5 in more detail.

4.4.2   Design Artifacts and Prototypes

The eventual prototype system is a mobile web application connected to a database-driven web server (see Figure 4.11 for screenshots). It essentially is a location-based storytelling and story experiencing system for web-enabled mobile phones to share thoughts and feelings in and about a place. Rather than being an app one has to install, *I'm Your Body* can be accessed via the browser from any web-enabled mobile phone. It uses the location feature of the mobile phone offered through the browser (i.e., GPS, wifi, or cell tower positioning, depending on availability) to geo-tag each individual comment with the user's current location. Citizens can record stories through the system as small fragments in text format. Everyone can participate at eye level; there is no strict distinction between producers and consumers.

The system is not restricted to be used in any particular area, and neither is it restricted to experiencing stories in a particular order, at a particular place, or on a particular topic. Instead, every entry is tagged with information about a place, a time of entry, a person, and a story context. These tags can be used to structure story material according to place, time, or the person creating it. Entries can be combined to create stories about comments (the responses to entries) or about movement, so that moving from one place to another creates a story. They can be browsed by time, place, or user in a map or list view. Entries that form stories are visually connected on the map and listed in the entries' detail view. Hence, *I'm Your Body* offers participants multiple ways to create stories, i.e., by choosing their own way of experiencing the present content, as well as entering stories of their own. Stories are located and can further emerge and develop on a geographical dimension.

Findings and contributions from this and the other experiments are reported and summarized in the following chapter.

Chapter 5

Conceptual Contributions

This chapter presents, in the first part, the contributions which the individual design experiments make to an understanding of situated engagement. In the second, it discusses how each of the experiments commits to an infrastructural perspective of situated means for civic engagement. To do so, I point out which aspects of a larger infrastructure the individual experiments are concerned with. Table 5.1 shows an overview of the contribution themes the individual experiments are concerned with and the infrastructural issues they touch upon. In chapter 6, I will then situate my findings and contributions within related work by unfolding a larger situated engagement infrastructure.

5.1 Contributions of the Individual Design Experiments

5.1.1 Mobile Democracy

Mobile Democracy provides the underlying principles for situated engagement. With the concept of two interconnected prototypes (presented in Paper 1) that allows in-situ and ex-situ reflection and action, the experiment particularly explores which distinctly different qualities in-situ reflection and action has as opposed to, and in concert with, ex-situ reflection and action in located civic discussions. It explores how people may come to different judgments 'in place' and 'out of place' and which additional elements of the situation could become implicated in discussions pertaining to citizens' everyday living environment. This takes place when we report how people relate to example planning issues in our walkshops and workshops in Paper 1 (p. 95). With this, the experiment approaches the very merits of a situated approach to civic engagement.

As outlined in Paper 1 (pp. 91-92), we take inspiration for this situated form of engagement from Schön's notions of *reflection-in-action* and *reflection-on-action* (Schön, 1983). We suggest that reflection-in-action is more dominant

Experiment	Contribution Themes	Infrastructural Perspective
Mobile Democracy	in-situ and ex-situ reflection and action; qualities of *being there*	additional desktop interface for 'remote' access
AR City	better impression of plans in-situ; place mediation	visual component for place mediation
Mening@Park	links between physical and digital spaces; access and representation; appropriate forms of engagement	physical artifacts in the environment as links to the digital infrastructure
I'm Your Body	storytelling, playfulness, and emotions for civic engagement; stories developing geographically	artistic and playful expression through physical artifacts (sculptures) and performances (theater play)

Table 5.1 Contribution themes of the individual design experiments included in this dissertation and their perspective on infrastructure.

in-situ and reflection-on-action more dominant ex-situ. As this is by no means explained by the simple juxtaposition of in- and ex-situ, we take the two to constitute a continuum affected by performed and potential actions connected to the ongoing process of reflection and understanding. The mobile phone mediates engagement with places and topics and functions as an interface to places, people, and discussions. We found that *being there* helped fathom the complexity of the planning object through physical and sensual immersion, while collaboration and sharing through community and deliberation spaces was more prevalent remotely (see Paper 1, pp. 95-96). There seems to be a big difference between the situation that, in the words of Schön (1983), "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. In Paper 1 (p. 91), we thus argue to strengthen the link between the (physical and located) object under discussion, the discussion itself, and the individuals involved by situating actors in the environment they are discussing about.

Immersion, we find, should be complemented by distanced reflection. The combination of a mobile app for in-situ use and a desktop app for remote use makes clear how different means (or entry points) can be employed to engage in civic discussions. The experiment provides insights on how to include personal mobile devices as a crucial element of a larger engagement infrastructure. It leverages their in-situ nature for engaging with topics. The desktop interface for remote engagement is another necessary element in such an infrastructure in order to allow citizens to engage with topics not only superficially. The support of in-situ and ex-situ participation through mobile and desktop apps allows citizens to engage in continuous reflection-in and on-action as a collaborative activity with other citizens, thereby inspiring citizens to increase their democratic engagement.

5.1.2   AR City

AR City, as a design proposition, contributes to the question how citizens can obtain a better impression of the often abstract and complex suggestions brought forward in municipal plans that they are asked to comment on. It mediates the referred-to places through an augmented and visual component, and it does so on-site. In doing so, *AR City* functions as an interface to the space and the planning taking place there.

In our early walkshops with citizens, we found that the AR functionality helps to render the nature of the proposed changes in the physical world more comprehensible (see Paper 1, p. 95). It does so by offering a way to better understand how proposed buildings might impact the surrounding cityscape. *AR City* connects people to the place and with the planning object mediated through the phone. This is shown in depth with our study on sense-making of augmented buildings reported in Paper 3. It found that distinct qualities of augmented objects are important to provide among other things and that people relate virtual objects to existing structures in the real world.

During an exploratory walkshop with citizens (A7 in Table 4.2), we saw the participants really experiencing the planning object and their own location in space as one – that is, they perceived the augmented planning object was there with them (see Paper 1, p. 95). This suggests that it is not only about the citizen *being there*, but very much about the planning object being there as well – which is in part achieved through *AR City*. Participants even suggested to communicate that feeling to their friends through taking a picture of the augmented scene, or of their individual, in-situ view of it (see Paper 1, p. 95). They wanted to share the impressions and insights they obtained on a matter that appears relevant and personally meaningful for them *there and then* in order to involve others in the cause.

Taking pictures with smartphones is a tremendously popular and growing practice (NPD Group, 2011; O2, 2012) attested by, among other things, the popularity of social media photo sharing such as *Instagram*, *Flickr*, *Facebook*, and *Twitter*. Taking a picture of an augmented site might just be the perfect extension of this practice for civic engagement, where personal photos taken in-situ could help to spread awareness of an issue or proposal in the own living environment throughout the citizens' social networks – especially since smartphones are the prevalent device for taking photos in everyday, spontaneous situations (cf. NPD Group, 2011).

Our additional aim to bring AR 'to the masses' and placing it in the hands of citizens poses the challenge to develop *instantaneous* AR systems. Instantaneous here means to enable any citizen with a capable smartphone to view AR visualizations immediately at any location without the need for manual initialization (which is still common with many outdoor AR systems) that requires specific knowledge of the local site. In our design, we devised an interaction technique for MAR that provides walk-by point-and-shoot visualizations at first, but allows for closer inspection of the augmented objects once they have

been calibrated (see Paper 3, p. 5). This is achieved through an initial coarse sensor placement of augmented buildings by the phone and a following finer manual alignment by the user. It is possible through the observation in our study that people generally know how buildings should typically be placed within an arbitrary environment with respect to other existing structures such as roads and intersections surrounding and connecting new buildings (see Paper 3, pp. 4-5). Such cues provide hints for people how the real and virtual align, which we make use of to calibrate the visualizations for closer inspection.

Instantaneous AR contributes to an in-situ, in-the-moment realization of future changes. Our qualitative user study on sense-making of augmented buildings contributes to an understanding of how these in-the-moment realizations come into existence through such an interactive and visual component the *AR City* system represents (see Paper 3, Findings section).

In concert with the elements provided by *Mobile Democracy*, *AR City* brings a visual (and somewhat more graspable) element to the infrastructure for citizens to, first, experience topics on the spot and, second, to engage with the discussions through them. It emphasizes the relations of a suggested change to the surrounding built infrastructure, which is crucial in urban planning to gain a holistic picture of the total impact of a new development. It adds a visual and interactive element to the abstract municipal plan. Hence, within the domain of participatory urban planning, the *AR City* concept offers new alternatives to engage with our living environment by achieving an awareness of and new insights into proposed changes to the cityscape.

5.1.3   Mening@Park

Mening@Park draws attention to the question how we can conceptualize the digital referents and representations of places in location-based systems and, hence, how to design for them. One possible avenue is to draw on the space/ place dichotomy (see Chapter 2.4) and transfer it to the digital realm. Can we understand the raw material of these place representations as digital spaces that people put to use, adapt, and appropriate on their own terms? Just as physical features (i.e., architecture) together with social norms and cultural values enable and limit our acting in the physical realm, the user interface frames and limits our actions in the digital realm. The available form fields, the media one can add, the way one can interact with discussion topics, the way the phone as such is employed as an interface and affords some uses and not others, the way touch control affords some things and not others, etc. all contribute to how we can engage through it.

The analogy which I draw between socio-technically confined access to the physical and digital realm entails the question of how physical places and digital spaces are connected. How can citizens make the link between the two? Or, from a felt life/user experience perspective (McCarthy & Wright, 2004, 2005) we could ask, how can digital spaces (topics in our case) be intimately

tied to places? The presented design ideas for forms of access and representation manifested in the prototype (QR codes, notifications, etc.; see Table 4.3) are potential means I explored to this end. While there are means to point from the digital to the physical realm (e.g., push-pins on a map, place descriptions) and *vice versa* (e.g., QR code signs, notifications, situated displays), it is still up to the individual citizen to pick up these referents and see the resulting image of a place *as one*, to make the link between digital and physical realms. Places can become mediated and augmented through the digital tools that we provide. To achieve a mediation between physical and digital realms, however, is a design challenge, and a crucial aspect in order to attract people to an engagement infrastructure. Access points, especially in physical form such as signs or situated displays, allow citizens to more readily participate in civic engagement activities concerning land use planning.

Beyond the physical/digital divide, the experiment also very much points toward questions of appropriate forms of engagement. That this insight came about has to do with the setting. While *Mobile Democracy* was still very much framed by a traditional citizen deliberation effort, where the municipality and particularly the urban planning department sought to attract new groups of citizens into an age-old involvement process, engagement in the formation of the national park was something new and not as bureaucratized as municipal planning. The process was carried out by the small secretariat of the national park rather than by a large municipal planning department. The process was not as much entrenched with local politics and urban development strategies, but rather a board of representatives from many citizen interest groups as well as civic and official associations was formed to lead the development (more or less) from the bottom up.

Hence, it has shown during our interventions in the park that there is a mismatch between the representations and conceptualizations of topics afforded in our user interface and the way people think and talk about the issues that they perceive. While our system is speaking to topics, issues, proposals, and objections, documents, complaints, and deliberative discussions, personal memories and stories were much more at the fore with citizens. *Mobile Democracy* and, hence, *Mening@Park* are premised on an implicit notion of a more dry and rational deliberation process rather than on a notion of emotional talk and storytelling. Yet, for a sense of place to emerge, the presentation of place and the forms of engagement offered are important. Are representations in the system compatible with citizens' own conceptions? Do they stimulate the expression of personal views and identity? In this experiment, we have observed that there is a mismatch between the conceptions codified in the app and the way citizens talk about their experiences in the national park. On the one hand, it is necessary to account for documents, proposals, plans, issues, topics, and discussions. While on the other hand feelings, personal stories, narratives, and memories are irreplaceable elements of the process. The tension between the two has become apparent here, but is more thoroughly reflected on in the last experiment, *I'm Your Body*.

- ((at a public park downtown))
  "Looking up at Karl the XII and think of how it used to be, during this person's time. Cannot help thinking how I would look like as a statue." [female]

  – ((in the suburb, behind the mall))
    "Oh how fun. Unfortunately, there are no statues here." [male]

    * ((in the suburb, residential area))
      "I agree, there are no statues here either. Really sad that there are no statues and other fine things which cheer up the streets everywhere!" [female, original poster, resend with typos corrected]

    * ((in the suburb, behind the mall))
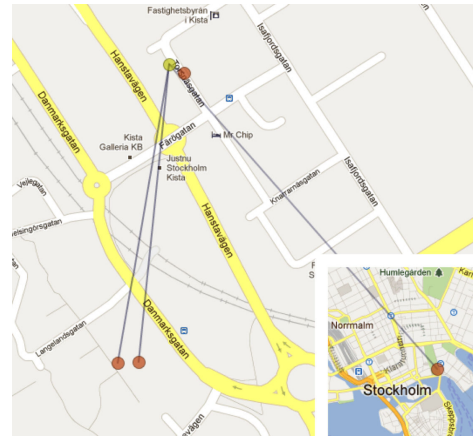   "No, I do not see any statues here just shopping installations" [male]

Figure 5.1 Example thread and corresponding map of the entries showing the geographic spreading starting with a comment from a public park downtown (bottom right) and the ensuing conversation in the suburb. (The comment in the lower left has been resend by the user with typos corrected. It is a duplicate of the one next to it. The original mistyped comment has been omitted in the thread for readability.)

5.1.4   I'm Your Body

I'm Your Body has two contributions to an understanding and design of mobile personal devices as elements of a situated engagement infrastructure. The first, a design idea that turned out beneficial, is to allow individual topics, or stories in this case, to develop geographically (see Figure 5.1 for an example thread; more in Paper 5, pp. 195-196). Whereas previous approaches (e.g., in *Mobile Democracy*) have restricted a whole topic and all its comments to a single location thereby making the topic location-centric, we suggest to tag each individual contribution (comments, photos, etc.) with its own location. This allows the locale to become part of the narrative, which is now also created by moving through space. Our observation is, that, this way, topics become topic-centered as citizens start to corroborate or refute the points that were made by collecting together information about different places in one common topic (cf. Paper 5, pp. 195-196). It allows users to broadly explore the diverse aspects of their neighborhood and places of personal meaningfulness. Instead of limiting conversations (and people expressing their emotions) to the location the original poster chose to talk about, other commenters may expand this discussion to other places. It allows users to collect and contrast similar aspects of different places under a common umbrella topic.

As a second contribution, and as a continuation from our insights from *Mening@Park*, this experiment further made clear the need for and usefulness of alternative forms of engagement. With *I'm Your Body*, we explore locative, playful, and pervasive storytelling as such an alternative means to engage people in civic discussions. In the system, story material forms according to time, place, or the person creating an entry, according to the responses or com-

ments to entries, and according to movement through space. The aim is, more than ever, to create awareness for issues and shared interests in the area and to foster civic conversations among citizens about places of personal meaningfulness.

Hand in hand with storytelling and playfulness goes a call for affect and emotions in civic engagement systems – a different understanding of the role these conversations play. Where the focus previously has arguably been on dry and rational deliberation in a Habermasian sense (i.e., the rigorous rational analysis of an issue resulting in a cold exchange between individuals; Habermas, 1989), we now emphasize the usefulness of emotional and communicative exchange between citizens in Barber's sense (i.e., the equal importance of mutual understanding of people through open-ended talk and conversation; Barber, 2003). *Mobile Democracy* attracts arguments and opinion, while *I'm Your Body* encourages the expression of emotions that may lead to the emblematic dinner table conversation. The whole of Paper 5 shows how civic discussions in and about places emerge out of the expression of feelings, memories, and attitudes exchanged among participants. With this, we present an approach to locative civic engagement systems that takes a vantage point in youth's emotions rather than a rationalistic approach to deliberation.

5.2 Preparing an Infrastructural Perspective

My focus has so far been on personal mobile devices that people carry around with them functioning as main access tokens for the infrastructure. They are, indeed, central to my conception of a situated engagement infrastructure. Mobile devices act as interfaces to the space around us. Including mobile devices leverages their in-situ nature to engage with topics on the spot. Yet, particularly smartphones are, for example, problematic in terms of inclusiveness (i.e., not everybody owns one). This is an important factor especially in the civic engagement domain. Furthermore, they still indeed lack a deeply intimate relationship with physical places that other ubiquitous technologies may better manage to achieve. Hence, alternative means of primarily engaging with the infrastructure, perhaps ubiquitous, may come to the fore.

The individual experiments already point to elements of the infrastructure that go well beyond a narrow focus on the deployment of mobile phones (see Table 5.1). *Mobile Democracy* points to the necessity of an additional desktop interface for 'remote' access to engagement facilities. The desktop interface provides an alternative entry point in a different, more relaxed setting in order to allow citizens to engage with topics not only superficially. *AR City* adds a visual component to understanding plans and ideas in an urban planning context and provides an alternative form of place mediation. *Mening@Park* emphasizes the need for various physical means of access to the infrastructure that make digital discussion topics better visible and graspable in the physical environment. It emphasizes the need for an intimate connection between

the digital and physical realms that can be approached through physical artifacts in the environment mediating the digital such as QR codes, displays, etc. Lastly, *I'm Your Body* explores alternative means of expression in civic engagement efforts also in the sense of artistic and playful expression through physical artifacts and performances such as sculptures and theater play as a form of engagement.

This motivates the need to look at the larger situated engagement infrastructure and, more specifically, at the socio-technical relationships that we can design for. Which devices and technologies can we employ to provide widespread interfaces to the infrastructure allowing engagement with located issues that is meaningfully situated in the physical space? To further unfold this infrastructural perspective, the next chapter provides an outlook on approaches beyond my own work in order to collect, compare, and sort elements for such an infrastructure.

Chapter 6

Related Work

Elements of a Situated Engagement Infrastructure

In this chapter, I pursue two intentions: (1) to present and reflect on related work and (2), by way of doing that, to unfold a larger situated engagement infrastructure. I draw together different pieces of related work from the wider technology-mediated civic engagement domain, in particular concerning spatial planning, and analyze in how far they are amenable for situated engagement. Each of the systems which I will mention supports a different way of engaging with spatial planning – both in-situ and ex-situ. Together, the multitude of different systems can inform a larger situated engagement infrastructure that provides widespread access to civic engagement efforts for citizens in a variety of settings and situations. Such an infrastructure goes beyond using personal mobile devices as the prime and only means to involve citizens and looks at other situated technologies and devices to be made use of. In this chapter, I situate my own design experiments in this landscape of a situated infrastructure. While invisible elements of such an infrastructure are equally important (especially on breakdown), such more subtle aspects are outside the scope of this dissertation. Having a citizen bias, I focus on technologies and devices that citizens experience more or less directly through interacting with them.

My effort to formulate an infrastructure for situated engagement is mediated by my desire to show that civic engagement needs 'more' – more than mobile phones. The elements of a situated engagement infrastructure I therefore want to point out and provide examples for are divided into the following four categories: (1) the mobile devices that have been a main focus up until now, (2) stationary devices that are fixed in the environment, (3) more ubiquitous technologies that we interact with yet pervade our physical spaces in often subtle or even invisible ways, and (4) ex-situ or remote access points that we can use, e.g., at home or work. One central aspect of situated engagement
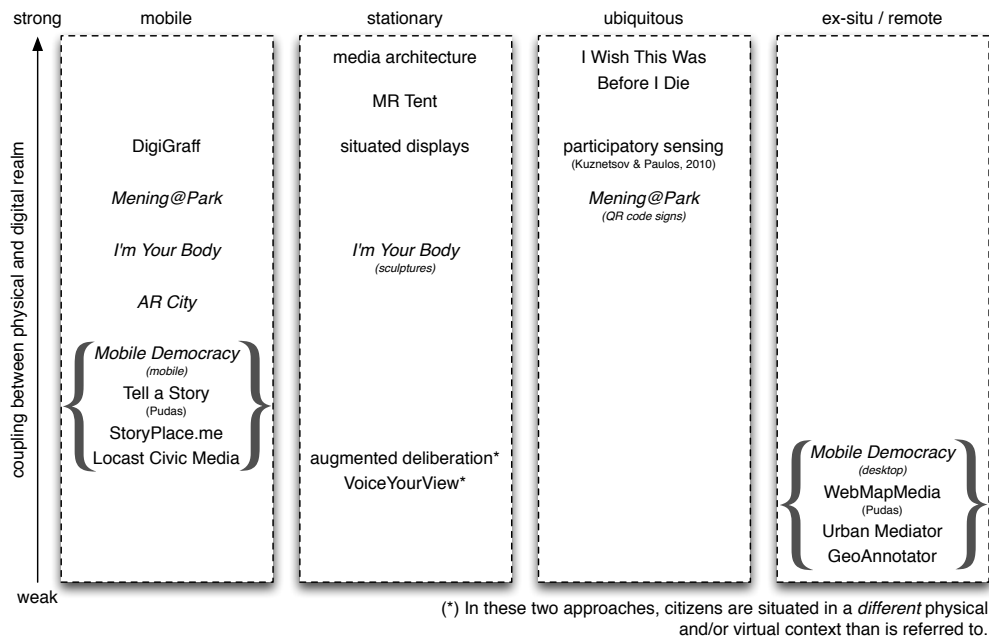
Figure 6.1 Conceptual overview of related work (systems in *italics* are mine).

that I have emphasized throughout is the coupling of technology and physical environment, i.e., the question how well the physical and digital realms are brought together. For this reason, in addition to their amenability for situated engagement *per se*, I discuss the systems along this dimension (see Figure 6.1 for a conceptual mapping of the space).

