Designing and Evaluating Mobile Multimedia User Experiences in Public Urban Places: Making Sense of the Field

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1. Introduction

The majority of the world's population now lives in cities (United Nations, 2008) resulting in an urban densification requiring people to live in closer proximity and share urban infrastructure such as streets, public transport, and parks within cities. However, "physical closeness does not mean social closeness" (Wellman, 2001, p. 234). Whereas it is a common practice to greet and chat with people you cross paths with in smaller villages, urban life is mainly anonymous and does not automatically come with a sense of community per se. Wellman (2001, p. 228) defines community "as networks of interpersonal ties that provide sociability, support, information, a sense of belonging and social identity."

While on the move or during leisure time, urban dwellers use their interactive information communication technology (ICT) devices to connect to their spatially distributed community while in an anonymous space. Putnam (1995) argues that available technology privatises and individualises the leisure time of urban dwellers. Furthermore, ICT is sometimes used to build a "cocoon" while in public to avoid direct contact with collocated people (Mainwaring et al., 2005; Bassoli et al., 2007; Crawford, 2008). Instead of using ICT devices to seclude oneself from the surrounding urban environment and the collocated people within, such devices could also be utilised to engage urban dwellers more with the urban environment and the urban dwellers within.

Urban sociologists found that "what attracts people most, it would appear, is other people" (Whyte, 1980, p. 19) and "people and human activity are the greatest object of attention and interest" (Gehl, 1987, p. 31). On the other hand, sociologist Erving Goffman describes the concept of civil inattention, acknowledging strangers' presence while in public but not interacting with them (Goffman, 1966). With this in mind, it appears that there is a contradiction between how people are using ICT in urban public places and for what reasons and how people use public urban places and how they behave and react to other collocated people. On the other hand there is an opportunity to employ ICT to create and influence experiences of people collocated in public urban places.

The widespread use of location aware mobile devices equipped with Internet access is creating networked localities, a digital layer of geo-coded information on top of the physical world (Gordon & de Souza e Silva, 2011). Foursquare.com is an example of a location based

social network (LBSN) that enables urban dwellers to virtually check-in into places at which they are physically present in an urban space. Users compete over 'mayorships' of places with Foursquare friends as well as strangers and can share recommendations about the space.

The research field of Urban Informatics is interested in these kinds of digital urban multimedia augmentations and how such augmentations, mediated through technology, can create or influence the UX of public urban places. "Urban informatics is the study, design, and practice of urban experiences across different urban contexts that are created by new opportunities of real-time, ubiquitous technology and the augmentation that mediates the physical and digital layers of people networks and urban infrastructures" (Foth et al., 2011, p. 4). One possibility to augment the urban space is to enable citizens to digitally interact with spaces and urban dwellers collocated in the past, present, and future. "Adding a digital layer to the existing physical and social layers could facilitate new forms of interaction that reshape urban life" (Kjeldskov & Paay, 2006, p. 60).

This methodological chapter investigates how the design of UX through such digital place-based mobile multimedia augmentations can be guided and evaluated. First, we describe three different applications that aim to create and influence the urban UX through mobile mediated interactions. Based on a review of literature, we describe how our integrated framework for designing and evaluating urban informatics experiences has been constructed. We conclude the chapter with a reflective discussion on the proposed framework.

2. Subject of study

During a three-year study, three software applications have been developed aiming to create and influence the experience of collocated people in urban public places through digital place-based mobile multimedia augmentations and anonymous mobile mediated interactions between collocated urban dwellers who congregate in the past, present, or future.

Fig. 1. Capital Music

Capital Music (Seeburger et al., 2010) is a mobile application designed for iOS, enabling collocated people to listen to their music as usual but also sharing a patchwork of the coverart of the songs currently played in the vicinity. Users can anonymously exchange messages based on viewing other people's song choices. Figure 1 visualises the user interface of Capital Music.

Fig. 2. Sapporo World Window

Sapporo World Window (Seeburger & Choi, 2011) is an interactive social media mash-up deployed in a newly built urban public underground space in Sapporo, Japan. The project utilises ten public screens and mobile phones of urban dwellers. Sapporo World Window enables users to share their favourite locations with locals and visitors through integrating various social media contents into a coherent screen presentation. Figure 2 visualises one screen of the Sapporo World Window system with the respective mobile website providing additional information to the promoted location.