Some of the related research projects I will present here include a limited perspective of an infrastructure around their tools. Various components such as databases, web services, network communication, mobile devices, web interfaces, and a combination and integration of different tools may be involved. The *Pudas* project from Oulu, Finland, for example, posits an infrastructural approach for supporting participatory urban planning.[1] The project seeks to utilize a number of services and technologies integrating internet and mobile applications to provide different access points to and different means for collaboration in urban planning. Yet, when they speak of infrastructure, the authors are primarily concerned with the technological basis on which these systems run (the databases, etc.). They are less considering how citizens' interaction is afforded by different devices in different situations. Such a more comprehensive, citizen-faced infrastructure I suggest here has not been approached so far. How can different tools, modalities, situations, locations, and phases within the urban planning process work together? In this chapter, and with my dissertation, I want to motivate and provide first clues toward such future endeavors.

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[1] See `http://pudas.oulu.fi/?page_id=8`, last accessed: January 3, 2013.

6.1   Mobile

Personal mobile devices are an integral part of an engagement infrastructure if the aim is to engage citizens on the go, in the physical environment, and integrated in their day-to-day lives. Mobile phones have been a popular target device due to their widespread use around the world and the largely personal nature of that use. The potential of this platform increases with increased capabilities and new use cases. I have previously discussed their functioning as interfaces to public space (cf. de Souza e Silva & Frith, 2012), which is elevated by new capabilities such as being geo-locatable. This development presents a prime opportunity to engage with the physical environment mediated through digital devices and services.

In the introduction, I have mentioned *SeeClickFix* and *FixMyStreet*. Both are publicly available, largely commercial smartphone applications that allow citizens on the go to report issues in their neighborhood such as potholes, graffiti, or broken street lights. Issues such as these are generated into a report and send to the municipality. This is a quick and easy way for citizens to engage with their neighborhood. However, these systems are limited to one-way communication from citizens to the municipality and do not focus on collaboration and discussion in both directions and among citizens. Furthermore, they employ a rather rigid format of civic participation (issues, problems) rather than allowing numerous means for citizens to express themselves in rich and meaningful ways. To that end I have presented the *Mobile Democracy*, *Mening@Park*, and *I'm Your Body* systems alleviating exactly these concerns.

Location-based rich social media is an increasing trend in the civic domain due to smartphones' increasing (and improving) capabilities of recording rich media (photos, audio, video) paired with their constant connectivity, geo-localization capabilities, and social networking tools. *Tell a Story* from the *Pudas* project, for example, lets citizens of a municipality record location-based photo-and-voice stories through their mobile phones (Halttunen, Juustila & Nuojua, 2010; Juustila, 2010). The authors seek to capture rich in-situ accounts of citizens in their immediate living environment. They state, "local contextual knowledge is important, and the best place to collect and 'remember' that knowledge is the place that knowledge is associated with" (Halttunen et al., 2010, p. 82). The aim is to collect such illustrated voice stories in the field in order to use that knowledge as a resource in participatory land use planning processes.

Locast Civic Media is an integrated mobile and web platform for recording videos ('casts') collected within topics of interest ('projects') (Boardman, Casalegno & Pomeroy, 2011). Acting within a civic engagement context, the system's design makes use of the format of reporting stories (as in a newscast) in order to foster hyper-local conversations about issues in the neighborhood. Furthermore, the main focus (and design intention) of the system rests on mobility and versatility (a prerequisite indeed) rather than on the situatedness of the stories *per se*. Last in the rich media field, *StoryPlace.me* similarly offers a

mobile app to record video stories of particular, personally meaningful places in the city for others to serendipitously discover (Bentley & Basapur, 2012). Stories are thought of to portray personal reminiscences or historical events in the city. Serendipity, here, is a central design intention in the sense that stories have to be discovered (literally stumbled upon) and unlocked through being physically present in their vicinity. Only after this unlocking is the location of a story and its title known to the user. Bentley, Basapur and Chowdhury (2011) have argued that the system has "demonstrated a new way for people to connect with a city and become aware of the importance of the places that they visit everyday in the lives of others or in history of the city itself" (p. 39).

Multimedia storytelling through mobile devices is a valuable approach to encourage rich expressions and viewpoints from citizens while in the moment. Yet, it may also present an entry barrier to contributions and discussions if they are the only choice. Not everyone wants to hear their voice or even see their (moving) picture (cf., e.g., Juustila, 2010). Furthermore, they are not very amenable for quick, turn-taking discussions that can be surveyed and reacted upon quickly. Facing these challenges, multimedia storytelling is a fruitful approach, but needs to be complemented with other (e.g., textual) reply features. It should create and integrate a rich mix of different discussion modalities in order to enable broad civic discussions to emerge. Such a rich mix has been the focus of all the experiments presented in this dissertation, where text and photo are conceived to be easily complemented with other rich media such as audio and video. Furthermore, especially in *I'm Your Body* I have studied which forms of engagement align well with citizens' own conceptions. In a design marked by storytelling and playfulness, I have found memories, feelings, and attitudes to be prime means of expression for citizens.

An example applicable to civic engagement which points into a different direction is *DigiGraff* (McGookin, Brewster & Christov, 2012). The system uses pico projectors attached to mobile phones to project annotations drawn by the user onto a wall. It thereby bridges the physical–digital gap and allows the expression of opinions connected to specific places in public space. The system applies a graffiti analogy in order to explore location as a primary rather than a secondary aspect of social media creation and browsing, where users have to actively consider where to put their expressions. This allows for more equitably accessible and more pervasive annotations of the physical world than, e.g., physical signs or public situated displays. The authors emphasize that "users must explicitly consider where the annotation will be placed, and when browsing, how the annotation relates to its surroundings" and, in turn, that "this avoids the 'happens to be' relationship between location and data that exists in many existing social networks" (McGookin et al., 2012, p. 2595). Where *Mening@Park* has suggested to put up physical signs with machine-readable codes that link to the digital topics, *DigiGraff* could potentially project the digital content onto the physical place itself. It thus achieves a stronger coupling between the digital and the physical realm by increasing, positively, the relationship between the digital annotation and the physical site.

While mobile devices are a prime means to capture and engage people in the moment, I argue that a yet stronger coupling with physical sites would be desirable. Moreover, to people 'on the go' mobile devices are often enough only peripheral or at best ephemeral to our attention. Therefore, a situated engagement infrastructure requires further elements to complement them.

6.2   Stationary

Stationary systems that are fixed in the environment and thus anchored in a specific location present a good opportunity to involve citizens 'there and then' in discussions relating to the site. They can achieve a strong coupling between the issue at stake and the referred-to environment. Examples here may include semi-stationary booths or large signs which are set up for a limited amount of time at specific events (such as fairs and markets) or major developments in order to engage with interested visitors and passers-by on-site. Instruments such as these can be characterized as rather traditional.

A frequent, technology-aided approach in this category are situated public displays. They may target a population at a busy square (Schroeter, Foth & Satchell, 2012), at a new major development, in a specific community or neighborhood (Taylor & Cheverst, 2010), or scale up to a whole network of connected displays distributed throughout the city (Hosio et al., 2012; Memarovic et al., 2012). One of their aims may be to get citizens involved in civic engagement processes through specific interactive applications running on them for this purpose (Hosio et al., 2012; Schroeter et al., 2012). Citizens interacting with such a display may either take place through the display being interactive itself (Hosio et al., 2012; Memarovic et al., 2012), through a dedicated web interface accessed remotely (Taylor & Cheverst, 2010), or through citizens' mobile phones, e.g., via *Twitter* or text messaging (Schroeter et al., 2012). With *Urbanflow Helsinki*, basically a design fiction project, an integrated and comprehensive vision for potential future uses of situated urban screens (and connected devices) in everyday life has been formulated.[2] Here, the screens function as guides and information stands highly aware of their own location and the things and people around them, while at the same time capable of being general purpose and showing broader, citywide information.

While the tight coupling with a specific locale is favorable for situated engagement, the fixed and stationary nature of situated displays also presents a disadvantage. Only predefined locations can be engaged with, which are furthermore mostly controlled by the owners of the physical space itself (McGookin et al., 2012). A more versatile and flexible approach might be to make the whole city a canvas for expression (as presented, e.g., with the *DigiGraff* system above; McGookin et al., 2012); another might be to integrate interactive means in the architecture of the city more directly (as is happening in the emerging field of media architecture; e.g., Dalsgaard & Halskov, 2010).

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[2]See `http://helsinki.urbanflow.io/`, last accessed: January 7, 2013.

Figure 6.2 The *MR Tent* is a portable lab for using mixed reality in urban planning on location (Wagner et al., 2009, p. 185).

Semi-stationary setups that are mobile enough to be transported to places of interest for a limited amount of time (e.g., during a special event or a major development process) present another approach. The *MR Tent*, being one such effort, is a semi-stationary in-situ laboratory for participatory urban planning that can be transported to places of interest (Wagner et al., 2009; see Figure 6.2). It presents a housing for a rich and integrated set of technologies combining tangible user interfaces on an interactive table with rich immersion in the environment through multiple interactive mixed reality projections (including a half transparent one with direct view of the site) and interactive soundscapes – all while being situated in the referred-to environment (Wagner et al., 2009). The tent allows citizens to deeply engage in and collaborate on urban planning projects at the concrete site, in a co-design fashion, and with other stakeholders.

In my view, the *MR Tent* is an interesting (niche) setup because it speaks to several senses and allows interaction with the present space in several different ways. As with other approaches, it not only mediates, but even augments *being there*, at the urban planning site, the site to-be. It intimately ties the planning discussions to the place mediated through interactive technology. The *MR Tent* needs to be complemented with mobile or more ubiquitous services that potentially integrate with people's everyday life to foster an *ongoing* urban planning dialog among citizens and between citizens and planners (as well as other stakeholders).

Planning interventions that integrate digital mediation of physical places in yet another way is presented by Gordon and Manosevitch (2011). In their *augmented deliberation* approach, face-to-face participatory planning discussions are augmented (and co-located if you will) with a virtual world view of the site under discussion in *Second Life*. As the authors state, "the local community was invited to gather in a physical space and a virtual space simultaneously" balan-

cing "the specific affordances of digital technologies with the established qualities of face-to-face group deliberation" (Gordon & Manosevitch, 2011, p. 75). The aim is to foster a better understanding of the complex issues at hand through visual immersion and free experimentation in the virtual space.

Lastly, stationary devices might also be installed at general purpose locations frequented by citizens, such as the local community center or the library. They are embedded in day-to-day life, but may not refer to these contexts in their engagement efforts *per se*. *VoiceYourView*, set up in a public library, is an example of this (Whittle et al., 2010). The system consists of a traditional-style phone receiver for voice input, a number of servers processing this input, and a public display providing real-time feedback auto-summarizing comments left so far through natural language processing. Its aim is to solicit the public's creative input on the general design of public space rather than targeting a specific area or topic. Hence, the system does not make use of or build strong ties between the locale it is situated in and the topics that are deliberated through it. However, even the authors suggest to transfer their insights to mobile computing in a next step, "where the commenting technology will not be fixed but will be available everywhere" (Whittle et al., 2010, p. 50).

Eventually, slightly more ubiquitous interfaces are conceivable that are stationary but better integrate with the minute details and subtleness of some of our environment than huge screens do. For example, smaller interactive e-ink displays interacted with through our mobile phones and connected via low-bandwidth cellular network connections could be a light-weight means to do distributed installations at various locales in order to have a physical (and more equitably accessible) representation of digital discussions on-site. This may further encompass even more reduced, non-digital artifacts like signs or stickers (possibly with QR codes or other means to link to the digital) as has been explored, e.g., in *Mening@Park*.

6.3 Ubiquitous

Mobile phones are already arguably the most mainstream manifestation of ubiquitous computing. Yet, they exclude many people; namely those not technically literate enough to use the advanced capabilities that they provide today and those that do not own or cannot afford them in the first place. Ubiquitous technology that is tied to the environment rather than to an individual owner presents an opportunity to be more inclusive. Together with stationary devices, it has the potential to provide access to an engagement infrastructure also to typically disadvantages groups inhabiting our cities like, for example, the homeless. Yet, their design, placement, and support structures are crucial considerations to indeed open them to all inhabitants and not blindly deploy ubicomp technology throughout the city.

What I briefly want to highlight here are two exemplary approaches that take this aspect into consideration. The first is to give sensor networks into the

Figure 6.3 Candy Chang's *I Wish This Was* sticker (left) and the original *Before I Die* installation in New Orleans (right). *(Copyright: Candy Chang)*

hands of the public where everyone can attach specific sensor nodes (e.g., exhaust, smog, pathogens, chemicals, noise, or dust) to a place of personal concern (Kuznetsov & Paulos, 2010). While the environmental sensors in their study were only non-functional mock-ups, it shows how people are reconsidering their attachment with public space and eventually democratizes data collection, analysis, and sense-making. This potentially allows the general public to uncover problems in the city that are not immediately graspable without this technology. The authors see in this "design opportunities for merging grassroots data collection with public expressions and activism" (Kuznetsov & Paulos, 2010, p. 21). Physically attached to objects of interest, these sensors are meaningfully embedded into the physical places they mediate.

Such efforts may, however, also scale down to much more low-tech approaches. As for a second exemplary approach, I would like to point to Candy Chang's projects which are highly interesting in this regard (see Figure 6.3). Her *I Wish This Was* stickers allow citizens in fill-in-the-blank style to express their opinions, to provide civic input on a specific site of their free choosing.[3] In her *Before I Die* intervention, she sets up a black wall and chalk in shared public space for people to fill in their desires and wishes in the sentence "Before I die I want to _____."[4] These low- or no-tech efforts provide inspiration for a more inclusive design of the augmented city where citizens' input is deeply integrated into the fabric of the physical environment but not necessarily aided by technology that people have to own.

6.4   Ex-situ / Remote

In this last section, the focus is on interfaces to participatory urban planning that are ex-situ or remote from the sites they are referring to. They, as the *Mobile Democracy* desktop interface, potentially allow for deeper engagement with topics in a more relaxed and reflective situation than during our hectic lives when we are out and about. Most systems in urban planning are of this

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[3]See http://candychang.com/i-wish-this-was/, last accessed: January 8, 2013.

[4]See http://candychang.com/before-i-die-in-nola/, last accessed: January 8, 2013.

kind. Newer approaches that combine public participation GIS and web mapping present large potential and usefulness – especially, when integrated into a situated engagement infrastructure. Hence, they are a good (and necessary) complement to more situated means such as those discussed so far.

All of the systems presented here focus on combining participatory web mapping (most frequently based on *Google Maps*) with discussions for spatial planning. *GeoAnnotator* uses geo-spatial annotations on maps as a communication tool. It lets citizen communities discuss a topic relating to a number of places (Yu & Cai, 2009). The authors argue that their map-based participatory discussion space allows citizens to address a particular public issue that is situated in the physical environment while directly referring to and anchoring their discussions in the issue's geographical location through those annotations.

WebMapMedia from the *Pudas* project is a similar participatory web mapping application for spatial planning (Nuojua, 2010). It aims at contextualizing discussions and at acquiring local knowledge in the form of comments and pictures. Entries in the system indicate locations of personal significance to citizens through colored markers on the map (differentiating places needing development, places to be preserved, and other places). The system focuses on collaborative knowledge creation and discussions, acquiring local knowledge and facilitating its combination with expert knowledge. For the purpose of the latter, the ex-situ/remote setting may indeed be more amenable. Therefore, *WebMapMedia* and, the previously covered, *Tell a Story* are sought to be integrated in the same fashion the mobile and desktop prototype of *Mobile Democracy* are. Illustrated voice stories gathered in-situ with *Tell a Story* are collected and discussed in the map-based online discussion space of *WebMapMedia*. For this purpose, the different systems share a common hypermedia database, where all digital material used in the urban design process is stored and, thus, enables links between different media elements on different systems.

The Finnish *Urban Mediator* is another web-based tool that allows users (citizens and planners) to collect and share location-based information on a map (Saad-Sulonen & Botero, 2010). Information, i.e., the individual data points, are organized in topics that are set up and maintained by users (which the authors/designers stress particularly). *Urban Mediator* also has a rudimentary mobile interface (also web-based) that is geared toward browsing and finding 'things nearby' as well as to create data points at a particular location. Lastly, *Urban Mediator* allows to embed individual functionality, such as adding points, into other websites through web widgets.

However, while such systems allow to reference particular places, they can only to a limited degree be sensitive to the situation and the actual places they seek to mediate. Furthermore, mobile situated interfaces are often only added as an afterthought that merely allow to access information or provide only limited possibilities to contribute on-site. Mobility is not a central element of their strategy. The 'situation' in which citizens contribute location-based insights is not explicated and not clear. How do those highly place-specific topics get in the systems? Lastly, most of these systems are still very much focused on

collecting issues and locations rather than on allowing deep and creative engagement with the physical living environment and its design as such. Yet, they present one element of the infrastructure that contributes to a deeper and potentially more collaborative engagement with planning topics.

6.5   Summing Up

A situated engagement infrastructure should offer citizens a variety of opportunities to provide input or engage in planning discussions in a variety of different, dependently meaningful situations and locales. This access can be accomplished through a rich mix of modalities such as personal mobile devices for 'everywhere' access in people's everyday life, stationary and semi-stationary setups tied to a specific place and/or urban development, ubiquitous approaches that provide shared access in a widely distributed and embedded fashion, and remote interfaces that people can engage with and collaborate through with others in the comfort of their homes. I have explored such different modalities through my design experiments and have, in part, situated them in related work unfolding a larger situated engagement infrastructure.

However, such infrastructures need not necessarily be integrated in order to be meaningful to citizens or useful for municipalities. Disjoint systems and heterogeneous infrastructures have their advantages as well. For example, Weise et al. (2012) ask how citizens would experience such a heterogeneous amalgamation of ubicomp technologies in public space: "Will we face different ubiquitous networks at a particular public location or will we interface with a unified service layer, which centralizes the various options that a ubiquitous computing infrastructure affords?" (p. 527). I would argue that the former poses many advantages, especially in terms of democracy and distribution of power and control just as well as in the diversity of engagement opportunities. Many disjoint and distinct systems (or infrastructures) provide different opportunities relating to different aspects of civic life and feeding into different aspects of the urban planning process.

An infrastructural perspective, however, goes beyond the range of devices which I have discussed in this chapter. An infrastructural perspective poses the question how technological elements are indeed embedded in our socio-material world. A situated engagement infrastructure for civic participation in urban planning involves people, the physical environment, the experience of place, institutions, laws regulations, procedures, and planning documents as well. Together they form a comprehensive amalgamation of what citizens interact with when dealing with planning discussions in the physical environment mediated through digital technologies.

Chapter 7

Conclusion and Future Work

Situated engagement, as I have coined it, seeks to 'situate' civic engagement activities in those spatial contexts that are at stake in a particular land use planning issue. Because this approach connects to the places that are personally meaningful to people, it enables engagement activities to be better integrated with their everyday lived experience.

Two main objectives have driven my research: First, to broaden our conceptual understanding of situated technologies for civic engagement and, second, to advance our methods and techniques so that they are suitable for studying and exploring mobile and ubiquitous technology use *in the wild*.