The PlaceTagz project investigates how physical artefacts in public urban places can be utilised and combined with mobile phone technologies to facilitate interactions. PlaceTagz are QR codes printed on stickers linking to a digital message board enabling collocated users to interact with each other over time resulting in a place-based digital memory. PlaceTagz are deployed through removable stickers placed on the walls of public toilet as a digital alternative to toilet graffiti. Figure 3 visualises PlaceTagz and a respective mobile website after scanning the QR code as well as PlaceTagz attached to various public urban spaces.

Fig. 3. PlaceTagz

All three projects add a digital layer to the physical urban environment, enabling collocated people to anonymously interact with each other and the specific information they share. These projects are in response to the question 'how can ICT be applied to create and influence the UX in public urban places?'. The study requires a methodology that assesses how the UX is influenced by these applications and their specific interaction qualities.

3. Review of the user experience literature

HCI research largely focussed on usability studies to evaluate activities such as task completion time and ease of use of software applications designed to fulfil given work tasks. The term "experience" is widely used to describe various aspects of HCI that go beyond the usability of work-related products and especially used when focusing on the UX concerning interactive consumer products. Garrett (2003) states that UX is not about how products tackle a problem to achieve a solution they were made for but rather, UX is about how products behave when people actually use and interact with them. While the ISO FDIS 9241-210:2009 norm on ergonomics of human system interaction defines UX as "a person's perceptions and responses that result from the use or anticipated use of a product, system or service," recently published studies in UX research highlight the lack of a common definition for UX, e.g. Law et al. (2009), Bargas-Avila & Hornbæk (2011), and Battarbee & Koskinen (2005).

Alben (1996, p. 12) defines experience as "all the aspects of how people use an interactive product: the way it feels in their hands, how well they understand how it works, how they

feel about it while they're using it, how well it serves their purposes, and how well it fits into the entire context in which they are using it." Alben (1996) states six characteristics, which directly influence the quality of experience, and two characteristics, which indirectly influence the quality of experience through the product designers. Direct characteristics are needs, learnability and usability, appropriation, aesthetics, mutability, and manageability. Indirect characteristics are the understanding of users and an effective design process.

Hassenzahl & Tractinsky (2006) argue that UX research should go beyond the instrumental and address surprise, diversion, or intimacy. UX should consider emotions in terms of joy, fun, and pride as well as the experiential, which means that a product is used in a specific situation resulting in the experience. "UX is about technology that fulfils more than just instrumental needs in a way that acknowledges its use as a subjective, situated, complex and dynamic encounter. UX is a consequence of a user's internal state (predispositions, expectations, needs, motivation, mood, etc.), the characteristics of the designed system (e.g. complexity, purpose, usability, functionality, etc.) and the context (or the environment) within which interaction occurs (e.g. organizational/social setting, meaningfulness of the activity, voluntariness of use, etc.)" (Hassenzahl & Tractinsky, 2006, p. 95).

McCarthy & Wright (2004) developed a framework to analyse experience with technology. The framework consists of four threads: (1) Compositional: "How do the elements of an experience fit together to form a coherent whole?" – e.g. narrative structure, action possibility, consequences and explanations of actions. (2) Sensual: "What does the design and texture and the overall atmosphere make us feel?" – e.g. look and feel of an application. (3) Emotional: "What emotions color the experience for us?" – e.g. fun, excitement, and frustration. (4) Spatio-Temporal: "What effects do place and time have on our experience?" – e.g. time speed up or slow, space may open or close down. Furthermore, it consists of six interrelated sense-making processes: (1) Anticipating: "We never come to technology unprejudiced." (2) Connecting: "We make a judgement in an instant and without much thought." (3) Interpreting: "We work out what's going on and how we feel about it." (4) Reflecting: "We examine and evaluate what is happening in an interaction." (5) Appropriating: "We work out how a new experience fits with other experiences we have had and with our sense of self." (6) Recounting: "We enjoy story telling and make sense of experience in stories." The framework is designed for interactive products. However, this research is interested in influencing the UX of public urban places through digital place-based augmentations and mobile mediated interactions and therefore the emotional and spatio-temporal threads of the framework are especially interesting: how does technology change the experience of places and can technology open up public places and connect the urban dwellers within them to make the space more accessible in a digital way?