My *methodological* aim has been to enrich our available methods and techniques that enable us to capture practices involving inherently mobile behavior and allow for exploration of the field with sophisticated prototypes in the wild (research objective III). Toward this objective, my walkshop technique facilitates hands-on co-exploration of an actual outdoor environment with interactive prototypes. The technique has demonstrated its usefulness through extensive application in several variations and for slightly different purposes in three of the four design experiments. Moreover, I have criticized the prevalent notion of field trials in ubicomp research, where they are seen as an assessment of an iterative design process. I propose to rather see them as a part of such a process. I employ field trials for further exploration of the field with sophisticated prototypes to look ahead toward use practices that are still in the making. Lastly, I have developed a general model for methods studying ubicomp systems that takes the following five dimensions into account: the use situation, the involvement of the investigator, the participants, time, and the sophistication of the prototype. The model helps to gauge the number of individual activities carried out in an iterative design process by moving back and forth along these dimensions.

My *conceptual* aims have been to explore, and conceptualize, the design of technology-mediated civic engagement opportunities in participatory land use

planning that are better integrated with people's everyday lived experience (research objective I), and to explore, and conceptualize, how such engagement activities can be made more pervasive and co-located with the referred-to places (research objective II).

I have explored and sought to satisfy these objectives through four consecutive design experiments that have in their progression advanced our understanding of situated engagement. The first, *Mobile Democracy*, points out the need to facilitate in-situ as well as ex-situ reflection and action. It thereby provides the very foundation for the concept as such and, early on, hinted at an infrastructural perspective that offers various means for citizens to engage in different situations and locales. The experiment further explores the qualities of actually *being there*, of a citizen being co-located with the object under discussion when engaging in civic discourse, and how such qualities can be mediated through technology. The second design experiment, *AR City*, offers a novel approach of how future planned buildings (i.e., future places) can be mediated through facilitating a richer impression and better understanding of plans in-situ. To this end, *AR City* continues the exploration of the qualities of *being there* and even further augmented this feeling.

The third design experiment, *Mening@Park*, provides various means for citizens to create links between physical and digital spaces in order to strengthen the coupling between those two. It explores providing both access to digital topics from the physical realm and representations of places in the digital realm. The last design experiment, *I'm Your Body*, continues a theme from *Mening@Park* by suggesting more situationally appropriate forms of engagement such as storytelling, playfulness, and emotions as the underpinnings and vantage points for civic discussions. Additionally, it suggests that such stories could transcend a single place by expanding geographically, and therefore provide more flexibility to engage with a number of topics at different places of personal interest.

Through these design experiments and their discussion and analysis, I have come to a richer understanding of a notion of situated engagement. This richer understanding is reflected in three central aspects: First, situationally appropriate forms of engagement that align well with citizens' own conceptions and afford their expression of memories, feelings, and attitudes are necessary in order to provide relevance and meaning of issues in the moment. Second, situated engagement requires a technological setup which facilitates the co-location of people, place, and the planning issue at stake. Third, the mediating technologies need to intertwine physical and digital realms through a strong coupling with the particular place concerned. This last and most pivotal aspect goes beyond merely bringing the technology to the places of interest. The technology needs to provide access to digital topics from within the physical space and represent the physical space in the digital realm in meaningful ways. This allows citizens to indeed understand the physical and digital realms holistically as two aspects of one and the same thing – i.e., two aspects of the same planning issue.

My design experiments, together with related work, point toward the forming of a situated engagement infrastructure. Such an infrastructure provides citizens with a variety of different means to engage with planning issues in a variety of contexts and situations. It allows them to act wherever and whenever it is meaningful and relevant to them in relation to particular topics and places of their interest. This is important because life is too messy for a one-size-fits-all approach.

Regarding future work, my research opens up a number of new questions and challenges. Through my design experiments, I have suggested a number of means to deeply intertwine digital technologies with places. However, my experiments only begin to approach this problem. Existing design propositions are not yet practical enough for widespread deployment, as I have shown in Chapter 6. They may be too complex or too costly, may depend on structures of ownership problematic in terms of equitable access (e.g., smartphones are personal, they require individual ownership), or may not be capable of bridging the physical–digital gap in a meaningful way. More research is necessary in this direction; and new ubicomp systems as part of a larger infrastructure may be a fruitful avenue to this end.

I have further argued that technologically mediated in-situ planning discussions augment the experience of place. How, then, are such augmented places understood and experienced by citizens? What qualities does the digital augmentation bring to the physical environment? Do people perceive digital and physical realms together or apart? Or does this perception change depending on their activities and focus of attention? Empirical studies need to be conducted to help theorize these relationships.

An aspect of situated engagement that I have proposed to be pivotal is the strong coupling between physical and digital realms. We need to reflect, however, if this notion of coupling goes both ways. Are we indeed considering 'online' activities to initiate 'offline' ones whose further activity then potentially transcends the digital realm? Are we indeed positing a notion that goes beyond merely seeking to lure more people in by providing visibility of and access to digital topics in the physical realm? Hence, we need to explore how citizens can not only act through but indeed *beyond the system*, thereby feeding back into, working together with, and affecting traditional engagement activities, processes, and institutions. How can digital engagement systems encourage and facilitate such acting beyond and collaborating outside of the digital realm?

Another complex of questions to be explored concerns the infrastructure aspect. How can we better interweave the various means offered through a situated engagement infrastructure (in-situ / ex-situ, ubiquitous, etc.)? How can we better facilitate and exploit their respective advantages and have them complement each other? Do they need to be integrated or are distributed and federated infrastructures indeed a better choice? A comprehensive approach at designing situated engagement infrastructures from the very start is necessary to explore and answer these questions.

Additionally, the subtle and often invisible parts of the infrastructure are equally relevant to be investigated from a citizen perspective. Where the elements I have looked at largely concern access points to the infrastructure that citizens interact with more or less directly, other elements such as networks, communication infrastructures, databases, and back-end systems underlie these systems. Citizens interact with these elements, yet they only become visible on breakdowns. While important to understand, these phenomena are difficult to observe and analyze from a citizen perspective.

Lastly, in order to truly empower citizens in the domain of technologically mediated civic engagement, we need to focus more on the notion of infrastructur*ing*, on enabling citizens to create and maintain their own base for civic engagement activities in a long-term and sustainable way. Infrastructuring emphasizes the continuous development, maintenance, and evolvement of socio-technical infrastructures through use, adaption, and appropriation by citizens (Star & Ruhleder, 1996). Infrastructuring needs to be seen as an ongoing design process where participation and co-construction are central themes. In the civic engagement domain, it is particularly relevant to facilitate citizens in the development, maintenance, and evolvement of (potentially many different) situated engagement infrastructures.

Civic participation is always a complex endeavor. Any engagement infrastructure has to reflect this complexity – yet in a way which invites and motivates people to take part in often complicated deliberative processes. To this end, place and its immediate experience in everyday situations is an invaluable resource. With situated – i.e., place-sensitive – engagement, I hope to strengthen a participatory culture on the move.

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Part II

Papers

Paper 1

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

by Morten Bohøj, Nikolaj Gandrup Borchorst, Susanne Bødker, Matthias Korn, & Pär-Ola Zander

The paper presents work from the first design experiment, *Mobile Democracy*. It introduces and discusses the distinction between in-situ and ex-situ reflection and action that is supported by a mobile and a web-based desktop app. This allows citizens to engage in continuous reflection-in and on-action as a collaborative activity with other citizens. The paper further details and reflects on the extensive participatory design process carried out to this end.

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 consorted 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-

gagement 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,[1] FixMyStreet[2] and SeeClickFix.[3]

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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[1] http://www.cityofboston.gov/doit/apps/citizensconnect.asp

[2] http://www.fixmystreet.com/

[3] 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 walkshop 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.
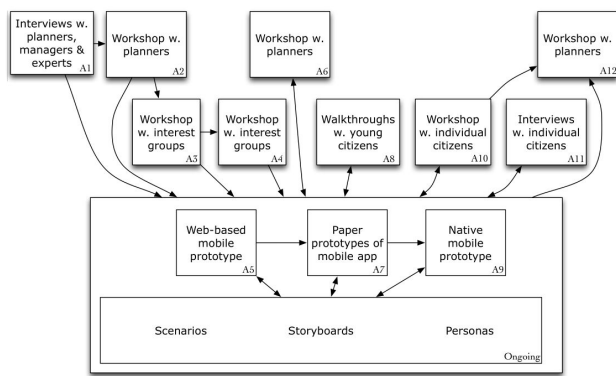
Figure 2. Overview of the design process (activities, participants and design artifacts). The upper and middle levels show activities with planers and citizens respectively. The bottom level illustrates the combined use of scenarios, storyboards, and personas; and prototyping on different technological 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 exists 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[4] 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).[5] The GWT service functionality is used to asynchronously fire commands to

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

[5] 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.
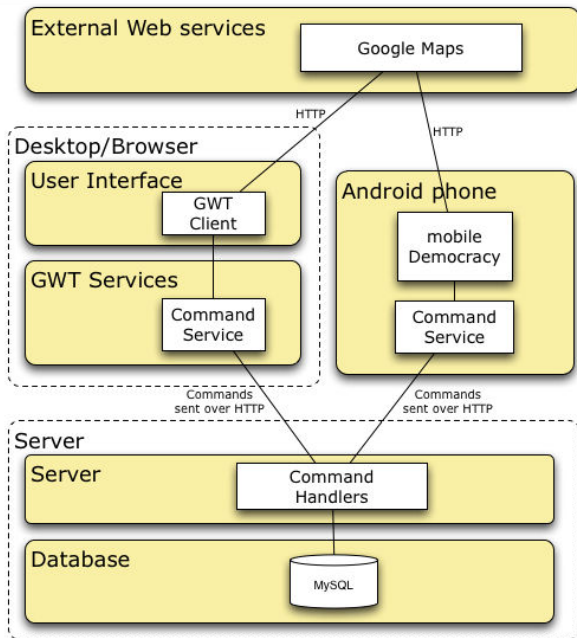

Figure 3. The software architecture.

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 inter-views 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 com-menting 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.
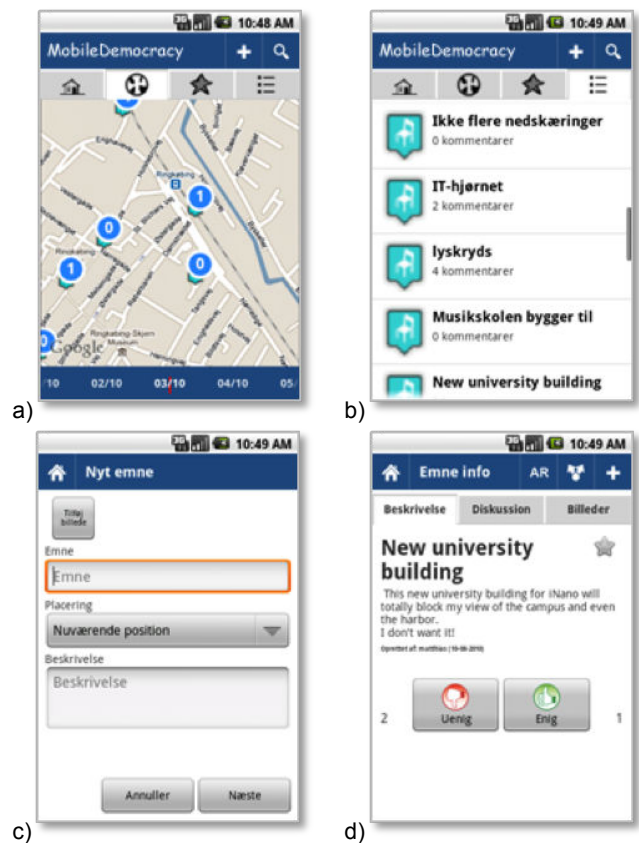

Figure 4. Screenshots of the mobile prototype: (a) the map view, (b) the list of topics, (c) creating a new topic, and (d) viewing a topic.

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 walkshop 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 walkshop 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, techno-logical 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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Paper 2

From Workshops to Walkshops: Evaluating Mobile Location-based Applications in Realistic Settings

by Matthias Korn & Pär-Ola Zander

The paper presents and discusses the walkshop technique that has first been developed in the first design experiment. This technique has later on been used in the two subsequent design experiments as well.

From Workshops to Walkshops: Evaluating Mobile Location-based Applications in Realistic Settings

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ABSTRACT

Many open questions on how to best observe the mobile user experience remain – at the stage of design time as well as use time. In this paper, we are focusing on the stage of design time and describe our experiences from evaluating a mobile application for citizen involvement in municipal land use planning. Due to the problems and issues identified after conducting several user workshops in our exemplary case process, we propose "walkshops" as a complement to traditional workshops and prototype field studies specifically to evaluate mobile location-based applications (and similar context-aware systems). We report some problems with workshops and outline how a walkshop may be carried out. The first trials of the new method are promising and have generated valuable feedback, insights and discussions about using the mobile application within the intended contexts.

INTRODUCTION

How to evaluate the mobile user experience both at design time and use time poses many open questions. Specifically, conducting user evaluation with mobile location-based applications is difficult as most evaluation methods are not contextual and/or not suited for systems used in outdoor contexts. With this paper, we focus on a new technique for design-time evaluation of mobile location-based applications. Our purpose is twofold: 1) to illustrate situations where workshops, well suited for stationary computing, raise problems in a mobile context and 2) to show how this can be in part alleviated by, what we coined as "walkshops", given the right staging.

Methods for evaluating systems directly in the context of use exist. For example in prototype field studies the software is deployed and the use of the system over time somehow monitored or observed from a distance. They can be strong in their ecological validity, but in themselves they provide no access to how users think about the use.

Workshops address what field studies lack. The concept of 'workshop' as an evaluation activity has become an umbrella concept for a range of method prescriptions and activities involving groups of users who meet, where perhaps the participatory design workshop is the most well known type. Under the label of 'workshop' we find a number of evaluation activities that vary in how they are conducted, what they evaluate, and perhaps also their epistemological underpinnings. Workshops are, however, generally used in order to stimulate a discussion between users where the outcome is used in the next step of design. In the rest of the paper, we let the term refer to methods we have used throughout the project including future workshops, pluralistic walkthroughs and group discussions between users and designers facilitated by various design artifacts.

There may be differences between stationary use in a workshop and stationary use in practice in the field study. However, these differences are more severe in a mobile context, since mobile computing usually affords multi-tasking, and the physical conditions vary widely. Let us turn to walking as a methodological alternative that decreases these differences. Different walking approaches, where users would move about in the context of the application domain testing a system to be evaluated, have been used before, but a focus on walking as a stimulating activity has never been made explicit or analyzed systematically in any methodology to the best of our knowledge. For example, transect walks [4,5], a method from participatory rural appraisal (PAR), are used for understanding the local context (e.g. natural resources, landscape, land use etc.) by walking together with local informants through an area of interest (e.g. a rural village). In civil engineering and architecture, one researcher even spent an entire year walking the streets of Lisbon and Barcelona in order to understand the architecture of these places [8]. Ochoa highlights that "the physical walk allows the mental walk, stimulating the thought and making possible the contact of the body, as element of measure, with the space" [8]. Yet, both of these methods are aimed at understanding the environment and not the mediating technology.

Summing up, field studies do not provide the strength of workshops – to capture details in a user's sense-making and other cognitive processes. Workshops around a table do so, but sacrifice context. Walkshops enable the study of context paired with the micro-processes of sense-making. We apply walking (i.e. as in going for a walk) both as a tool for thinking and a tool for closer relation to the use context.

The forthcoming sections of the paper concretize this argument by examples from our research project. It describes how we developed that walking may stimulate reflection and that an increase of ecological validity can be gained by observing *sense*-making processes during walkshops. Finally it provides some lessons to be learnt.

RESEARCH CONTEXT

In this section, we describe the research setting where we employed our evaluations. This may give readers an idea of to what degree our findings generalize to their own evaluation tasks.

The evaluations have taken place within a project called "MobileDemocracy." This project has explored how citizens can participate in municipal planning in various ways. The approach is user-centered, and was conducted in participation with a municipality and some community-based organizations in western Denmark. A municipal plan is a document used in strategic planning that describes various visions and goals, but a key element is to relate the strategy spatially and to the existing physical infrastructure. The use of maps is frequent.

The municipality we interacted with has had problems in mobilizing its citizens and cooperated with us in order to better understand citizen involvement. The community-based organizations cooperated with us in order to make their voices heard to the municipality.

Our initial design idea was to create a mobile application that allowed citizens to suggest changes or to react to proposed changes, where these contributions could again be utilized in the planning process. The application was envisioned to be location-aware, and provides notifications when a user passed by a site of discussion. The municipality in our case is sparsely populated, so the number of discussions was estimated not to be occurring often enough to make most users turn off the notification. This mobile app was to be paired with a desktop interface, where people could engage more deeply in discussion. In sum, get people motivated (be it curiosity or indignation) through a mobile application, and provide room for deeper reflection at the desktop. The rest of this paper concerns the evaluations of the mobile prototype.

THE DESIGN PROCESS AND ITS EVALUATIONS

In this section, we highlight how we continuously evaluated our ideas in the design process, in order to arrive at an identification of some problems in the following section.

We explored these ideas in a user-centered system prototyping. The process was iterative, and we created a number of scenarios, storyboards, paper prototypes and refined a mobile prototype in a number of versions. The initial functions proposed in early versions of these design artifacts were based on a mix of our own ideas and empirical data from interviews and cultural probing not further described in this paper.

All of our design artifacts were put in contact with citizens and planners in workshops. Typically, we presented a scenario or storyboard, and discussed it with the participants. We moderated the discussions in order to get more concrete details or examples of actually ongoing planning situations, for the variety, and for barriers to appropriation of such systems. In one occasion, we assigned different roles to citizens, and asked them to discuss a fictive dilemma, and how dilemmas like this could be facilitated by IT. We did not show interaction on keystroke (or "tap stroke") level in these workshops.

We also conducted two pluralistic walkthroughs each with one user and one or two researchers in the panel [3]. The first was conducted on paper, where interactivity was emulated through Wizard of Oz [7]. The second walkthrough used an early version of the high-fi prototype on a mobile phone. The participants were given some tasks, where a problem a user could possibly relate to was introduced. They were then asked to solve or react on it through the prototypes. Following the steps proposed by Bias [3], each set of screens (on paper or the mobile phone) was looked at and notes written down individually. Afterwards they were discussed within the panel with the user going first. Some tasks given were aimed for use of potentially all functions of the prototype, and others were for a specific control inside the application.

Participants

There are two user groups in this project: citizens and planners from the municipality. The citizens were selected through "organizational belonging", and were therefore to some degree convenience sampling. However, we established contact with several organizations independently from each other, in order to avoid e.g. that the municipality chose citizens that would have opinions that fitted to their focus. The users from the municipality were chosen because they worked with municipal planning as key persons at various levels.

The citizens participating in our experience workshops were spread along common demographical spectra (age, gender, education, profession, computer literacy). The users in the most recent workshop to evaluate our latest high-fi prototype were chosen so that they fitted our final choice of a target user group – i.e. citizens from the more rural areas of western Denmark with medium computer, or rather mobile phone literacy.

METHODOLOGICAL ISSUES IDENTIFIED

On a general level, results from the workshops strengthened our design concept in making us sure about the motives in the activities users engaged in and in particularly interesting ideas for scenarios. Thanks to the Wizard of Oz nature of the first pluralistic walkthroughs, we got feedback of the interface at a stage, where we did not have to engage in time-consuming programming in order to implement it.

When we planned and later interpreted the results from the workshops, we experienced a number of problems with our method:

- We experienced a relatively formal workshop or meeting room atmosphere. No matter how we structured them it was mostly a bi-polar exchange between researchers and users.

- We could not utilize exploration by foot or vehicle in a natural manner, due to the physical scale of a meeting situation being too small. A user who was prompted by a position-dependent function had to be told "now you walked through the parking lot of your workplace" and then we made the mobile phone beep.

- Time constraints and stress on the user (e.g. for input with the onscreen keyboard) was observed to be totally different when sitting at a table (e.g. in a workshop where they posed no problems) or standing outside or even walking.

- We observed that in practice, typical workshop situations often proceed in a rather fixed setting, where one or two users continue to work on one phone. Although hypothetically possible, people do just not switch places that often.

- A meeting space is limited in the number of objects to interact with in ways that may be problematic. For instance, parts of tasks in our workshop included taking a picture. This resulted in arbitrary shots of e.g. the table instead of a suitable real-world photo. This includes e.g. problems of where to stand when taking the picture, or how the user would reason when the quality of the picture was poor. Similar issues arose when entering other types of content.

Our conclusion was that we wanted more realistic user conditions. At the same time, we wanted to keep the possibility to gain insights on the user's sense-making processes, which ruled out field studies with remote monitoring.

WALKSHOPS: EVALUATING MOBILE LOCATION-BASED APPLICATIONS IN REALISTIC SETTINGS
In this section, we further motivate and outline our proposed walkshop method, which we think alleviates some of the problems identified above. We also present experiences and results gathered from three walkshops we conducted with different user groups within the MobileDemocracy project.

The term "walkshop" itself has been used before – mainly by activist groups and in academia on topics like walkable cities as well as architecture and urbanism [10,9,6]. We adopt this term as it highlights the need to move part of the traditional workshops out of the meeting rooms and into the actual context of use. We stress both the in situ aspect and the aspect of walking as a thinking tool. The aim of this method is to evaluate prototypes in a more realistic or natural setting (i.e. within the context of use). Thus, the focus is on understanding the mediating technology, rather than the environment or context it is used in. With this, we strive to bring the evaluation into the context, rather than bringing the user's context into the evaluation situation.

Walking as a Thinking Tool
Neurologists have recently shown that walking as a rhythmic activity may possibly have a positive effect on our thought processes [2]. Similarly from the field of regional

planning, Anderson proposes a method called "talking whilst walking", which suggests "that conversations held whilst walking through a place have the potential to generate a collage of collaborative knowledge" [1, p. 254]. While focusing on how an understanding of the knowledge and lives of individuals can be gained by wandering around aimlessly through place, he also again acknowledges that "the bodily movement of walking invokes a 'rhythmic relaxation' of both body and mind that 'frees the imagination'" [1, p. 258] as well as that "the rhythm of walking generates a rhythm of thinking" [Solnit in 1, p. 258].

We can thus argue that walking goes well together with talking and discussing the issues that surround us, and those we may be occupied with at that moment. We are aware of casual walks in the park with colleagues, friends or family, which occasionally lead to interesting and profound conversations. Back to our context, the activity of walking or wandering frees workshop participants from the fixed confines of the meeting room, table, and chairs making the atmosphere much more informal by allowing participants to move about freely and flexible.

Conducting Walkshops and Results
Our focus for the proposed method is on evaluating mobile location-based systems as their use cases are based on acquiring one or more spatial positions. Bringing these systems into the context allows for the creation of more realistic evaluation settings closer to the actual application domain (in terms of body movement, light conditions, distortion, etc.). Location and other environment variables can be incorporated more easily than in a spatially fixed setting.

Throughout the course of the MobileDemocracy project, we conducted three walkshops at different stages of the prototype and with different user groups. All walkshops took place outdoors. The first two walkshops were an integral part of workshops. One walkshop was conducted with planners from the municipality (three users), where the prototype only notified the user of topics at the locations he or she was currently walking and allowed him or her to retrieve details of these topics and see them placed on a map. The second walkshop was conducted with citizen users (four users), where we, in addition to the functionality above, allowed and asked participants to also create new topics with details, take photos related to these topics as well as view an augmented reality visualization of the future plan. The third walkshop was part of a preliminary project presentation again with planners and other interested parties from the municipality (six users). Here, we showcased in a hands-on (and foots-on) session the main functionalities and look-and-feel of our prototype implementation via scenarios and let the users react through the prototypes.

While one could imagine conducting walkshops as stand-alone, we deliberately chose to do them in conjunction with

user workshops in order to be able to work on different aspects of the project. In a three-hour session we reserved a timeslot of 45 minutes for a walk of approximately one kilometer. Before going out, the walkshop was introduced with a very short briefing of the prototype and followed up afterwards with a discussion. Here, created content (in our case topics and photos) could serve as a starting point and framing of the discussion. For the walk itself, we prepared real world points-of-interest along the route, of which our prototype would notify users and would allow them to view details and write comments. Users were also provided with more concrete problem-centered tasks and asked to respond to or rather interact in response to them. As it was our desire to understand the sense-making with such technology when used in context, we, as researchers, came along the walk. Our roles were, similar to those in workshop settings, those of facilitators (in terms of setting up the infrastructure and helping with usability issues), of observers (in terms of action research), and those of partners for informal conversations (in terms of soliciting, probing and discussing feedback and insights).

Through these walkshops we found several usability problems we hadn't identified before. These related especially to data input under stress (e.g. when standing or walking rather than sitting at a table), but also to ways of how and to what extent our system will and can actually be used in these (more realistic) settings (including what kind of content was created). Similarly, we experienced elaborate discussions and reflections of the users on how the system works, how it might be used, and which other opportunities it opens for the future. This may be in part due to the users interacting with the real environment rather than a staged one only provided through scenarios or similar. We believe that the real environment provided more graspable stimuli, which helped to fuel the users' imagination and thoughts leading to interesting discussions.

On a practical level, the walkshops allowed interacting with real-world objects and issues to create content from or take photos of. Furthermore, the walkshops afforded a flexible reconfiguration of usage situations between users. While also possible in workshop settings, with users already being on their feet and mobile, they simply moved around more and were free to engage with different other users, with the researchers or just explore the prototype on their own.

Apart from these findings, we are also of the opinion that going out into the context rather than bringing the context in is often the only meaningful way to evaluate a location-based mobile system with users. As our aim was to get an understanding of the sense-making process of users using the system, we decided not to put the system out into a field study and monitor it from a distance at this stage.

CONCLUSION

Based on our experiences with the workshops it seems that some things are problematic: Formality, stress constraints, exploration, and shortage of objects to interact with. It suggests that if such issues may be important for a user's experience, it is inadequate to rely too much on workshops for evaluation. Walkshops seem to mitigate some of these problems by intertwining the evaluation with the actual context of use. In conclusion, we observed users being more engaged with the software and the evaluation situation as a whole, but limitations e.g. on the use of paper prototypes persist. Therefore, walkshops are no silver bullet and we propose to integrate them into traditional workshops and complement them with other methods such as prototype field studies in later stages of a project.

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Paper 3

Making Sense of Green Boxes: A Study on People's Understanding of Augmented Buildings on Mobile Phones

by Matthias Korn & Mikkel Baun Kjærgaard
Unpublished paper draft, 1–5. 2012.

The paper presents the research in the second design experiment, *AR City*. It details a mobile augmented reality system that visualizes planned buildings within the real environment on people's smartphones. The main part concerns a study on the sense people make when confronted with such augmented buildings. The study makes use of the walkshop technique.

Concerning the status of the manuscript: The paper has been rejected from the *CHI 2013* conference, where it was submitted in the very dense and challenging four-page *Note* format. It is now included in this dissertation in a revised and expanded version, and currently in preparation to be submitted to another conference.

Making Sense of Green Boxes: A Study on People's Understanding of Augmented Buildings on Mobile Phones

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ABSTRACT

Mobile augmented reality (MAR) is a promising tool for urban planning as it allows a wide audience to experience future changes to the cityscape firsthand through their smart phones. With a study on how people make sense of visualizations of planned buildings within a real (outdoor) environment, we identify user requirements for such augmentations using a bespoke prototype system with sparsely visualized buildings. We employ an *in-the-wild* study that involves encountering virtual buildings through the prototype system on a 45-minute walk in a planning area. Based on in-depth, qualitative data, we found that distinct qualities of augmented objects are important to provide among other things and that people relate virtual objects to existing structures in the real world. Our findings are generally applicable beyond urban planning whenever augmentations seek to imitate or represent real objects.

Author Keywords

Mobile augmented reality; participatory urban planning; virtual buildings; sense-making.

ACM Classification Keywords

H.5.1 Information Interfaces: Multimedia Information Systems—*Artificial, augmented, and virtual realities.*

General Terms

Human Factors; Design; Experimentation.

INTRODUCTION

The advent of the smart phone generation of mobile phones is bringing augmented reality (AR) to the masses. With their sensors, camera, and high processing power, smart phones present the most widely distributed and well equipped platform for AR. Much work has already been done in mobile augmented reality (MAR) systems [4] and AR in the architecture domain [1, 9]. Additionally, numerous commercial AR applications for smart phones exist (*Wikitude* and *Layar* are two of the earliest and most prominent examples).[1]

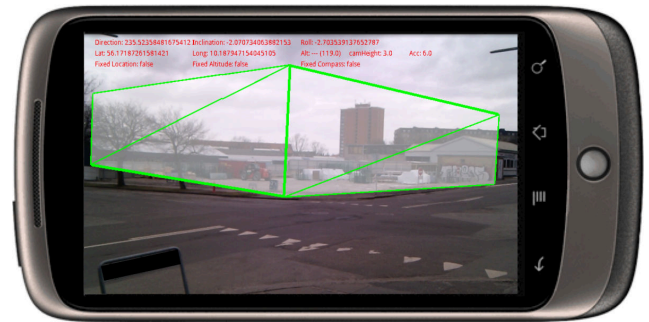[1]See **www.wikitude.com** and **www.layar.com**.

Figure 1. Screenshot of the *ARCity* system showing the outline of a planned building through the camera of the phone.

A domain where a wide-spread adoption of MAR systems could help is participatory urban planning. Although, changes to the cityscape are usually announced in the press and other outlets by the municipality, citizens are still often unaware of them or the implications they may pose. Architectural drawings and textual descriptions are often unapt or insufficient in communicating these plans to interested residents, who may not always be able to read and understand them. Furthermore, they are often published for the city as a whole rather than being filtered according to the areas a citizen may be interested in (e.g., close to home or work). Architectural models can neither appropriately communicate the actual impact new buildings might have within lively and real rather than stylized surroundings. We envision that a MAR approach to urban planning may improve the awareness and understandability of municipal plans by visualizing planned buildings anchored in reality and aligned with the actual current surrounding cityscape in real-time.

For this purpose, we are building the *ARCity* system (see Figure 1). We employ AR building visualization in order to engage more people to experience and participate in urban planning of their own everyday living environment. We use a fairly basic approach for building visualization for it to perform well on general-purpose smart phones. We rely solely on already built-in GPS and inertial sensors for registration and tracking—i.e., only on the capabilities already in the phone. This enables augmented buildings in every person's pocket without any required calibration or preparation of the site as would usually be the case with other AR techniques such as feature-tracking and model-based approaches. We seek to enable citizens to just point their phone at any future building site and see what is planned to be built there.
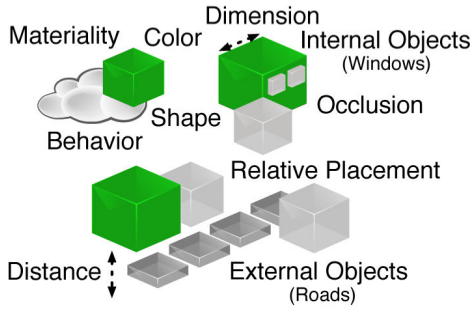
Figure 2. Elements of our findings.

Figure 3. Structure and information flow of the *ARCity* system.

With a few recent exceptions, there has been very little work involving user studies of outdoor MAR applications. In their survey paper, Dünser et al. [3] estimate that only 10% of AR-related papers published between 1993 and 2007 included some sort of user evaluation. Moreover, most of these were concerned with perception and cognition issues and user task performance (e.g. [6, 7]), and only a small fragment employed formal qualitative methods as is the case in this paper. Recently, also HCI is showing an increased interest in outdoor MAR applications on smart phones (e.g. [2, 8, 10]). Morrison et al. [8] present a study of a MAR map application for outdoor use. They stress the need for field trials in real environments to investigate "interaction while embedded and mobile in the referred-to environment" [8, p. 1890]. Olsson has carried out a number of studies investigating expected and actual user experience of MAR applications currently available on the market (e.g. [10, 11]). They generally provide support for the type of application we are studying here and highlight the need for more research in this direction.

With the present study, we investigate the sense people make of planned buildings visualized on their smart phones within a real (outdoor) environment. We are interested in how people interpret augmented buildings in order to identify user requirements for such augmentations. We opted for a lower bound for the sophistication of the visualizations (ignoring, e.g., detailed shape, texture, and other characteristics provided by 3D graphics libraries) for three fundamental reasons: First, this increases the need for participants to actively interpret the visualizations and thus better facilitates our study of their processes of sense-making. Second, we are interested in gaining fundamental (i.e., low-level) insights with our study. Third, this resonates well with the notion from participatory design that rough low-fi prototypes are less intimidating for people to actually participate and contribute in earlier stages of design—which is very much applicable to urban planning as well.

We found that distinct qualities of augmented objects and various additional information are important to provide and that people relate virtual objects to existing structures in the real world (cf. Figure 2). The findings are generally applicable beyond urban planning whenever augmentations seek to imitate or represent real objects. In the remainder, we will present the *ARCity* system, our method, and our findings in more detail.
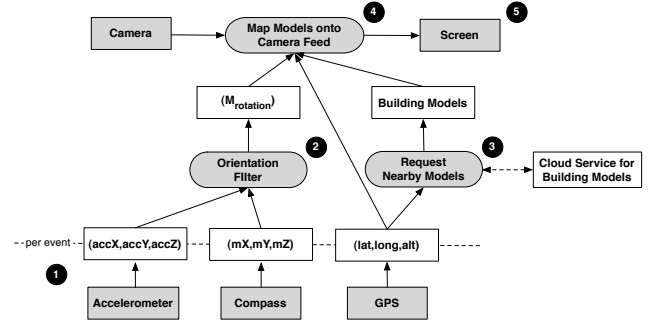
PROTOTYPE: THE ARCITY SYSTEM

The *ARCity* system has been built to be computationally light weight in order not to drain the resources of the phone. The goal is to visualize buildings using only the sensors available in current Android-based smart phones (i.e., accelerometer, magnetic field, and GPS). It does not rely on feature-tracking techniques as this would require initial calibration by the user and thus knowledge of the site. It does not apply model-based techniques because area or building models are not yet pervasively available. In accordance with our objectives, it uses basic wireframes to visualize future buildings (cf. Figure 1), which only provide rudimentary information about size and location of a building, refraining from, e.g., textures and more detailed shapes.

The structure and information flow of the *ARCity* system is illustrated in Figure 3. In short, the system functions as follows: inertial sensors and GPS provide continuous measurements (1). A configurable rolling filter is applied to the raw inertial sensor measurements to smooth out fluctuations without creating a noticeable delay when changing the phone's orientation (2). A rotation matrix is computed from which the orientation of the phone is inferred. Given the GPS location, models of nearby buildings are requested from an online service in a dense format (3). Rotation matrix, models, and location provided, buildings are mapped onto the live camera feed using OpenGL (4) and projected on the screen with 25 frames per second (5).

Beyond AR, the app has only a minimal UI. Participants can tap the screen to take a screenshot for purposes of the study. A 'hidden' UI allows the investigator to instrument the app prior to participant involvement to configure the different experiments (e.g., different sensor or building model settings).

METHOD

The exploratory user study is based on walkshops [5]. In our adaption of walkshops, participants explore the use of location-aware mobile technology within the actual outdoor environment rather than a fixed indoor setting. The aim is to bring the study into the use context, rather than bringing the use context into the study situation. Walkshops employ walking as a thinking tool to stimulate reflection. In this instance, people had time to reflect between experiments when walking from one site of virtual buildings to another.

Figure 4. Participant and investigator discussing what is seen on the phone and in reality.

We recruited five participants to go through a walkshop procedure individually: a female PhD student in philosophy (P1), a female secretary in the computer science department (P2), a male master student in computer science (P3), a female bachelor student in media studies (P4), and a male facility manager of the computer science campus (P5). Except for the master student, none of the participants were smart phone users at the time of the study. All participants knew the area— just as the target group would do.

Each walkshop consisted of three parts and took about 45 minutes to one hour per participant. A brief indoor introduction explained procedure, aim of application and study, and tasks to the participants. They were, furthermore, instructed in the types of virtual objects that may appear, that is, the exterior walls of new buildings, already existing buildings, and modifications to existing buildings (of which there actually were none and were only included to open up for interpretation even further). A quick demo of the application was given to familiarize participants with the style of visualizations and to slightly reduce the initial novelty aspect.

In the following outdoor part, participants were encouraged to explore the physical environment on their own terms (still accompanied by the investigator) in order to find virtual objects and to approach them for closer inspection (see Figure 4). Upon finding such an object, they were asked to identify the building, to estimate where it is placed, how it integrates with the surroundings, how big it is, and to compare its dimensions to existing structures (e.g., other buildings or trees). Further questions were centered around action possibilities, i.e., how the participant could put the visualizations to use, or how she could potentially interact with the building once the proposed change has been implemented (e.g., how to walk around it).

During the walk, participants were encouraged to take screenshots of interesting constellations or those they were unsure about. These screenshots were used as a scaffold in the third and final part: an indoor follow-up discussion. In addition to using these screenshots for inquiring more deeply about various aspects of participants' understandings, participants also produced drawings of the layout of new or modified buildings they believe have seen for the same purpose. These drawings further helped to understand and analyze what sense participants make of various constellations.

FINDINGS
We first transcribed and then analyzed audio recordings of all three parts with a qualitative, inductive, open coding approach. The three themes that we identified and developed from the resulting codes are reported in the following.

Building qualities
Performing the cognitive translation from virtual to eventually real buildings seemed to be the hardest task. However, we specifically asked participants to make sense of virtual buildings—and so they did. Naturally, the way in which such buildings are actually visualized played an important role:

> *But as it is now, you can see through the building. So, maybe I need to see the building as a building. You know, a black box or something.* (P2)

The participants of the study characterized real buildings by their dark color and opaqueness; their big size, immobility and heavy weight; as well as by their concrete material. Yet, these were qualities that our virtual buildings did not have. They were light in color, semi-transparent, green, and they lacked texture. They also appeared lightweight due to their lack of anchoring within the real environment as afforded by the AR technique used. They were quite different in their feel than real buildings are.

Similarly, when inquired about which other properties, apart from location and dimension, she would like to know to form an opinion of her own, one participant responded:

> *Of course the color. If it's a dark building or a light building. I mean, what this suggests to me is that the building is made of a very light material, a lot of glass, light bricks or something. And of course everything would be different if it would be darker.* (P1)

Especially one other quality constituted an obstacle to making the cognitive translation from virtual to real: the virtual buildings' steadiness, or rather their lack thereof. The buildings in *ARCity* were described as being *shaky*, *moving*, *changing*, or even *jumping*. This often made it hard for participants to pinpoint what the visualization actually shows and to make up their mind, to form a conclusive decision about the buildings placement, for instance. Looking back at a building's character, one participant used her intuition of how buildings are to argue for a preference in the trade-off between steadiness of the augmented buildings and reaction time during phone movement (as could be configured with the rolling filters):

> *I'd like to have it slow. Because, I mean, buildings are something that doesn't move at all. And I wouldn't mind if it would be slower. Because buildings are something very solid and they don't move.* (P1)

Another participant observed that, when moving the phone, real buildings stand still, but virtual buildings jump around and move with you. In order to support users in making the translation, virtual buildings being stable in their position on the screen may be more important than them being accurately placed at all times.

A building's three-dimensionality, it became apparent, is another quality insufficiently reproduced in *ARCity*.

> *So, I have no imagination of how deep it will be?* (P1)

Three-dimensionality, here, relates to that of the buildings themselves (i.e., their shape), but also to their spatial relation to each other and to the real world (which we will both discuss in the next section). In *ARCity*, only visible walls were visualized, which did not, in turn, help participants to form an imagination about depth and layout of a building. Virtual buildings often appeared to look like a 2D wing rather than a 3D block (cf. Figure 1). However, in order to enable a usage similar to point-and-shoot, people need to be able to judge a building's shape, i.e. how it extends beyond the front-facing walls, and its dimensions from any one position.

Placing and estimating buildings

How people make sense of a virtual building's placement and dimensions is one of our primary interests. While left/right and above/below were no real problems in terms of placement, whether a building was far or close was:

> *I can't see how far away it is. That's difficult. Again, you don't get dimensions of how tall the buildings are. It doesn't say on these overlays. The only thing I can relate to is the actual image I see. So, if it doesn't fit with the actual image I have no idea...* (P3)

The participants' difficulty of inferring the distance to a building, without having any point of reference, was, furthermore, connected to their problem of inferring a building's dimensions, especially its height. While the overlays suggest some dimensions, the actual building size cannot be known. The building could be small and close or big and far. A definitive decision was often not possible from any one point of view. Thus, walking around and looking at the building from different angles was a common strategy to find this out.