Forlizzi & Ford (2000, p. 420) state that "a singular experience is made up of an infinite amount of smaller experiences, relating to contexts, people, and products." They created a framework to understand what influences experiences and dimensions of experiences. Prior experiences of users, their values, emotions and feelings all influence their experience. A product influences the experience through its usability, quality, aesthetics and so on. Additionally, some products are personal items that have specific meanings to particular users such as a specific golf ball that was used for a hole-in-one shot. The user-product interaction takes place in context influenced by social and cultural factors what requires the designers to "understand the users, products, contexts, and nature of interactions that may

happen" (Forlizzi & Ford, 2000, p. 420). The authors describe four dimensions of an experience: (1) sub-conscious experiences that are fluent and automatic experiences such as using the coffee machine, (2) cognitive experiences that require users attention and problem solving skills such as interacting with an unfamiliar software, (3) narrative experiences that force people to think and formalise what they are doing and experiencing, and (4) storytelling experiences that are created through sharing experiences. Forlizzi & Battarbee (2004) describe three types of user-product interactions: (1) fluent interactions enabling automated interactions such as riding a bike, (2) cognitive interactions requiring problem solving skills, and (3) expressive interactions creating a relationship with a product. Additionally Forlizzi & Battarbee (2004) differentiate between three types of experiences: (1) experience, a constant stream of information while interacting with the world, (2) an experience, an interaction with the world which can be named, and (3) co-experience, which "reveals how the experiences an individual has and the interpretations that are made of them are influenced by the physical or virtual presence of others" (Forlizzi & Battarbee, 2004, p. 263). Battarbee & Koskinen (2005) criticise that current UX research mostly focuses on the individual and does not consider experiences that are created together. The term co-experience is used "to describe experiences with products in terms of how the meanings of individual experiences emerge and change as they become part of social interaction" (Battarbee & Koskinen, 2005, p. 7).

The definitions show that emotional attributes such as enjoyment, contextual attributes such as place and environment, as well as the social setting have to be taken into account when conducting HCI research. Furthermore, existing definitions discuss products, services, or interfaces. However, this research is interested in designing and influencing the UX in public urban places through digital place-based mobile multimedia augmentations and mobile mediated interactions. In a broader sense, this research creates applications that mediate the UX by augmenting the urban space rather than creating a UX isolated on the mobile device. This urban UX is influenced by people who are collocated in the past, present, or future interacting with each other in an anonymous way mediated through their mobile device resulting in the creation of a digital layer on top of the geographical space. "People create, elaborate, and evaluate experiences together with other people, and products may be involved as the subject, object or means of these interactions" (Battarbee & Koskinen, 2005, p. 15).

The literature review highlights that various attempts have been made to define and scope diverse types of UX. Additionally, having in mind that a variety of variables before, during, and after application usage can influence a user's experience is further contributing to the challenge of systematically studying them. This methodological chapter integrates the various attempts of previous research into a unified framework providing guidelines for researchers to design and evaluate the UX of digital place-based mobile multimedia augmentations and mobile mediated interactions.

4. Framework construction

Given the lack of a common definition of UX and how to design or evaluate them, we integrated the findings from the literature review in order to create our own framework to guide the design and evaluation of Urban Informatics interventions enabling mobile mediated interactions.

The Urban Informatics definition highlights three influential factors to study, design, and practice the urban experience: real time ubiquitous technologies, people networks, and urban contexts and infrastructures (Foth et al., 2011). Place and location are playing a central role in Urban Informatics research and are the focal point of investigation. The aim is to create and influence the urban UX through technological interventions used in public urban places. Rather then focusing on the technological intervention itself, we are interested in how the combination of people, place, and technology can form new UX in an integrated way. Therefore the framework utilises the people, place, and technology notions of urban informatics as a starting point of investigation. Some of the existing UX definitions use similar categories whereas in our approach we specifically use the term place as context of interaction:

- User's internal state, characteristics of the designed system, context within the interaction occurs (Hassenzahl & Tractinsky, 2006)
- Contexts, people, products (Forlizzi & Ford, 2000)
- People and technology (McNamara & Kirakowski, 2006)
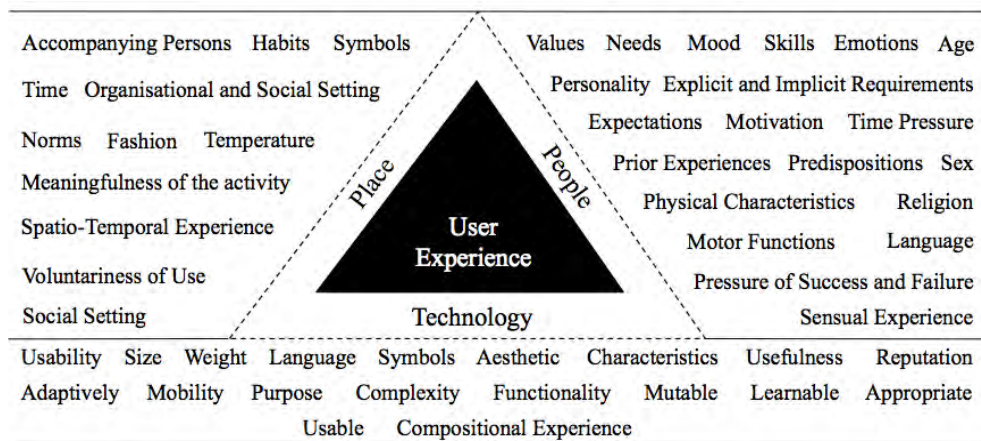- People, products, context (Alben, 1996)

Fig. 4. Aggregated elements of UX (Forlizzi & Ford, 2000; Hassenzahl & Tractinsky, 2006; Alben, 1996; McCarthy & Wright, 2004; Arhippainen & Tähti, 2003) recategorised under the people, place, and technology categories

The place category investigates the possibilities of digital layers and augmentations of the particular space. Is the deployed application suitable for a specific public urban place and do the interaction possibilities align to current norms and practices of that space? What possibilities for digital augmentations and mobile mediate interactions does the place offer? How do other collocated people and the used technology influence the perception of place? Gordon and de Souza e Silva (2011) state that experiences of urban spaces always have been mediated through technologies such as buildings, cars and streets but new ubiquitous and location aware technologies add additional possibilities to influence this experience. The technology section is about the characteristics, functionality, and usability of the deployed urban informatics interventions. The people section focuses on how people feel about the

technology used in a specific space. Does the application enable sociality, support positive emotions, and what kinds of feelings are triggered?

The various elements of UX mentioned in literature have been collected and recategorised under the people, place, and technology notions of Urban Informatics. This approach is visualised in Figure 4 and shows a wide variety of elements within each category. Figure 4 also illustrates that the existing UX frameworks emphasise the user and the technology. Place or context of use is not always considered in the existing literature. However, in having a technological intervention in a public urban place with the aim to create and influence an experience, people are the object of interest while place is the focal point of investigation whereas technology is the mediator of the experience.

The elements visualised in Figure 4 are very broad in nature. An Urban Informatics intervention will most likely not require all of them to be considered during a study. For example, having a mobile application as the technological subject of study, the researcher will not be able to influence or be interested in investigating how the size or weight of the mobile device resonates with the UX. Therefore, the next step in the construction of the framework is the elimination of elements irrelevant for our study. Table 1, Table 2, and Table 3 in the following subsections list the remaining elements after the elimination process, categorised within the people, place, and technology notions.

The following subsections further discuss each category in more detail through proposing investigative questions for each element within the category while suggesting some methodological tools and frameworks for study.

4.1 Place

A starting point for an Urban Informatics study should begin with its context of use, the place following an observation of how people use the space. An ethnographic approach can help "to develop a thorough understanding of current work practises as a basis for the design of computer support" (Simonsen & Kensing, 1997, p. 82). Furthermore, ethnography aims "to see activities as social actions embedded within a socially organised domain and accomplished in and through the day-to-day activities of participants" (Hughes, King, Rodden & Andersen, 1995, p. 58). In the context of Urban Informatics research, work practice refers to how people use ICT devices during day-to-day activities. Day-to-day activities refer in this research to the time people spend at urban public places of their city.

It is important to identify what kinds of activities take place in the analysed space and of what kind of nature the activities are. For example, are people just using the place to traverse through the city or as a third place to meet friends or strangers between home and work? Are people mostly alone or accompanied by people and during what time(s) is the place mostly used? Table 1 lists the relevant elements in the place category providing guidelines to use while observing the space. The elements and questions stated in Table 1 should be considered to inform the design and purpose of the application. After application development, the elements mentioned in the framework design by McCarthy & Wright (2004) should be considered to investigate the spatio-temporal influence of the experience of people in the public urban place.