In addition to having difficulties with the distance, the following observation is even more interesting. A participant is standing right at the corner of where a new building supposedly starts, which is actually also what he sees on the screen:

> *Or, of course, it could be that the building is actually behind it [a small real building that might or might not need to be demolished]. But then, that would make the building even taller. I mean, if it's far away and I have to go like this to see the top of it... [pointing the phone camera overhead toward the sky] So, it's hard to say...* (P3)

In this, we see the other end of the spectrum: a lack of a feeling of closeness. While real buildings are very present to us when we stand in front of them, our virtual buildings were not. Participants could only know for sure where a building starts, when they actually walked into it, that is, when they walked through the front wall. To our initial surprise, several participants exhibited this spatio-physical experimentation behavior of exploring the boundaries of buildings that was completely new to us—some of them quite extensively.

Missing information about distance and dimensions also created problems with identifying the spatial relation between virtual buildings. In several different cases, participants interpreted a virtual building further behind another one as an extension to the one in the foreground (see Figure 5). The
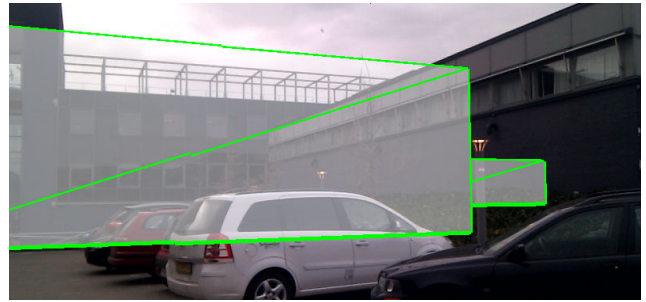

Figure 5. A virtual building further behind (small box on the right) is interpreted as an extension to the virtual building in the foreground.

buildings were visually connected on the screen and a bigger gap between them not noticeable. Only in one of those cases, the participant recovered later on with more spatial knowledge about the virtual site.

To try to tackle the distance and scaling problem in an intuitive way, one participant provided an ingenious suggestion:

> *I thought it would be really nice to see some windows, because then it would be easy to judge how high it is. [..] Then you would also know how far it is, because you would see the size of the windows.* (P1)

Such additional information would help users to build up their imagination and make sense of these visualizations. A different question is, however, how much information should be provided (e.g., texture) and in which form (e.g., a numerical versus a visual distance indicator). This certainly depends on the person, different use situations, and what the visualizations are used for (e.g., showing finalized designs versus soliciting opinions on earlier drafts). Eventually, the question can also be framed slightly different: When, and in which properties, should virtual objects be closely aligned with the physical world and when should they not? Here, we merely provide *minimal* requirements for virtual buildings.

Relation to existing structures

We explicitly asked participants to compare virtual buildings with existing ones in the environment. However, all on their own, participants already related the occasionally confusing virtual objects to various structures in the real world.

> *Maybe it's on the parking lot!? Or it's further away. That I don't know again... but it would somehow... it would fit with the road.* (P1)

Structures that participants used were other buildings, assumed property lines of *empty* spaces, as well as roads and intersections, as we see here. These reference points provided hints for participants of how a new building will likely be placed within the particular environment. However, in some of these cases, real and virtual objects cannot be easily aligned, e.g. due to inaccuracies of the visualizations or proposed changes being more severe than estimated. There then seemed to be no intuitive or logical solution, which resulted in participants *not being sure*.

4

Because virtual buildings appear in the foreground even if they are conceptually behind a real building, i.e. real buildings are not occluding them, participants frequently mistook them as the real building or as replacements for it:

Now we see the Babbage building, I think. [..] I mean, it would look like it from where it is placed, but it is not quite the right size. (P4)

This was obviously even more the case if the virtual building matched in shape and size with the real one. However, while occlusion would help in these cases (a technically difficult task), it may not be the only possible indicator. Adding information about distance and dimensions may already go a long way in making sense of virtual buildings in the foreground.

IMPLICATIONS AND CONCLUSION

With a qualitative user study of a MAR application for building visualization, we identify minimal user requirements for augmentations that seek to imitate or represent real objects. From our first theme, we argue to acknowledge and incorporate the distinct qualities of buildings (e.g., shape, color, materiality, and behavior). From the second theme, we identified that providing distance, dimension, and three-dimensional shape are the most salient information to provide. Adding a full 3D cube of a building could help with several aspects: shape, layout, and dimensions of a building as well as their relation to each other. Using windows or some other grid might be a good idea too. The biggest issue, however, is making virtual objects stable, fixing them within the real world.

In the third theme, we have seen that people generally know how buildings should typically be placed within the environment with respect to other existing structures. We should leverage this fact and provide additional information to let users make the alignment themselves rather than letting *the phone's sensors* do it. Robertson et al. [12], e.g., argue for visual context cues that can help a person make sense of ambiguous augmentations and can reduce the number of errors and time it takes to complete a task. Using, for example, existing roads and intersections that surround and connect new buildings as such a cue would provide hints for users, how the real and virtual align. After doing this manual calibration step, natural feature-tracking techniques could indeed provide steadier virtual buildings. This dual-functionality, that is, coarse sensor placement and fine manual alignment by the user, would provide walk-by point-and-shoot visualizations at first, but also allow for closer inspection once the buildings have been *fixed* by the user. Within the domain of participatory urban planning, this potentially offers new alternatives for citizens to engage with their own living environment by achieving an awareness of and new insights into proposed changes to the cityscape.

ACKNOWLEDGEMENTS

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Paper 4

Looking ahead – How field trials can work in iterative and exploratory design of ubicomp systems

by Matthias Korn & Susanne Bødker

The paper critically discusses the merits of fields trials as part of, rather than as an assessment of, an iterative design process. The central argument is that field trials in design should be used to look ahead rather than back in order to facilitate further exploration of the field. The paper also extensively introduces the third design experiment, *Mening@Park*.

Looking ahead – How field trials can work in iterative and exploratory design of ubicomp systems

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ABSTRACT

We investigate in which forms field trials are a workable model as part of an exploratory design process for sporadic, mobile, non-work settings. A major concern of evaluating ubicomp systems is to study how practices and context of use emerge and develop over time when new technology is introduced. To introduce a sophisticated version of our own prototype in the course of an iterative design process, we conducted a public field trial of the system—a new platform for mobile democratic discussions in municipal planning—that we distributed via the Android Market. However, it turned out to be surprisingly difficult to evaluate our design in a setting that stretches over time, place, and without a preselected set of users. Analyzing our difficulties, we develop a general model for methods studying ubicomp systems. On the basis of this model, we characterize an openly interactive approach to field trials in order to look ahead rather than back.

Author Keywords

Ubiquitous computing, methods, field trials, exploration, iterative design.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Design

INTRODUCTION

The history of field trials is almost as long as the history of HCI methodology itself. While the classic cognitivist approach to HCI was primarily coming from a human factors tradition, Bannon [1] in his paper 'from human factors to human actors' argued for the need to understand technology situated in realistic use situations and the need to work with users in design. At the same time, Grudin [10] pointed to the added challenges of designing groupware instead of single user technologies. Among his methodo-

gical concerns are the issues of critical mass, and that designers' intuition is even more flawed than usual when addressing collaborative technologies.

Both of these authors and many more saw prototyping a possible means of better understanding the future use situation—for users as well as designers. Bardram [2], however, points to new difficulties regarding prototyping of specific sets of applications (CSCW in his case) due to more complicated use settings. Common to these early experiences with the deployment of prototypes in realistic use settings is that the deployment happened within rather well-established use situations and even more well-established communities of practice.

With the new millennium came a new wave of technological and methodological challenges [5]: The technology became increasingly mobile, use situations moved from work to the rest of human lives, and the idea that technologies were designed and deployed as systems one at a time no longer functioned as a basis for design.

Grudin [11] addressed some of these new challenges of ubicomp, in particular that applications are no longer about the 'here and now', meaning that use situations stretch into everywhere and forever. This has consequences for the methods with which we analyze and design ubiquitous technologies, because many of the methods deployed hence far were addressing situations where people act, perhaps together, within quite well-understood settings, time spans, and locations. Ubiquitous technologies are often designed for use situations that are not well understood and in the making. Bødker and Christiansen [6] suggested using prototyping to explore which questions to ask in such emergent settings.

Iterative design and prototyping has dominated our research. Accordingly, we see all designs as part of an iterative design process, where the prototypes, for a period, hold on to design decisions [21] and are vehicles for communication in the project and for users' hands-on experience [7]. Prototypes accordingly are intermediate outcomes that in various forms capture what we know about the product, the use situation, and the design process. Some of these prototypes are versions of the final product that are in various ways fully functional, while others at the other extreme are experimental and throw-away prototypes formed in materials and software that has little to do with a final product (e.g. mock-ups or paper prototypes).
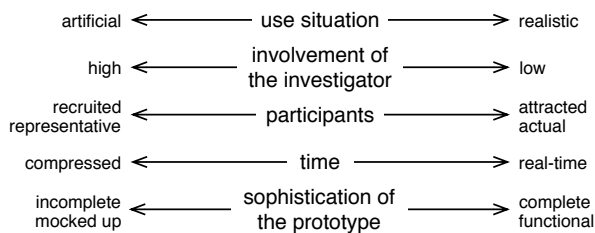
Figure 1: A model of five dimensions for methods studying ubiquitous computing systems.

In general, an iterative design process moves from primitive and ad-hoc prototypes towards something that is increasingly sophisticated and reliable. Yet, there are also movements in the other direction, such as when particular elements of a sophisticated prototype fail and need to be re-iterated in a more exploratory manner. As mentioned above prototypes may be used both to explore settings and to provide answers regarding future designs.

In participatory design, prototypes are explored and reiterated in situations that are remote from the actual use situation (e.g. workshops) as well as situations that are close to real use or located in real use settings. Similarly, use may unfold in real time, or the use situations may be set up as to compress or limit time, such as in many kinds of workshops, e.g. future workshops [16]. The participating users are often selected based on various criteria of representation, but they may also be the actual future users [7]. The prototypes are assessed in settings where the designers are active, and in others where they are more in the background (e.g. think aloud). Figure 1 shows a preliminary model that takes these different dimensions of the use situation, the involvement of the investigator, the participants, time, and the sophistication of the prototype into account.

Upon this background we are challenged by the revocation in ubiquitous computing of more classical scientific approaches. 'Tests' and 'field trials' have become the new approaches to conceptualizing change, and validating the technologies as such. We argue in this paper that field trials are problematic as part of an iterative design process as they frequently result in *looking back* rather than *ahead*.

Specifically, we analyze a case in a leisure (i.e. non-work) setting, where we have already, in our iterative design process, carried out workshops and walkshops [20] and where we now found it relevant to make a more sophisticated and reliable prototype stand on its own two feet, to see how people would actually use it. In several ways, this case partly failed and we discuss the problems of field trials as part of design based on that failure.

After the related work section, we first very briefly describe the design process as well as the system itself, and second how we went on to conduct a field trial based on a sophisticated version of the prototype. After the description of the study and its outcomes, we analyze this field trial along the five dimensions shown in Figure 1 in order to motivate a gap in methods for iterative and exploratory design of ubicomp systems.

RELATED WORK

There are numerous considerations as to how one gets about doing field-based evaluation of mobile technologies. Hagen et al. [12] point to various forms of mediated data collection, to simulations and enactments, and to combinations of those as types of methods that are often used in order to assess mobile technologies.

Some of the methods for mediated data collection are in essence clever ways of bringing the classical usability lab out into the field (e.g. [13,19]). Others include various kinds of probing (e.g. [15]) or sampling (e.g. [8]). Other methods yet again are more concerned with having users use the prototype and collecting data through that (e.g. [24,26]), methods that are less concerned with adding additional evaluation layers to the prototype as such. Our study belongs to this latter category. Yet, even though we are logging and gathering use data, we have not added extra evaluation instruments to the prototype. This is primarily because we have been concerned, in this stage of the process, with evaluating and exploring the general concepts of the system, rather than with narrow usability issues that were in focus in earlier parts of the process.

Simulations and enactments belong together with workshops and walkshops to methods where the prototype needs to be less consolidated. Methods that have been applied in this area regarding ubiquitous technologies are, e.g., bodystorming [23] and magical things [14]. While we very much believe that such methods are helpful in various stages of iterative design, we have deliberately moved away from simulations and enactments in the work discussed here.

Rather, the intention with this paper is to explore the ways in which we think about field trials as part of a design process. This discussion adds to the renewed interest in method and the value of field trials, and how such experiments should (or should not) be conducted in more naturalistic settings [4,18,22, 25]. In general, we agree with Brown et al. that we need *"much greater innovation in methods around trials, a break away from the assumption that trials should be as 'natural' as possible"* [4, p. 1665]. We argue for an approach that does not seek to be 'natural' in a mimetic sense, i.e. that does not regard field trials as simulations of use as it would allegedly occur outside and independent of field trials. We instead favor an openly interactive approach with users.

BACKGROUND: A PARTICIPATORY DESIGN PROCESS

In the spirit of the eGov+ project, which explores e-governance services and infrastructure to examine how citizens may be supported in engaging actively in the provision of public services of various sorts, an exploratory participatory design process led to the development of what
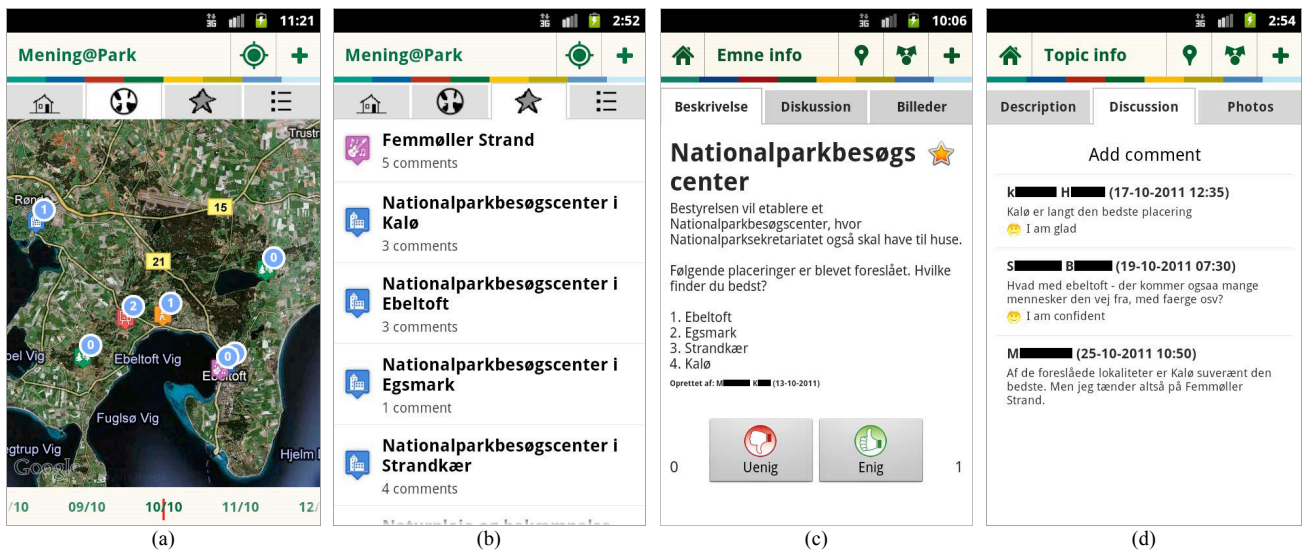
Figure 2. The Mening@Park app allows users, while out and about, to explore topics around the park through location-specific QR codes, location-based notifications, maps, and lists (a, b); to add topics of their own; and to favorite a topic, express agreement or disagreement, comment, and upload photos (c, d).

later came to be called Mobile Democracy. Details of this process and the results can be found in [3]. In the Mobile Democracy case, we worked with a sparsely populated municipality in western Denmark to explore the use of mobile technology in municipal land use planning. The aim was to engage citizen groups in this process by exploring the use of geographical information systems (GIS) and mobile technologies as a means of supporting user involvement. The goal of the overall municipal process is to solicit input and feedback from citizens, among other stakeholders, on a municipal plan that is created every 12 years and continually revised.

Through various design activities with individual citizens, citizen community groups, and municipal planners, we collaboratively explored the design space for potential interventions. We conducted initial interviews with municipal planners and individual citizens as well as focus group interviews with citizen interest groups to get a first grasp of the field and understand potentials for intervention. We held future workshops with citizen community groups and planners respectively to identify concrete problems and opportunities for future developments, and conducted other forms of participatory design workshops for brainstorming and critique.

Throughout the process, we utilized design artifacts such as scenarios, storyboards, and personas, and developed and deployed numerous prototypes of varying sophistication (from paper to fully functional) to better understand the future use situation, for users as well as for designers. With the first more concrete mock-ups and prototypes at hand, we additionally invited citizens for walkthroughs of the prototype and facilitated other forms of hands-on experience during workshops. Specifically, we also conducted what has been coined walkshops [20] to provide hands-on experience for citizens and planners in more realistic use

settings. Walkshops do so by urging participants to carry out concrete tasks on the prototype while out on 30-minute scenario-based walks in a planning area together with the investigators. The primary goal at this earlier stage was not to validate our design concepts or prototypes, but to further explore and understand the design space together with users in more realistic use settings than workshop rooms.

THE PROTOTYPE SYSTEM

One result of this process was the concept and implementation of two interconnected prototypes: a mobile app and a browser-based version that both were designed to facilitate citizens to discuss topics located on a map (and in the world) while out and about. The simple idea behind this concept is to gather feedback and opinions in the moment (when users are physically close to the planning object) and allow for deeper reflection and collaboration later (remote to the planning object) [3]. The rest of this paper mainly concerns the 'evaluation' of the mobile app.

The intention of our design is to facilitate discussion and collaboration among citizens and between citizens and municipalities, rather than merely one-way, location-based information from citizens to the municipality. Thus, using the platform, citizens can explore, create, and react to topics created by other citizens or by the municipality in a number of ways: through maps, lists, expressions of agreement, comments, and photos. A special focus in the latest iteration of the mobile app was on facilitating users to establish a connection between a digital topic and a physical place. The app therefore offers various ways to link topics to locations and vice versa: location-based notifications, access to topics through location-specific QR codes, as well as locating a specific topic on the map.

In order to advance our exploration of mobile deliberation systems, the Mobile Democracy app was transferred into a new domain, adapted, and renamed to Mening@Park ('mening' being the Danish word for opinion or point of view). Figure 2 shows screenshots of the final app.

EXPLORING PROTOTYPE USE

With a concept and working prototype at our disposition, we set out to explore, how our design could be introduced into more real-life settings. In this section, we will describe the general domain this took place in, the concrete study context, and the preparations for the study itself.

A new domain

When we moved to a new domain, insights from facilitating participatory land use planning in a municipality were transferred and applied to the participatory planning process of a national park (NP). This case explored the citizen participation process in the forming of Mols Bjerge, the second of five NPs to be established in Denmark. Under the supervision of a board and secretariat, a central aim of this development was a plan for the first six years of the park's official existence.

The park is somewhat unconventional in that it is not merely a nature reserve, but people actually live and work there. Thus, residents have a strong interest in its development. Similar to municipal planning, many topics regarding the planning process could be connected to specific locations in the park and visualized and discussed on a map. Therefore, deploying the Mobile Democracy prototype in this domain presented a viable option for further exploring our ideas and concepts.

Leading up to the here presented field trial, the development of the NP had already been followed and studied by us for over a year. Well aligned with this development, we conducted exploratory, qualitative interviews with the NP secretariat and participated in public hearings in a first hearing phase. The aim was to establish an in-depth understanding of the citizen involvement process in the NP.

After phase one, a long internal process between the secretariat and the board evaluating all the feedback and suggestions received led to the release of a draft NP plan. In a second public hearing phase citizens had the opportunity to dispute and submit proposals to this draft for about three months. Before the actual start of the second phase, we reconvened with the NP secretariat in two sessions to brainstorm and discuss possibilities for concrete interventions—which we report on in this paper.

In retrospect, our activities have thus not only been motivated by, but have also been deeply integrated in, and aligned with, this ongoing participation process and were fully supported by the NP secretariat as part of their effort to solicit feedback and proposals.

Deliberation in the park

In order to motivate our setup and compare to our own data, we have coded the publicly available comments and proposals that individuals and organizations have made to the draft NP plan[1]—either off-line or by visitors to the tent at the Ebelfestival (see next section)—during the second public hearing phase and in parallel with our own study (see Table 1). Our interests have been two-fold: First of all, how many responses were made by individuals, versus those of NGOs and other organizations (e.g. the municipal council), and therefore of lesser interest to Mening@Park. Secondly, which comments were about particular localities or locations, versus those who were general, and again for that reason not the primary type of contribution possible through Mening@Park.

Submissions	Total	From individuals		From organizations	
		About location	No location	About location	No location
Ebelfestival	4	3	1	0	0
Off-line	55	20	9	6	20

Table 1: Comments to the draft NP plan from individuals and organizations.

The total 29 location-specific comments include, e.g., very specific comments with attached GPS coordinates to suggest park benches, as well as comments that make reference to particular buildings, or geographical positions to indicate ends of suggested walking or biking paths. With more than half of the comments to the NP plan being made by individuals, and more than two third of these being about specific locations, this underlines a general applicability of the Mening@Park concept in this context and a general interest in the development of the park.

Study context

The actual intervention took place as a deployment of the Mening@Park system, which was strategically kicked off at the Ebelfestival, an annual and week-long local folk and harvest fair in Ebeltoft, the biggest city in the park.

The festival attracts many local, domestic and international visitors—officially 40.000 in total in 2011.[2] It is a busy place for tourism in the park at large (it conveniently takes place during the autumn school holiday week), but more so

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[1] See Nationalpark Mols Bjerge (2011), Høringssvar til Forslag til Nationalparkplan 2012-2018 Nationalpark Mols Bjerge. http://www.danmarksnationalparker.dk/Mols/Organisation/Nationalparkplanen/horingssvar2011.htm (last accessed on March 20, 2012).

[2] See Nationalpark Mols Bjerge (2011), Nationalpark Molsbjerge sender 8250 planer ud. http://www.danmarksnationalparker.dk/Bibliotek/Mols/planudsendese.htm (last accessed on March 20, 2012).

Figure 3: The two study settings during the Ebelfestival: the NP tent on the festival site (left) and the gate (with our QR sign) leading to the Kalø castle ruin in the back (right).

for local community building and the ongoing citizen participation process with many local inhabitants as well as summerhouse owners visiting the festival. With the second public phase in full swing, the NP set up a dedicated, fairly visible tent close to the entrance of the festival site (see Figure 3). At the tent, the NP distributed the draft plan and disseminated 25 concrete action proposals from the plan through roll-ups around the tent. They additionally invited changing collaborators to share the tent space (such as the local hunters association and the natural history museum) in order to offer various hands-on activities for children and attract more visitors.

The NP's main goal was to create public awareness of the NP itself, the NP plan, and its topics by getting into dialogue with people. The NP reported 2.000 visitors to the tent during that week.[3] We used the festival and the buzz and activity around it as the main stage for deploying our prototype and studying its use. We did not, however, recruit participants (in the traditional sense) for using the system in general. Before elaborating on the intervention in the next section, we hint at some of the preparations necessary to address the challenges discussed in the introduction.

Preparing the prototype deployment
Leading up to the festival, we not only prepared the Mening@Park prototype for the study purpose, but also polished it for real use by real users in the field. These preparations included the prototype itself, the initial content that was added, as well as other activities to advertise the app to gain critical mass.

Preparing the prototype included branding it for the NP, implementing various features that were only hinted at before but central to our study, removing obvious usability problems and other small bugs identified through heuristics so as to not have them distract from our actual goals, streamline the registration and log-in process for easy access and use, internationalization of the user interface in English and Danish, and, finally, adding interaction logs and other means of documenting actual use for later analysis.

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[3] Ibid.

A second central part of the preparations was to add 'real' and meaningful rather than no or mock-up initial content to the system. As [7] noted, this is often important in order to be able to assess prototypes in the field. In our case, this meant providing easier access to the system and the community by allowing users to contribute first with comments rather than creating topics of their own from the very start. The seven initial topics that we thus added were almost exclusively proposed directly by the NP secretariat rather than by us. They were therefore relevant for the overall process, and the secretariat wanted to stimulate discussions and receive feedback on them. Three of the seven topics consisted of three or four possible geographical locations for placement, which we added separately due to a conceptual limitation in the prototype that tied a topic to only a single location. We thus had a total initial topic count of 15.

We tried to address the challenge of achieving critical mass as highlighted by Grudin [10] by situating (and integrating) our intervention in a lively and meaningful context as outlined above. Our goal was to introduce the prototype as an open platform available for everyone interested rather than a closed user study with a number of recruited participants. We thus made the app available on the Android Market, a wide-distribution channel for mobile phone applications, from where citizens could easily install it to their Android smart phones. The Android Market, however, is merely a convenient distribution channel: it creates new methodological challenges and opportunities, but is not a tool for investigation in itself [22]. We announced and advertised the existence of the app through various means (a pertinent and active Facebook group, emails to interested stakeholder groups and concerned individuals, etc.).

At the festival site, we had a big poster prominently hung up in front of the tent and fliers on the table advertising the app, which we also handed out to visitors pro-actively. During the festival week, and as one focus of our study, we also hung up eight A4-size signs with big and intriguing, location-specific QR codes at the tent and at various popular locations around the park, which attracted attention for some. The QR codes potentially provided direct access leading to a topic about that specific location.

CONDUCTING THE STUDY
The study can be divided into four parts:

1. deployment of Mening@Park at the festival tent,
2. deployment of Mening@Park at the Kalø castle ruin,
3. walkshops at the festival site, and
4. post-festival study activities.

The ongoing deployment of the Mening@Park system constitutes the basis for all four parts.

The first three parts took place during the Ebelfestival, where we also first introduced the prototype. Here, we initially split our attention between two different settings: the NP tent at the festival site and the Kalø castle ruin, a very

popular destination in the NP (see Figure 3 for an impression of the two settings). The reasoning behind this was to benefit from the generally high and concentrated (recreation) activity in the park during the holiday week by adding a second setting more realistic in the sense of experiencing the park as such. This part comprised of roughly three full days of activities.

Towards the end of the festival week we decided to adapt our strategy and approach to the reality of the festival situation by starting a more concentrated effort to interact with participants by conducting walkshops on the final festival day (a Saturday). This interestingly contrasts the 'uncondensed' activities during the first part of the week, which we will return to in the discussion. After the festival week, the system was kept running and we conducted various post-study activities.

Deployment of Mening@Park at the festival tent
At the festival tent, we advertised the app, approached people about their mobile phone use, and observed how visitors interacted with the provided information and the NP staff at the tent. Our activities included individual in-situ demonstrations of our system, informal impromptu interviews with visitors and NP staff, as well as observations of activity at the tent. Interviews were audio recorded, observations were documented in field notes and photos, and usage of the app was logged. The focus lay on common and specific information enquiries and questions by visitors as well as the uptake of our app and QR signs at the tent.

Deployment of Mening@Park at the Kalø castle ruin
The Kalø castle ruin, which was our second study setting, is one of the most popular destinations in the NP—for tourists and locals taking a walk alike. We hung up a QR sign on each side of a gate leading from the parking lot to the ruin, and spent time observing people's use of it. We partly shadowed them to see the extent to which they engaged with the app as well as their general use (and non-use) of mobile technology during the visit.

Walkshops at the festival site
For the last full day of the festival, we decided and planned to conduct more concentrated activities in the form of walkshops in the area surrounding the festival site [20]. We tried to recruit some local, concerned citizens (including members and representatives of stakeholder organizations in the park) that had interest in the park's development through Facebook, email, and through the NP staff beforehand to come to the festival and participate in our walkshops. However, no one signed up and it was difficult to enlist people for a 20-30 minute walk on the spot. Therefore, instead of bringing people to the sites and artifacts of study, we had to sacrifice some of our intentions of realistic settings in this instance and bring the artifacts to them.

We took two different QR signs that were about topics in the immediate vicinity and pro-actively approached random

people around the tent and the whole festival site. We encouraged them to scan the QR codes with provided phones and involved them in a brief try-out of the system combined with an informal interview. As a vantage point, we specifically enquired about familiarity with and opinions about QR codes as well as mobile technology use in general and in the park. Interviews were again audio recorded and additionally documented in field notes. Altogether, this resulted in about 20 informal interviews with individuals, couples, families, groups of friends, etc. and, while not being the most critical part, provided the most interesting insights for our ongoing exploration of the field.

Post-festival study activities
After the festival, the prototype was maintained and kept running until the end of the second public hearing phase. The system has been further advertised at two consecutive exhibitions at a local library and at the town hall. Lastly, all three people from the NP secretariat attending to the tent during the festival were interviewed about their experiences of getting in direct contact with citizens at the festival in general and the deployment of our prototype in particular.

USAGE STATISTICS
Here we provide a brief overview of usage statistics of the deployed prototype system during the complete field trial period. The numbers were derived from interaction logs, our database, and statistics provided in the Android Market developer dashboard.

The prototype has officially been running until the end of the second hearing phase. This amounts to a runtime of almost two months (52 days or 7,5 weeks). The Android Market reports 46 'total installs' of our app and 27 'net install' at the end of the official runtime (the maximum 'net installs' was 33). During the official runtime, 27 users initially registered with the system, 20 (74%) of them during the festival week. That means for 59% of the total installs a user was registered in the system (not accounting for double installs and other irregularities).

Users could contribute to the system in four ways: creating topics, adding comments to topics created by others, expressing agreement or disagreement, and uploading photos. Only one topic has been created by a user, in addition to the 15 we added. Nine of the 16 topics received in total 29 comments (with a maximum of five comments per topic) by eleven users (with a maximum of nine comments per user). 17 (59%) of the comments have been made in the first week (the festival week), and another nine in the week thereafter (in total 90% of all comments). In total 61 agreements or disagreements have been expressed on all 16 topics by 21 users. No photos were uploaded. Six (22%) of the 27 registered users have not contributed to the system at all.

Summarizing, use of our system has been concentrated in the festival week and the week thereafter. Afterwards, the system has only been used very sporadically. We judge the

number of users to be fairly decent for the short period of time that the festival had created activity. However, activity by user was, not unexpectedly with this marginal type of app, quite low.

Comparing to the general deliberation in the park (cf. Table 1), visitors left three relevant topics at the festival tent and the general hearing left 20 topics comparable to ours (left by individual users in relation to a particular location) in addition to six location specific topics left by organizations. We did not have access to these documents until after our study, but we believe that these numbers mean that the idea of commenting on the NP and the park plan as such was highly relevant to a number of people and organizations in this time period. Hence, the reasons why we did not generate more use must be found in the study, rather than the domain. In the following we turn to elements of our study to discuss why.

ANALYSIS

As described in the introduction, we see iterative design processes as a number of activities that can be characterized along a number of individual dimensions. These dimensions relate to the realism of the use situation, the involvement of the investigators, the participating users, the sophistication of the prototype, and time (cf. Figure 1).

What is typically understood as a ubicomp trial use exists at one end of these dimensions where the finished prototype is used by voluntary users in real, un-tampered use situations at a safe distance from designers and researchers. On the other extreme, we typically find mock-up prototypes used in workshop settings in close interaction with the investigators. However, there are many other ways in which these dimensions may be combined and in the following we use the dimensions to analyze and discuss our case.

Use situation

The different settings of our study have different properties in how closely the setting resembles the actual use situation that we envisioned.

The Kalø castle ruin, as a typical location within the park but outside the buzz of the festival, clearly represented a setting that was closer to the envisioned use situation, 'out there' in the park where people meet concerns and issues that they want to share with others (and the NP board). At this setting, we tried to make the study have a very withdrawn role, hoping that people would, on their own accord pick up the QR codes and start using the system. At the same time, this meant that we had very few means of ensuring that the system was actually used, as we discuss later.

The NP tent at the festival site provided a more artificial version of the use situation, both because the site as such was created with the purpose of the festival and was not a permanent site of the NP, and because, as a consequence of the festival, the buzz that it created was slightly artificial.

Due to this, however, people were prepared to ask questions, to be informed, and even to be approached by tent staff on matters of the NP. However, they had no expectations of being approached and used as informants by the investigators on the matter of smart phone technology. While the prototype itself provided a 'ticket to talk', even in this setting of citizen interaction, we suspect visitors frequently perceived our interaction with them more as a unidirectional demonstration and advertising situation rather than a bidirectional study situation. Consequently, they often felt intimidated and were limited in their feedback.

Slightly frustrated by this communication mismatch we decided to involve participants more structured and directly. In the actual walkshops in the third part, this meant that we tried to use the momentum of the festival while sacrificing some of the realism of the use setting. Due to no one having signed up upfront, we were restrained to walk around the festival site, rather than the surrounding downtown area, where access to real NP plan issues was quite sparse (e.g. a visitors center could not realistically be build on the festival site itself, but rather 200 meter away from it).

Eventually, the tent setting turned out to be very beneficial when talking to the NP staff. They were talking with citizens all day. This meant for us that we could have very interesting and fruitful informal interviews with them about specific encounters with citizens. In that regard, the tent presented a good context for talking to NP staff different from and in addition to the more formal interviews and workshops at their or our location. The tent presented a practical context, where they had the citizen perspectives immediately visualized.

Involvement of the investigator

The different settings of our study, in addition to how closely they resemble the actual use situation, are also different in terms of the involvement of the investigator in the use or study situation.

At the Kalø castle, people were left on their own, completely undisturbed by the investigators. However, it turned out that the possibility of learning what people were doing and thinking (beyond seeing if they knew QR codes) was extensively difficult. With the setting being this 'wild', there was a limit to what artifacts people could interact with, what incentives they had to do so, and consequently what could be observed by us. Basically, people also did not tour the castle to be interrupted and questioned by investigators, but rather to enjoy a brisk walk or be with family and friends, on top of seeing the historic remains. In addition to making use infrequent, which in itself posed a challenge e.g. with respect to how it could be observed, it also made it very challenging for the investigators to approach visitors e.g. for interviews. These situations did not lend themselves well to interruptions. Both the use situation and the level of interaction with the investigator were problematic in this setting and, consequently, this setting of little use to us.

As described previously the activities at the tent were entirely different. Even though the situation lent itself more to interaction and intervention from the investigators and in a way thereby reduced the realism of the use situation, the involvement of the investigators as such was more realistic: it was a fair and people were in general being approached by staff at the tent. Nonetheless, as described, the framing of this setting may have made people see investigators as sales people which was quite problematic to the study.

In an attempt to move away from this, the walkshops were set up. We were hoping they would frame the role of the investigators more specifically as researchers. However, whether that ended up being the case, is an open issue since participants were, in the end, enrolled from the crowd at the festival and not based on the distributed invitations. Yet, simply adjusting the level of investigator involvement at the walkshops helped dramatically increase the number of insights we could gather. At this time we were not so much concerned anymore with attracting users for the field trial itself, but rather pro-actively interacting with visitors to collect qualitative data for further exploration.

Participants
As mentioned earlier, generating a critical mass of activity is a crucial problem, not primarily with respect to the use of the end product [10], but rather in order to make trial use work as such. For this purpose, many evaluation methods used in ubicomp research frequently either (1) pro-actively and consciously speed things up and 'make use happen' by, e.g., introducing artificial tasks for users or setting up 'use sprints' (e.g. walkshops), (2) introduce artificial incentives to the system that were not part of the original design concept (e.g. some form of gamification), or (3) create artificial incentives for users outside of the system itself to use the system more than they otherwise would (e.g. compensation, provided equipment, commitment through personal relationships [4]).

In an example for (3), Brown et al. [4] talk about trial use in situations where the researchers have enrolled users into the study. In these recruitment situations they found that "*users shape or enhance their behaviour in a trial or experiment, in response to the imagined desires of the investigators*" [p. 1660]. They state "*much of participants' motivation to use the system seemed to stem from a sense of obligation to us rather than their relationship to the system per se*" [p. 1660]. To avoid, e.g., that users are more likely committed to the investigator rather than the idea, we largely steered away from such artificial incentives by publicly deploying Mening@Park to an 'open market' [22] instead of actively recruiting users for the field trial. We wanted not only representative, but actual future users.

However, we had problems getting enough people to use the system during the field trials in order for them to reflect on it. We started with a rather purist idea that it would be beneficial to let users come to us rather than the opposite,

and in this sense we would get more authentic use. Along the way we realized that a closer and more real contact than the announcement posters was needed, hence the interviews at the tent, the emails to relevant stakeholders, and the walkshops. In retrospect, we should have worked more along this continuum up from the start. Perhaps by getting more enrolled use corresponding to (1), we would ultimately also have ended up getting more authentic use, simply due to critical mass of comments etc. that would ultimately motivate even more comments. Above all, with a bustling platform we might have eventually also gotten richer insights and perspectives from users.

Time
We largely let field trial use of Mening@Park progress in real time and without our intervention. This, to some extent, resulted in the limited success of our system. Initially, we in fact were working under the assumption that field trials should be conducted as 'natural' or 'real' as possible.

We were convinced that the Ebelfestival should help to generate some usage of our prototype system. Due to the nature of the festival, the activity was nicely compressed time-wise, making it easier for us as investigators to monitor and study. Yet, the buzz surrounding it was not sufficient to gain momentum. One question is if we were simply too impatient? The usage data suggest that even shortly after the Ebelfestival, no continued discussions took place. Evidently, we have no way of knowing if some external event would at a later state have led to further discussions.

Hence, for the walkshops, we wondered instead what would happen if we accelerated use in order to spur discussion about it: The walkshops condensed events to a shorter time frame and 'made things happen' that would normally take place over longer periods of time (or not at all). This intensified activity through time compression resulted in broadening the discussions with participants towards the bigger picture, e.g., ranging from how likely they are to use such discussion platforms, to the greater impact such technologies might have on the park's development.

Time is a well-observed variable in ubicomp field trials. It is a generally acknowledged tension that studying social systems in a rather short time frame is problematic as distinct social practices are not likely to emerge and solidify. Referring to [11], the 'everywhere and forever' nature of many ubicomp systems stands in contrast to the comparatively short-lived nature of the deployed research prototype. Accordingly, with our field trial alone we are not able to, by only observing a snapshot in time, make any conclusive comments on how the system is and always will be used. With the investigation discussed in this paper, it is evident that it only embraces the early stages of use-in-the-making, and not the longer-term development of the use activity.

With this perspective in mind, we found that it is difficult to both study use as un-tampered by the designer, and look ahead at the same time. Studies based on trials that 'leave

use alone' will always look back, and hence cause problems as part of an iterative design process.

Sophistication of the prototype

The level of sophistication our prototype reached and that it could basically stand on its own two feet was a starting point for us, and one reason why we embarked on a field trial in the first place. Our assumption was that this was the next logical step in an iterative design process.

Hence, the polishing of the prototype, the fliers, and the poster were supposed to make it appear as a more or less finished service 'in beta'. The initial content that we added supported this appearance and hinted at some activity already going on in the system. However, while the prototype was as such self-contained and fully functional, it did not feel completely finished. The way we thus eventually presented the system to festival visitors was rather framed as some experiment by a university, a pure try-out to explore further the possibilities of such applications. This was reflected in the way we, and the NP staff, talked about it, e.g., at the tent: *"a prototype"*, *"an experiment"*, *"not yet a finished system"*, *"yes, that's how we envision it to be"* etc.

This portrayal of the system as incomplete and preliminary to some extent diminished the usefulness of the prototype as a probe, as a real service proposition. By lightly acknowledging its limitations rather than being bold, we tended to discover and discuss issues with the concrete artifact rather than the broader perspectives and potential impact. For instance, a common theme was that it was too much hassle to install the app just to be able to see or make comments. We knew that and a mobile website with limited functionality was part of our overall concept. Yet, it took over many of the conversations with participants. Therefore, reflecting on the aim of our study, it is important to gauge the sophistication of the prototype system with respect to the purpose it needs to fulfill within the study.

IMPLICATIONS FOR RESEARCH

In critically analyzing where our study is located on the individual dimensions of our model, we were able to identify tensions in the choice and application of our methods. E.g. while our starting point was a sophisticated version of the prototype for people to try out and use on their own, we found that we actually fell short of interacting with participants sufficiently and in a way that would help us to further explore the future application of mobile deliberation technologies in the park. Many ubicomp systems, by virtue of being brought into sporadic and mobile settings, are difficult to study, as use practices are really only in the making [11]. Hence, the application of field trials is problematic. In our case, people do not, already, walk around in nature and comment on a plan, even if they are concerned citizens that otherwise take part in local democracy.