Answering the questions stated in Table 1 will help to design applications supporting mobile mediated interactions suitable to a specific public urban place. Urban Informatics

intervention should align to current social practices and behaviour of people in public urban places rather than creating new ones (Pedersen & Valgårda, 2004). Therefore, studying the place and the applications' context of use are vital factors in influencing the UX. The overall aim of answering the questions while studying the place is, what kind of data can be collected by urban dwellers and utilised in an Urban Informatics intervention.

Element	Description
Meaningfulness of the activities in the place	Are the activities in the place in the nature of business, pleasure, idling, or other settings?
Organisational/ social setting	What kinds of activities are accomplished in the organisational and/or social setting?
Fashion	What is 'in fashion' according to the place?
Habits	What are the habits in the place?
Norms	What are the norms in the place?
Time of mobile mediated interaction	When does the interaction between urban dwellers occur? Are they synchronous, asynchronous, or both
Place of mobile mediated interaction	Where does the interaction take place? What kind of place is it? What are the entry barriers? (if any)
Accompanying persons	Do other persons usually accompany people or are people rather by themselves?

Table 1. Elements in the place category

4.2 Technology

After analysing the place and its elements as listed in Table 1 the technology section provides guidelines for developing an application deployed in the analysed space. Table 2 lists the elements in the technology section.

First of all, the results of the ethnographic observations need to be analysed. The results should inform system development, which utilise the available data and location information as well as available ICT devices used in the place. For the Capital Music application, we observed public transport users and selected music listeners' song choices and their mp3-players and mobile phones for an Urban Informatics intervention.

Element	Description
Purpose	What is the purpose of the application? Why should someone use it?
Functionality	Is the functionality sufficient to fit its purpose?
Complexity	Is the software complex enough to fulfil its task without hindering usability?
Usability	Is the software easy to use?
Aesthetics	Is the designed technology visually pleasing? Does the design support usability?
Acceptance	Does the application suit the place and support current social practices?

Table 2. Elements in the technology category

To ensure that the purpose, functionality, characteristics, and complexity of the proposed application align with the needs of the users, they have to be involved during the development process. A user-centred design methodology will ensure that the mobile application meets the needs of the users (Kangas & Kinnunen, 2005). For example we evaluated the concept of sharing of song choices through a paper-based study reported in Seeburger et al. (2010).

During and after application development, usability studies have to be conducted. Thereby Tractinsky (1997, p. 121) found that "perceptions of interface aesthetic are closely related to apparent usability and thus increase the likelihood that aesthetics may considerably affect system acceptability." This implies that the visual design of the studied intervention has to be sufficient enough to not hinder usability. Lavie & Tractinsky (2004) developed a measurement instrument for evaluating perceived aesthetics of computer interfaces. They subdivided aesthetics into "classical aesthetics," emphasizing clear and ordered designs as well as "expressive aesthetics," emphasizing designers' creativity and originality to break common design rules.

The acceptance element in Table 2 has been derived from the usefulness element mentioned in Arhippainen & Tähti (2003). Traditional research on technology acceptance models includes perceived usefulness and ease of use of an information system as predictors of how likely a system will be used. Perceived usefulness has been defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). As this research is focusing on hedonic information systems rather then utilitarian systems, "perceived usefulness loses its dominant predictive value in favor of ease of use and enjoyment" (van der Heijden, 2004, p. 695). We added acceptance instead of usefulness to the technology category for this framework consisting of perceived usefulness, ease of use, and enjoyment. Validated items are researched to investigate these variables (van der Heijden, 2004).

4.3 People

"When users are confronted with a product, a process is triggered: First, an apparent product character is constructed. It is a user's personal reconstruction of the designer's intended product character. Second, the fit of the apparent character and the current situation will lead to consequences, such as a judgement about the momentary appealingness of the product, and emotional or behavioural consequences." (Hassenzahl, 2005, p. 33)

Following the observation and analysis of the place and involvement of the user during the design process of the software application, people have to be further considered to generate insights into the quality of the experience created through using the designed application.

A survey on current UX research by Bargas-Avila & Hornbæk (2011) states that the most researched dimensions of UX are emotions and affect, enjoyment, and aesthetics (aesthetics in this framework has been re-categorized into the technology category). Additionally the authors state that new dimensions such as enchantment, engagement, tangible magic, aesthetics of interaction, and relevance has been proposed to research (Bargas-Avila & Hornbæk, 2011).