By looking at these dimensions one at the time we see not only a need, but also a path away from 'naturalistic' field trials in a conventional sense. As with Brown et al. [4], our experience has led us to think that such 'naturalistic' field trials are difficult to set up and may not be as informative as expected. We have come to think that an openly interactive approach to field trials might prove to be both more viable and more insightful. Pursuing this approach, we attract, rather than recruit, actual future users to an open system. We interact with (some of) them directly and take their experiences of using the system as a springboard for indepth explorations of their perspectives and insights about the concrete system, the broader concept, and potentials and tensions for future approaches in general.

There are, however, fundamental epistemological issues underlying the challenges of field trials in design. Field trials fundamentally look at use as it is here and now, and possibly as it has developed to become what it is, if the field trial is left to happen long enough. Design on the other hand, is concerned with understanding and shaping the future. Anticipating future use is fundamentally difficult, which is exactly why Floyd [9] and many others have emphasized the need for iterative design, where prototypes are at best versions of a product that may later be changed, once it has been tried out in use. While even such rather sophisticated prototypes need to be tried out and evaluated, they quite fundamentally never have the permanence that justifies a 'natural' field trial. Accordingly, classical field trials fundamentally *look back* on the past in that they study what participants have done, an insight that is definitely needed in the long run. At the same time, design needs to work with fully functional prototypes to *look ahead* and explore what participants might do towards use practices that are still emerging and in the making. This is a fundamental methodological challenge that we are facing with the current state of ubicomp technologies and practices.

CONCLUSION

Our starting point of this paper was that we wanted to add 'naturalistic' field trials to our design process in a leisure setting. Our experience has led us to think that such 'naturalistic' field trials are difficult to set up in these settings and may not be as informative as expected. We thus argue that field trials might be better thought of as a part of, rather than as an assessment of, an iterative design process—i.e., a counterpoint to the more prevalent 'design then study' mentality in ubicomp. We have come to think that an openly interactive approach to field trials might prove to be both more viable and more insightful.

In setting up trials or prototype evaluations, we may move back and forth along a number of dimensions where realism of the use situation and sophistication of the prototype are at stake. How we may position a specific trial on these dimensions is a methodological choice. However, this is not an either or. Our model helps to gauge this gap between prototyping and workshops on the one hand and full-blown field trials on the other by locating critical aspects of these methods on the individual dimensions. While classical field

trials fundamentally look back on the past, we need ways of working with fully functional prototypes to look ahead towards use practices that are still in the making.

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Paper 5

Talking it Further: From Feelings and Memories to Civic Discussions In and About Places

by Matthias Korn & Jon Back

The paper presents the fourth and last design experiment, *I'm Your Body*. It provides insights on and discusses appropriate forms of engagement, in this case for marginalized youth. It does so through the analysis of actual usage data of a pervasive, location-based storytelling and story experiencing application for mobile phones. The paper argues for an approach to civic engagement systems that takes a vantage point in emotions rather than a very rational and dry approach to deliberation.

Talking it Further: From Feelings and Memories to Civic Discussions In and About Places

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ABSTRACT

Civic engagement systems to date frequently focus on purely rational aspects of deliberation void of emotions. In order to empower youth in a largely immigrant and lower-income neighborhood, we designed a location-based storytelling and story experiencing system for web-enabled mobile phones. The system is based on a novel concept of pervasive play where stories emerge and develop on several dimensions – most notably for our design a geographical one. This system functions as a research instrument in this paper. Through a qualitative analysis of the comments made through the system, we find (1) memories, feelings, and attitudes to be prime means of expression for youth, (2) the expression of such personal emotions leading to civic discussions, and (3) such discussions expanding over geographic areas in the neighborhood. Consequently, we argue for an approach to locative civic engagement systems that takes a vantage point in youth's emotions rather than a very rational and dry approach to deliberation.

Author Keywords

Civic engagement, youth, mobile phones, collaborative and locative storytelling, pervasive play, emotions.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

"While walking past the schoolyard I remembered how we used to play here when I was young. It makes me sad to see how gray and boring it seems today. I decided to share my thoughts and started up I'm Your Body on my phone. I took some time to formulate my comment and wrote it into the system.

Just a couple of days later I came by again, remembered my old comment, and decided to check it. There was a new reply, and from the map it seemed to be from another school in the neighboring suburb. The feelings were similar:

'We also have a kind of boring schoolyard. But we have a

nice tree in the middle of it, where I used to climb when I was younger.'

I answered the comment. 'Maybe we need a tree as well, or some other kind of nature thing. It would make the place so much nicer for the kids playing here now.' Maybe my comment will lead to change in the future, who knows."

In this fictitious scenario the location-aware mobile phone application *I'm Your Body* (IYB) is used to share thoughts and feelings in and about a place. In the IYB project, we explore the use of collaborative storytelling and story experiencing as a political and artistic instrument. Our aim is to empower the inhabitants, especially youth, of a largely immigrant and lower-income area in Stockholm, Sweden by increasing their social capital [21]. As part of a larger participatory arts project, the mobile application lets participants collect their stories, present them to others, and experience the stories of others. We report on findings from the IYB system for the first time in this paper.

The goal of IYB is to design a leisure-oriented experience tied to a specific place and related to its cultural and political meaning. Thus, one way to describe IYB is as a location-based cultural experience. As Benford et al. [6] in their work on cultural applications, games, and performance, we use the singular word 'experience' to refer to such staged installations that encourage participants to engage.

Although the implemented system is generic, it was specifically designed to be used in a particular area. This area, Järva (a part of Stockholm), is politically challenging. Large cultural divides and different agendas among inhabitants, commercial forces, and politicians create tensions. Thus, it is crucial that the experience creates close ties to the physical area in which it is staged.

We broadly subscribe to the traditions of action research, participatory design, and in the wild studies in our research and design process. As IYB is implemented, tested, and used on location, in real use contexts, and with real users, the reality of the situation means we have to take an active part in the community to be able to design for it; i.e., there already *is* an existing community that we add on to. Our partners in the project act according to their artistic and political backgrounds. And so do we as researchers and designers who want to be a part of that community change. In this active role, we consequently take a participatory action research approach in the steps of Lewin [1]. The

intervention is created in a cyclical process, a "spiral of self-reflection" [18] where we plan, act and observe, reflect, and then go back to re-plan – a method well understood in design research [28] and game design [23].

In this process we worked with several different people, among them a sculpture artist, a person from a local theatre group as the creative lead, and three youth employed by the municipality as 'game testers' and creative co-producers of both the system and the artist's work. Our partners use the system to organically build a located cooperative artwork where temporary sculptures, performance art, and a theatre play come together striving to give a voice to a part of the public otherwise often unheard in politics. This context and process is important to the findings reported in the following.

In this paper, however, we look at the *everyday uses* of IYB by youth in the Järva area *outside* of these artistic practices. Through a qualitative analysis of the comments in the system's database we find (1) memories, feelings, and attitudes to be prime means of expression for youth, (2) the expression of such personal emotions leading to civic discussions, and (3) such discussions expanding over geographic areas in the neighborhood. Consequently, we argue for an approach to locative civic engagement systems that takes a vantage point in youth's emotions rather than a very rational and dry approach to deliberation.

In the remainder of this paper, we make use of the following structure: We first provide background and related work, and briefly describe the system as well as our method. The core findings are then presented in three themes and discussed concerning the aspects of geographic expansion, civic discussions, and narratives, storytelling, and playfulness respectively. We close with our main argument for emotions in civic engagement systems and its limitations in the conclusion.

BACKGROUND AND RELATED WORK

We provide background and related work in four areas: civic engagement with a focus on emotions, play as empowerment, collaborative and locative storytelling, and the pervasiveness of play and storytelling.

Civic Engagement through Play and Emotions

With IYB, we take an approach to civic engagement of youth that is based on play and emotions. In respect to civic discussions, two competing notions can be characterized. Where Habermas emphasizes the rigorous rational analysis of an issue resulting in a cold exchange between individuals [16], Barber stresses the equal importance of mutual understanding of people through open-ended talk and conversation [4]. Barber's notion of talk refers to a "complex mix of imagining, wondering aloud, listening, and understanding" ([13], p. 19). This is the notion of talk we endorse with IYB.

Fundamentally, de Sousa has argued that emotions underlie our rational processes in that they can guide us in our opinions and judgments [24]. He claims emotions foster our values without which rationality is void. Emotions are a basic feature of our cognition. Not only do emotions express themselves in immediate feelings, they are also an essential aspect of our memories and attitudes. Memories, i.e. recollections of the past, come with an emotional tone. Attitudes, however rationally argued they might appear, are often entrenched in emotive intuition and can trigger deeper emotions [24].

Furthermore, there is an emergent debate on the role of emotion and affect in political life. Boler [10], exemplified in the domain of education, suggests that emotions are also a site of political resistance, e.g. to dominant cultural norms, and can mobilize social movements of liberation. Emotions give us information about what we care about and why, informing both our cognitive and moral perceptions [10]. She argues that emotions need to be brought out of the strictly private and into the public sphere. Thrift [26] seeks to shift attention to affect in the politics of cities. He calls the neglect of affect in current urban literature 'criminal' with respect to the reality of cities and works towards a spatial politics of affect. Lastly, Anderson [2] talks about the affectual potentialities of hope towards a theory of affect in social and cultural geography.

Informed by these perspectives on affect and emotion and based on Barber's view of civic conversations gives way to put close focus on personal experiences of people in civic engagement processes. In IYB we seek to enable youth to express these experiences through feelings and memories supported by playful and locative storytelling.

In the field of HCI, Gaver et al. create cultural probes that they put out into the everyday life of participants [14]. The probes are artifacts that in different ways ask participants about their life, but they do it in a vague and uncontrolled way that leads participants to interpret the question and give a creative answer. As an example, they gave disposable cameras to participants with certain open-ended and absurd requests for images. Interpreting the *vague* answers they got in return lead to insights into new areas of the participant's life they could not have inquired into themselves since they were not aware of them. Similarly, IYB produces stories and hard to interpret data because of the degrees of freedom and nebulous or even non-existing questions from the researchers. The meanings, and the answers, instead are created by the user of the open system.

As a counterexample depicting a general trend in civic technology research in HCI, Bohøj et al. [9] devise a mobile location-based citizen deliberation tool for in-situ and on-location discussions pertaining to land use planning in a sparsely populated area in Denmark. However, they take the word deliberation serious and build their system around arguments and opinions with the intention that citizens later collaborate (via a complementary web application) in order to formulate better informed and substantiated complaints or proposals to the municipality that take a vantage point in

local understandings of the area. While Bohøj et al. focus on personal and immediate reflections on places with their mobile application, they eventually subscribe to the camp of more rational deliberation in the Habermasian sense.

Play as Empowerment

In the design of IYB we discuss how to engage, inspire, and empower participants to take control over their own stories, and their own environment. Most cultural experiences are created around designed content such as tourist guides [3] and museum tours [19], but others have also been designed for purely artistic purposes [5]. The goals of IYB are political as well as artistic: the goal is not only to create an experience, but also to give participants a voice. IYB is, among other things, inspired by Blast Theory's art project *Rider Spoke* [8, 22]. Just as *Rider Spoke*, IYB gathers stories from participants and presents them at the location where they were created. A major difference is, however, that *Rider Spoke* still tightly controls which stories the system will collect. IYB aims to let participants take control also over how stories are shaped over time. IYB is about letting participants collect their stories, present them to others, and to behold the stories of others. It is about people's stories, but also about their connection and influence on the physical space where they take place.

Collaborative, Playful, and Locative Storytelling

Previous research has shown that people are able to tie their own personal experiences to locations [12]. We know that we are willing to share not only our positions with friends (e.g. Foursquare[1]), but also our personal reflections and experiences of places. Bentley et al. describe a system called *StoryPlace.me*, a public location-based video service. The system allows users to place video stories at spots on a map for others to serendipitously discover throughout the city as they are living their daily lives [7]. Based on conveying stories about a family's history at places around the city, they talk about them as 'place-based reminiscences' [7]. Potentially, such place-based accounts could form a basis for *collaborative* storytelling, connecting routes through the landscape to experiences that are both created and experienced by the participants.

It is not hard to find examples of both locative and playful storytelling. Many children's games and some commercial games create play out of storytelling. For example, the storytelling card game *Once Upon A Time* [27] integrates collaborative storytelling into a game. In the context of locative storytelling, our main inspiration comes from Debord's idea of the *dérive* [11]. Despite its slightly radical backdrop originating from the Situationists movement, Debord's playful and spontaneous traversal of space is an act of pervasive play, and has as its effect that this traversal changes the meaning of a place, from mundane to mystical. Debord documents these experiences as psychogeographical maps; subjective maps of the city where the personal experience

of the city and the connection between city and identity is represented. By combining the idea of psychogeographical maps and the *dérive* with playful and collaborative storytelling, these personal experiences can grow into collective experiences.

Pervasive Play and Pervasive Storytelling

Staged experiences put high demands on participant engagement. This is even truer when participants are expected to create and share their own stories within the experience. Conceivably, participants could be motivated by a desire to tell stories, read stories, acquire a voice, or even get paid. In this project, we made it our goal to create a *playful collaborative story listening / storytelling experience* that would be fun enough without external motivations and rewards. From Huizinga [17], we can derive some core aspects of play that potentially can bring this about: play is fundamentally voluntary and needless, you cannot be forced to play; play takes place outside of, and offers an escape from the ordinary and mundane; play is also distinct from the ordinary, it is somehow marked off either physically or mentally, either you play or you don't play.

Unlike Huizinga, in pervasive games [20], the playful experiences are situated in everyday contexts, they can be continuously ongoing, and they take place in the 'real world' rather than on a screen or a designated playground. Seen from this perspective, IYB is intended to be a *pervasive* play experience. When play is framed this way, the experience is heightened in two ways: the real world setting of the game makes the experience more 'real' and more meaningful, at the same time as ordinary life is rendered more playful. The pervasiveness of IYB is crucial as it is staged in the politically challenging area of Järva and thus needs to create close ties to the physical area.

SYSTEM

Technically, the IYB system is a mobile web application connected to a database-driven web server (see Figure 1 for screenshots). It is written in PHP and uses the CodeIgniter[2] web application framework. Consequently, the system can be accessed via the browser from any web-enabled mobile phone. It furthermore uses the location feature of the mobile phone offered through the browser (i.e. GPS, Wifi, or cell tower positioning depending on availability) to geo-tag each individual comment with the user's current location. Users can record stories through IYB as small fragments in text format. Everyone can participate at eye level; there is no strict distinction between producers and consumers.

The implementation of IYB is rather generic. The system is not restricted to be used in any particular area, and neither is it restricted to experiencing stories in a particular order, at a particular place, or on a particular topic. Instead, every entry is tagged with information about a place, a time of entry, a person, and a story context. These tags can be used
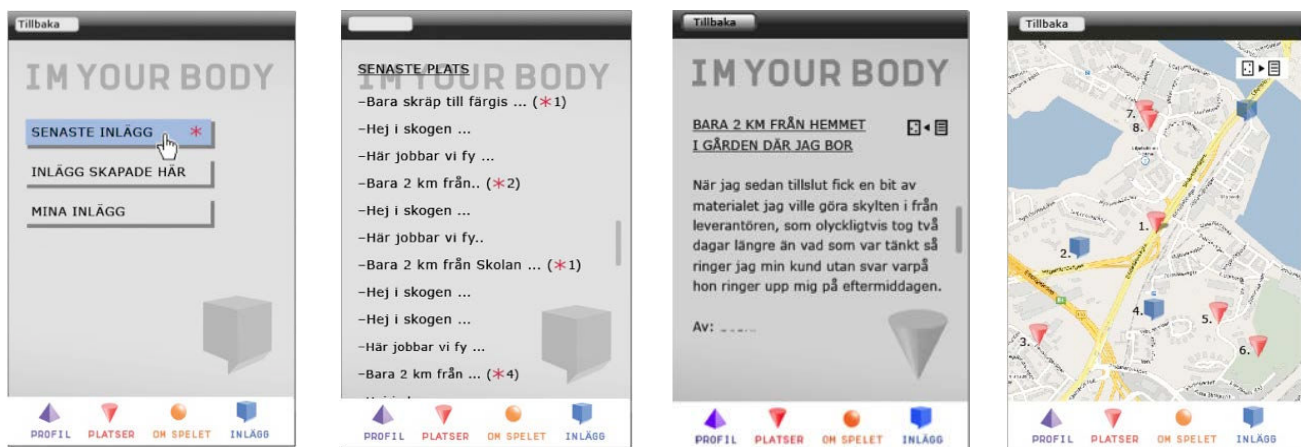
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[1] See http://foursquare.com/

[2] See http://codeigniter.com/

Figure 1. The main screens in the application: menu for choice of view ("Latest Comments", "Comments Created Here", "My Comments"), list of comments, comment details, and map-view accessible from a comment or the list of comments.

to structure story material according to place, time, or the person creating it. Entries can be combined to create stories about comments (the responses to entries) or about movement, so that moving from one place to another creates a story. They can be browsed by time, place, or user in a map or list view. Entries that form stories are visually connected on the map and listed in the entries' detail view. Hence, IYB offers participants multiple ways to create stories, i.e., by choosing their own way of experiencing the present content, as well as entering stories of their own.

METHOD

The IYB system functions as the research instrument with which we study the use of emotions in mobile civic engagement systems. During its uptime, IYB collected 390 comments in 179 threads and was used by 78 users in total. It was mainly used during 4 months at the end of 2010 and has had a few sporadic posts ever since. The amount of use differed between users. Few used it throughout the whole period. We disregard 136 comments in 38 threads in our analysis that came about during two rather scaffolded (and artistic) activities: the exploration of and preparation for a play of the local theatre group, and the sculpture artist's efforts to get in dialogue with and make youth reflect on their experiences of 'their' everyday places.

What remains are 254 pertinent comments in 141 pertinent threads from everyday usage of IYB. We know of some of the users and use situations of this everyday usage, but not all. The system came to be used in several different situations, among them, by three high school youth (16-18 years old, living in the area) employed during summer as test subjects for development of the prototype; during arts class in junior high (13-15 years old) and high schools in the area where students went out for a walk in order to 'record' places; in very casual and personal communication among family members or with close friends (mostly residents of the area and in the same age groups, recruited through the previous activities); and by the occasional user that through one way or the other became aware of IYB. These situa-

tions were not at all separated and participants in one group of friends or classmates answered to comments from another. However, we observed a general tendency that users are talking with and responding to people they know. These are the uses of IYB that we are analyzing in this paper.

We conducted a bottom-up, open coding qualitative analysis of these 141 threads and their comments in the system's database received during its runtime. We went through the material several times during this process [25]. From the resulting codes we identified and developed themes and patterns reported on in the following section. Example comments and threads used in this paper were selected to best represent and convey these themes to the reader.

FINDINGS

We are structuring our findings in three themes that describe a progression from emotional to civic and locative aspects of IYB use. The observation that users largely use the system to express memories, feelings, and attitudes builds the fundamental basis. From there, we observe that, with their comments, users abstract on an inter-personal and a geographical dimension: (1) a progression from rather individualistic and personal emotions to concrete and collective civic discussions, and (2) threads progressing from notions about one place to similar notions about other places – i.e. a geographical expansion of threads.

Memories, Feelings, and Attitudes

Civic engagement systems to date typically provoke the more Habermasian notion of rational deliberation attracting arguments and opinions rather than encouraging expressions of memories, feelings, and attitudes (e.g. [9]). In contrast, our data shows that meaningful and very personal conversations about everyday places emerge on IYB. About one fourth of the comment threads in our data directly talk about memories and/or feelings concerning specific places or neighborhoods. The majority of these also have replies. We are surprised by the breadth and depth of people expressing emotions through IYB. Therefore, we have found it useful to distinguish between feelings, memories, and

attitudes. In a common sense definition of the words, feelings *are* emotions. The latter two, however, are *also* clearly laden with emotion and trigger emotion, but also involve more than 'mere' emotions. Memories and attitudes clearly do possess informative and argumentative character as well. Their potential for civic processes, we argue, lies in the fact that they interweave emotion, factual information, and arguments. This is particularly apparent in the study of memories.