Element	Description
Requirements	What are the technological requirements people must master to use the technology?
Motivation	What motivates people to use the technology? What need does it fulfil?
Prior Experiences	How do prior experiences influence technology usage?
Feelings	How do people feel about using the technology?
Affect	How does the technology affect the user?
Emotions	What kinds of emotions are created through using the technology?
Enjoyment	Do people enjoy using the technology?
Likeability	Do people like the technology?
Social Interaction	How does the technology support sociability? What kind of social interaction takes place?

Table 3. Elements in the people category

This framework proposes a three-fold process to investigate how people experience the technology. First, the application has to be made available in the designated space and be used by real users. The software application itself can be used as a data collection tool, logging data about software usage and interaction. This kind of data logging enables conclusions, for example, how often, for how long, and to what extent has the application be used. Second, as UX is subjective, semi-structured interviews with users is a promising approach to collect qualitative data about how users feel about the application. Thereby, we propose to ask application and place specific questions about how using the developed system influences, changes, and possibly enhances the experience. After the semi-structured interview, a paper-based survey for collecting basic demographic data as well as getting insight into various elements of the UX using the validated items should be applied.

To measure emotions, Huisman and Van Hout (2008) selected eight emotion terms such as joy and sadness, desire and disgust, fascination and boredom, and satisfaction and dissatisfaction to evaluate interactive digital systems. These eight emotion terms are also related to different concepts such as aesthetics or usability. The AttrakDiff (Hassenzahl, 2008) questionnaire provides insights into the pragmatic (effectiveness, efficiency) and hedonistic (e.g. stimulation, identification) qualities of an interactive product. Hassenzahl (2008, p. 322) argues that "[u]sing a product with a particular product character in a particular situation will lead to consequences, such as emotions (e.g., satisfaction, pleasure), explicit evaluations (i.e. judgements of appeal, beauty, goodness), or overt behavior (approach, avoidance)." Watson et al. (1988) developed and validated two mood scales with 10 items to measure positive affect (interested, distressed, exited, upset, strong, guilty, scared, hostile, enthusiastic, proud) and negative affect (irritable, alert, ashamed, inspired, nervous, determined, attentive, jittery, active, afraid) of peoples' mood. Watson & Clark (1994) extended the positive affect and negative affect scale and added fear, hostility, guilt, and, sadness as basic negative emotion scales, joviality, self-assurance, and attentiveness as basic positive emotion scales as well as shyness, fatigue, serenity, and surprise as other affective states.

Table 3 lists the elements in the people category and the main questions behind each element. We also added social interaction to the framework as this framework is designed to
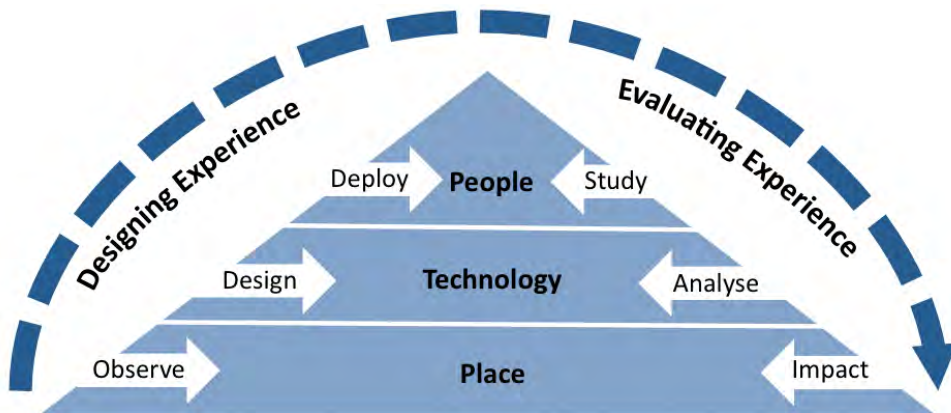
Fig. 5. User experience framework overview

evaluate systems enabling mobile mediated interactions. Battarbee & Koskinen (2005, p.15) state that "user experiences are created together and are thus different from the user experiences people have alone" and suggest to analyse the interactions which occur between users. The three software applications described in this chapter enable mobile mediated interactions with collocated people who congregate in the past, present, or future. Having interactions in real-time with collocated people rather then over-time with people who have been or will be at the same place might further impact the UX in various ways. Additionally, analysing the interactions is especially important in the field of mobile mediated interactions between collocated people in urban public places as the experience of using such an application is heavily dependent on other application users. For example, a user utilising an application enabling information sharing with collocated people such as Capital Music, the user will have a significantly different experience through using the system if they open the application and no one else is in their surroundings rather than when plenty of users are available with which to interact. Conversely, scanning a PlaceTag with a mobile phone and being the first one to leave a message provides a different UX then finding a stream of messages and joining an existing conversation.