Users reflecting on things lost and forgotten that comes back to their minds when they visit everyday places is a strong theme in our data. Participants remember and reminisce how things used to be, e.g., during their childhood. It is relevant to highlight, however, how memories are from then, but feelings are from now. Places evoke childhood memories and this creates feelings today. These feelings are triggered not only by merely visiting the place, but are also motivated by and to be expressed through IYB. The users in Listing 1 would not have gotten to reflect on and express that feeling without the IYB system.

- ((at his old school in the suburb))
  "It was so much fun to shoot hoops here when I was younger. The whole schoolyard reminds me of my childhood. It feels wonderful, yet strange to be here..."
  [male]
- ((at a public park downtown))
  "I remember I always used to sit here and eat ice cream with my family, now I see other families do the same. Sometimes you wish you would never grow up." [female]

Listing 1. Two examples of memories at everyday places.

These memories and feelings also develop into conversations. In Listing 2, we see a user talking about her childhood memories and feelings. She directly encourages people to visit the specific place. As a reply, a user picks up the specific formulation of the original comment to corroborate and add to the feeling expressed by the original poster. He, however, refers to a place of *his* childhood and highlights with the last sentence *why* this place is important and meaningful to him. Conversations such as this one indicate an exchange of memories and feelings between users.

- "Memories come to life when I look at the green grass that I when I was six used to visit. Today the place does not look like eleven years ago, which I don't find odd as society develops and progresses. Visit the point and you should probably understand." [female]
  o "Memories come to life also on this point because I used to play here when I was little. I stand outside my cousins house." [male]

Listing 2. An exchange of memories about two different places.

Apart from feelings triggered by memories, users are also expressing feelings for their own sake. In our data, we find them on different levels: from general everyday feelings, e.g., about the bad weather, to deeper concerns about the bad environmental state of the area, or the lack of cultural diversity in the neighborhood. In the thread in Listing 3, we become witness to how a general feeling and complaint from the original poster sparks her and those replying to express their diverging environmental attitudes. These attitudes only become apparent in the articulation through IYB.

- "I dislike gray days. Especially gritty gray days. I hate that it's so messy and that the ground is filled with cigarette butts. Is there no one who cares about nature?" [female]
  o "I do not like gray days either, but you know this is Husby, nobody cares about the environment, not even I do it, but what is so tiresome is when my mom nags me when I throw things on the ground." [female]
  o "I really care about nature! It is home!" [female]

Listing 3. Everyday feelings, environmental concerns, and attitudes.

Listing 4 similarly shows how attitudes surface from general feelings. The first post addresses an observation about cultural diversity that the same poster again expresses, being in another suburb, later on – seemingly being reminded of the earlier impression and having reflected on it. The first replier agrees and asks the same question the other way around for a popular downtown square. Again, we argue from this example that feelings and attitudes expressed on IYB can serve as a springboard for civic discussions.

- "Hehe ... It feels different to be in Rinkeby since you do not see many Swedish faces here :p" [male]
- ((same guy, a few days later, in another suburb))
  "Why do I not see many Swedes here?" [male]
  o "This, I also wonder sometimes, but then I wonder why I only see Swedes at Stureplan." [female]
  o "There are, but you got here at 10:00am and everyone is asleep now. Hehe from [users nickname]" [male]

Listing 4. Feelings and attitudes on cultural diversity.

In most of these comments (especially in Listing 1 and Listing 2), we observe how people ascribe very personal meaning to these places: important places of their childhood, places relating to their family, the neighborhood they live in. We see how these personal meanings are inscribed in the places and thus warrant a safe dealing with them. These meanings derive aspects for a more general

meaning of these places for society at large. Small narratives are the means through which users of IYB express themselves. Memories, feelings, and personal meanings are the content of what they express.

Talking it Further 1: From Emotions to Civic Discussions
Another persistent theme are collectively meaningful civic discussions that emerge from the rather individualistic memories, feelings, and attitudes described above. Instead of only expressing personal feelings and general attitudes, it is clear that users are exchanging their different opinions about specific things or places that are of broader interest. And, instead of remaining on a vague and general level, conversations are becoming very concrete: users are identifying concrete issues or make concrete suggestions about specific places or specific areas. Through identifying issues and making suggestions, conversations attain a formative character where users negotiate and discuss a preferred state through the system. The 'exchange' of feelings and memories leads to conversations about problems of the present and possible future courses of action.

Listing 5 shows a pertinent example of how feelings lead to practical civic discussions. It starts off with a user expressing his discontent with a landscape feature. A second user replies to this dissent with a similar notion (and feeling), but about another place. She is wondering who is in charge of such decisions, for which the original poster promptly provides a possible answer. The two users each identify a very concrete imperfect condition in two specific places that they think can easily be remedied. They are also inquiring for the people responsible for such decisions in the silent hope that they would read it and take action. They want to get heard.

- "Why doesn't anyone cut off the ugly clutter in the midst of the beautiful meadow? It covers even the view." [male]
  - o "An open meadow is usually most beautiful. I am myself standing on top of a hill, so amazingly beautiful, but the big tree destroys my view. Who takes care of those things?" [female]
    - "I think it's the municipality that decides such things. There are many disadvantages in that they always have to decide, but at the same time it can be positive." [male, original poster]

Listing 5. Feelings leading to practical civic discussions.

The example in the thread in Listing 6 illustrates how people are directly comparing the features of one place (a public park downtown) with their own neighborhood. It illustrates how they transfer good qualities of one specific place to the problems of another. The admiration of a statue by the original poster in the public park leads to the complaint by a replier that there are unfortunately no such things in the area they live in. Rather, their neighborhood is characterized as an area of tristesse and commercialization,

in part, due to an enormous central shopping mall at the subway station.

- ((at a public park downtown)) "Looking up at Karl the XII and think of how it used to be, during this person's time. Cannot help thinking how I would look like as a statue." [female]
  - o ((in the suburb, behind the mall)) "Oh how fun. Unfortunately, there are no statues here." [male]
    - ((in the suburb, residential area)) "I agree, there are no statues here either. Really sad that there are no statues and other fine things which cheer up the streets everywhere!" [female, original poster, resend with typos corrected]
    - ((in the suburb, behind the mall)) "No, I do not see any statues here just shopping installations" [male]

Listing 6. Civic discussions and geographic spreading. (The third comment has been resend by the user with typos corrected. The original mistyped comment has been omitted for readability.)

More than merely identifying a concrete problematic situation, we argue that users start to define, negotiate, and discuss a preferred state for specific places or their living environment as a whole. The thread in Listing 7 shows youth, rather creatively and freely, coming up with ideas and suggestions for action to address an annoyance in their environment that bothers them. This turns into a quick and successive 'brainstorming session' via IYB among three people gathering ideas for improvement of an identified imperfect state.

- "Some taxis are so ugly!" [male]
  - o "I agree! Why yellow of all colors? Pink or blue would be cool!" [female]
    - "Or maybe gold???" [male, original poster]
  - o "They need a little make-up maybe" [male]
    - "Great idea, we make them up together!" [female, also second poster]
      - "We can put some foundation on them :p" [male, original poster]

Listing 7. Youth 'brainstorming' ideas and suggestions to improve the current state of their living environment.

Another group, actually co-located in this thread in Listing 8, is expressing very concrete complaints and issues about a specific square in the suburb. They do not 'like' it at all. Again, they formulate and re-iterate a preferred state for

their living environment and discuss some very concrete suggestions to improve the appearance and use of this square towards their preferred state.

- "A very boring square. Looks very dead and gloomy. Could be livened up with more plants or stores. A fountain or sculpture would get the square to look nicer." [female]
- "To create a more welcoming square one should perhaps turn the benches towards one another rather than away from each other?" [male]
  - "Agree. One should place the benches along the square's walls, so that the square becomes a little more open" [female]

Listing 8. Youth expressing very concrete complaints and providing concrete suggestions.

People are seeking real impact with their comments. They bring up specific problems they observe, are brainstorming new ideas and make suggestions, and think about the people in charge who could improve the current problematic situation. Through expressing their emotions, they also want to get heard.

Talking it Further 2: From Notions about One Place to Similar Notions about Other Places

A last theme from our data, already apparent in some of the examples above, is a geographical expansion of individual threads (Figure 2 shows a map of the geo-distributed comments in the single thread of Listing 6). Users are not only talking about one place in a single comment thread, but are instead directing the conversation to other places as well and thereby expand their emotions and opinions geographically. Talk about one place inspires talk about and sparks associations to other places – a fact often overlooked by other locative civic engagement systems that restrict whole topics to a single location (e.g. [9]).

Referring back to Listing 2 and Listing 5, we already learned how memories and feelings of one place spark similar notions of another by other users. The childhood memories of one person spark memories and feelings of another at a meaningful place of his own in Listing 2. And, a specific and personal issue raised about one location in the neighborhood is picked up and thereby corroborated at another by someone else in Listing 5.

On the contrary, in Listing 6, instead of seeking similarities, we saw how people contrast observations in a public park downtown on the one side with their own suburban neighborhood that they live in on the other – two very different areas, even perceived as opposed. The thread takes a vantage point in a distant location that is then contrasted to their own local conditions by the original and two other posters. Through this comparison with the downtown area, they criticize and thereby potentially contribute to what is dear to them: their own living environment.
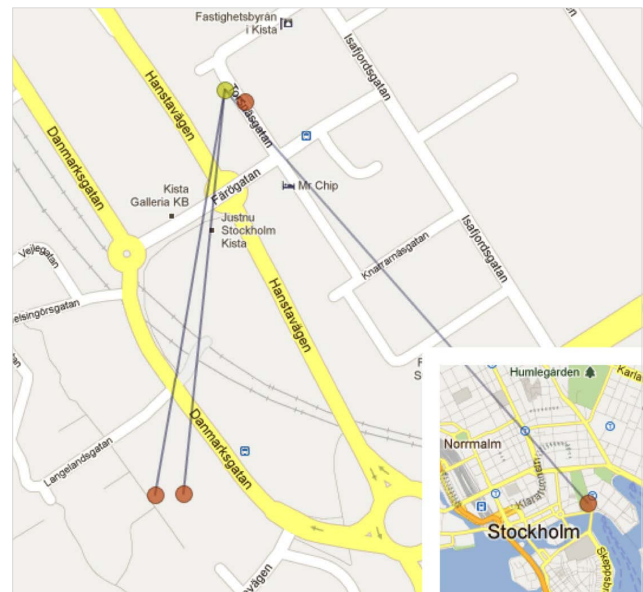

Figure 2. Map with the thread of Figure 6 showing the original comment from the public park downtown (bottom right) and the ensuing conversation in the suburb. (The comment in the lower left has been resend and is thus a duplicate of the one next to it.)

In Listing 9 we have an example of users discussing about their favorite places in the suburb. The original poster talks about her feelings and discontent with the suburb at large. She identifies a beautiful place, but complains that this is the only nice place and the rest of the area is being neglected by city planners. The second poster replies to the notion of beautiful places and provides a suggestion of his own. He does not refer to the issues raised for the suburb at large. The third poster, in the same 'beautiful area' of the original poster, refers to the initial place and questions other qualities of it, i.e. its liveliness, thereby in a sense diminishing the observations of the original poster. The example shows how some aspects of a comment get picked up in a reply, while others do not. Interestingly, it is the theme of favorite places that the second poster responds to with a place that he really likes instead of commenting on the actual concerns raised in the original post. The third, in contrast, 'returns' to the original place and notion, but does not generalize to the whole suburb.

- ((in a newer area of the suburb)) "Now I wonder why you just select a location in each area to do so amazingly beautiful and fine and then just not give a shit about the rest of the area. Here I think is the nicest place in Ärvinge but also the only nice place. For no one takes the trouble to make all places equally fine. I am pleased that it is so nicely done with lighting, pizzeria, statues and flowers but not anywhere else in this area. Shame on those responsible." [female]

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o ((at the central square of the
    suburb))
    "I think this is the finest place in
    Kista. It's probably the fountain in
    the middle that makes all things
    beautiful. Have the urge to swim in
    it!" [male]

o ((also in Ärvinge, the newer area))
    "I agree but it's deserted? Is it
    always like this." [female]
```

Listing 9. Discussion about favorite places and problems with the suburb at large.

This thread exemplifies, how conversations may diversify in topic and location, thereby not always necessarily leading to coherent civic discussions. Yet, in conclusion, users of IYB discuss and judge about their own living environment, the area that is close and dear to them, facilitated through the system. Meanings ascribed to one place are also relevant to other places. Feelings, ideas, and issues may spread in any normal discussion from one to several places, thus, expanding conversations geographically and in meaning.

DISCUSSION

We approach the discussion in reverse order of the themes just presented looking at what results out of the 'emotional' basis. We start with the concepts of geographical expansion of threads and an inter-personal 'abstraction' of users in civic discussions. We then discuss the role of narratives, storytelling and playfulness in our findings. By critically reflecting on the three themes, we eventually argue for feelings, memories, and attitudes as a vantage point for (mobile) technology-mediated civic engagement efforts that seek to integrate with people's everyday lives and their concerns about their living environment.

Geographical Expansion

Users are not only talking about one place in a single comment thread, but are instead directing the conversation to other places as well and thereby expand their emotions and opinions geographically.

The geographical expansion theme is based on a design (and research) choice of IYB with the plan to explore how stories may spread out geographically. Through our analysis we are confident that this is a good design choice and, in itself, a novel design contribution for mobile civic engagement systems. Without very much focus on it in the user interface design, users are already expanding their emotions geographically in conversations on IYB. Having each individual comment geotagged with its own place of creation allows users to broadly explore the diverse aspects of their neighborhood and places of personal meaningfulness – a feature that mimics 'normal' conversations where we also often divert and make reference to other places. Instead of limiting conversations (and users expressing their emotions) to the location the original poster chose to talk about (as in other systems such as [9]), other commenters may, facilitated by the system, expand this discussion to other places.

On the basis of our data we are convinced that this, thereby, not only better facilitates more natural and personally meaningful discussions to emerge (as users are *more* 'free' to talk about what they want), but also allows users to collect and contrast similar aspects of different places under a common umbrella topic. Instead of the system being swamped by individual, unrelated threads about all kinds of different places (because everyone wants to talk about his or her own special place as we have seen, e.g., in Listing 2 and Listing 9), this functional extension tends to gather comments in topical threads rather than spatial ones. Geographical hotspots can, however, still be analyzed by overlaying *all* comments and threads on a map. In our analysis, we have elaborated on how discussions that are concerned with several different places tend to indeed progress towards civic aspects in the course of conversation (e.g. in Listing 5 and Listing 6). The topical concentration of comments increases the chance for conversations to develop into relevant civic discussions (e.g. in terms of identifying issues and coming up with suggestions).

The increased spatial flexibility of the system also creates tensions. Individual threads may be burdened with irrelevant comments about irrelevant places. Users in a conversation may not talk about places they have all experienced and are personally meaningful to them if the expansion (or the area they are talking about) is too big. However, we face similar problems in other web-based conversation forms. It remains to be studied if the benefits outlined above outweigh these and other tensions.

In sum, we argue based on our findings for the concept of geographically expanding comment threads. This could also encourage users to draw in examples and counterexamples from other places into their discussion, to use it as a means of expression in its own facilitating and gearing this practice towards more relevant civic discussions.

Civic Discussions

Even though the system promotes comments on personal thoughts that turn into quite concrete discussions on change, we have seen throughout the whole design process and in the data that the openness and flexibility also create tensions. Too much 'openness' leaves users without a clue of why and how to use the system. Our analysis tells us that people appropriate the system quite differently and that there are many different usages making it difficult at times for meaningful civic discussions to emerge. Only about one fourth of the comment threads concerned memories, feelings, or attitudes and an even smaller amount exhibited some kind of value for or tendency towards civic discourse. Additionally, the comments and conversations in our data are all in all still rather short and shallow (some examples of which we have seen above). There are longer comments in short threads and shorter comments in longer threads (see Listing 2 and Listing 7 for two symptomatic examples). But conversations did not extend over longer time periods, involved many users posting many comments or expressing

many different positions. We are experiencing breadth, but not so much depth. In part, this can be attributed to a lack of critical mass of users [15] and a clear guidance of how the system is intended to be used among the different user groups.

We of course have to ask what these discussions do for youth, for Stockholm municipality, for other inhabitants, and for other stakeholders. How helpful are they? What can actually be learned from them?

Even though a lot of information in the system might be hard to use directly, the system still gathers input that could be used by the municipality, no matter what the intention of the user posting it was. Thoughts and feelings, as well as the at times not so serious solutions may be used to identify problems and find potential areas for improvement. While the comments in IYB may not necessarily be representative, it may be a good tool to give youth a voice. In this situation we need to ask ourselves how empowered youth really are through IYB. In this prototype probably not much, because there is no direct influence, but in a larger implementation this would be dependent on to what extent the municipality, and other people in charge, relate to the content.

We may further ask ourselves if we encourage youth to participate only superficially (e.g. in Listing 7). If contributing with comments to a civic engagement system already gives them the feeling of having made a substantial effort, we may rob them of the urge to engage any further. They may, for example, refrain from directly contacting people in charge if they have already posted the issue or suggestion on IYB silently hoping it would be seen by the right person. Furthermore, taking action also means engaging with established democratic instruments beyond the system itself (e.g. town hall meetings, focus groups, political engagement). How can a path to such activities be facilitated through the system?

Still we believe, if framed right, the municipality can learn a lot from youth expressing memories, feelings, and attitudes about youth's experiences, understandings, needs, and problems in their living environment – even if posted for different reasons. In a follow-up project, we used a similar system (with the added capability to take photos) in a day-long event with a school. We asked students to take photos to record places they like or dislike on and around the school grounds. Afterwards, the students were engaged in a group discussion to talk about their photos. Early insights from that project make clear that we and Stockholm municipality learned a lot about what is at stake in this area and identified several critical elements to consider for the upcoming restructuring of the school grounds.

Narratives, Storytelling, and Playfulness
Our analysis implies narratives on various levels. Individual comments expressing memories and/or feelings can be understood as micro-narratives in and of itself. Beyond, however, we see narratives expand over time, place, people,

relation to each other, and topic. Such narratives interweave emotive, factual, and argumentative content and are key to trigger instances of bottom-up civic exchange among users – much in the sense of Barber's notion of talk [4]. Initially, we see many users appropriating the system very playfully, trying out, gauging what to write: starting with short messages about what they are doing or where they are at, then, increasingly reflections on what they think, feel, or remember about a place. Descriptions of memories are extended with descriptions of what feelings this creates now.

These narratives are followed up by other users, and when read together create a story about the place, and sometimes related places as well. This ties in to the inspiration from Deboard [11], where *dérives* and psychogeographical maps create a collective experience. In this it is possible to get a qualitative and personal understanding of a place from the point of view of a few users, a view we can evaluate in similar ways as cultural probes [14]. The stories often move from reflecting on a memory in the past, to describing a feeling today. These stories are vague, personal, playful, and maybe sometimes even made up. They are part of an everyday playful behavior [17, 20], but still useful to get a deeper understanding of the place. The playful freedom of testing and trying in any way you like combined with storytelling makes this a powerful tool to tell what you want to tell, as long as we manage to listen.

CONCLUSION
The central argument of this paper is that we see meaningful insights emerge out of memories, feelings, and attitudes expressed by the youth users of IYB. This insight is revealing for the neighborhood community as well as the municipality. Essentially we argue that an approach for civic engagement systems with a vantage point in emotions is better apt at understanding what is actually behind people's opinions and arguments, providing *some* idea of why they might think the way they do. In contrast to approaches that focus on rational discussions, on arguments and opinions often expected to be void of emotions (though they never are) (e.g. [9]), this vantage point provides more context and a better way to actually understand people's standpoints in a discussion. Even more, if these emotions lead people to actually discuss civic matters, to identify issues and suggest solutions for their neighborhood, to provide said arguments and opinions, and if these emotions lead people to talk about different places in their neighborhood that are dear and meaningful to them, then this vantage point proves to be very fruitful – as we have shown in our analysis. While this is the case, such use practices emerge and develop over time and thus necessitate a longer-term study.

We add to previous work this argument for emotions in civic engagement systems. And we highlight that this is even more relevant for the socio-politically disenfranchised youth we are working with (and for) that are prone to be unheard and may rather express personal emotions and experiences than abstracted arguments. However, the system

we have presented here is only a prototype, a research vehicle. In the spirit of action research, our efforts are not useful for the neighborhood community until they lead to actual change. People seek real impact with their comments. If they do, we need to actually listen to them or else such systems become meaningless.

ACKNOWLEDGEMENTS

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