Figure 5 summarises the UX framework for designing experiences and investigating the quality or impact of the experience presented in this chapter. As described in this section, the framework proposes to start with an observation of the place following the utilisation of the gathered knowledge to design a technology suitable for the place. All three applications described in this chapter were used as place-based design interventions and were deployed and made available to users in the designated space followed by in situ user studies and observations. Additionally, logging mechanisms were added to the applications in order to get insights into the co-created experiences of collocated users. Through following the steps described in this section researchers are able to study and explore the quality of the created experience.

5. Discussion

The chapter proposed steps and guidelines in terms of what kind of research activities should be undertaken in the software design, development, and evaluation phase. However,

we do not propose that each single question stated in the people, place, and technology categories have to be strictly followed. Designers have to consider which steps are necessary and valuable for their particular investigation.

The PlaceTagz project, which is deployed in public toilets, does not necessarily require an observation of the place and an analysis of the activities within the space, as usage is obvious. Additionally, usability studies are not necessary as the underlying system uses the commonly known and extensively used Wordpress weblog system. The Sapporo World Window project, which does not necessarily require user interaction with the system itself to be useful and appealing to onlookers, does not necessarily require an in-depth analysis of the meaningfulness of the activities within the space as content is mainly presented to by-passers. Additionally the acceptance element – how does the application fit into the place and support current social practices – in the place category is not highly relevant as urban screens and displays are more and more commonly used in urban spaces. The Capital Music project, designed for public transport, does not require rich aesthetics studies as the visual component of the application mainly focuses on the album artworks of the songs currently played in users' vicinity.

Additionally, the methods used in the people section can vary from case to case. In general, all applications enabling mobile mediated interactions in public urban places should be evaluated in the real world environment they have been designed for. However, this can be crucial for some Urban Informatics applications.

For Example Capital Music relies on multiple users using the application at the same time in the same space and preferably should not know each other. Enforcing such conditions in a lab environment might not result in realistic results. One way to gather reliable data from users in such conditions could be the utilisation of the Experience Sampling Method (Consolvo & Walker, 2003), adding self-reporting mechanisms into the deployed application. Additionally the Wizard of Oz (WoZ) method (Höysniemi & Read, 2005) could be utilised whereas the researcher is simulating other application users in a lab environment. This approach has the benefit that participants are available for semi-structured interviews after application usage. Furthermore, using an early prototype in combination with a WoZ study can closely simulate a contextual evaluation (Reilly et al., 2005).

Sapporo World Window on the other hand is deployed in a busy urban space. Time-lapse observations of the public urban space (Whyte, 1980) in combination with log files of screen interaction and follow-up structured interviews or questionnaires can help to get an deeper understanding of the impact of the created UX, for example in Brynskov et al. (2009).

As already mentioned above, the PlaceTagz study, which is deployed in public toilets, does not allow observations or interviews due to the nature of the place. People using the place and the technology are difficult to access without making them feel uncomfortable. On the other hand each PlaceTag collects text-based messages left by users, varying in context and content. Furthermore, during the data collection period some users left their email address in the form provided for writing comments. Conducting a content analysis in combination with interviewing people who left their contact details can give further insights into the quality of the created experience.

6. Conclusion

This chapter presented our framework for creating and evaluating UX under the umbrella of Urban Informatics. We are aware that much theoretical research has been done in researching UX. However, given the lack of a common definition, elements, scope, and methods for creating and evaluating them, we reviewed the relevant literature in UX and recategorised them into the people, place, and technology notions of Urban Informatics.

This chapter has focused on a methodological approach for the study of UX in urban public spaces. It is written as a response to the inconsistent use and the intangibility of the term 'user experience' and the resulting questions such as what is part of an experience, how to design, influence and how to assess a UX. Having three applications aligned and tailored along this framework we hope to inspire other researchers to practically study, design, and evaluate UX in such an interconnected approach of people, place, and technology.

7. Acknowledgment

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