Middle-Out Design: Collaborative Community Engagement in Urban HCI

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ABSTRACT

This paper presents a collaborative approach for designing, implementing and deploying situated urban HCI interventions. It draws on field studies that use HCI technologies for collecting feedback from citizens. Based on an analysis of these field studies and a discussion of top-down and bottom-up initiatives currently used in community engagement we propose that both decision makers and local communities should be involved in the city making process. We relate our approach, which we refer to as middle-out design, to other co-design and participatory design movements in HCI and conclude on a discussion on how our work can contribute to the discourse around urban HCI particularly for the purpose of community engagement to inform change.

Author Keywords

Urban HCI; community engagement; pop-up urbanism; middle-out; top-down; bottom-up.

ACM Classification Keywords

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

INTRODUCTION

City governments undertake a formal community engagement process to inform local communities about urban planning policy changes and infrastructure developments. Technological developments, such as wide spread usage of mobile devices and access to web 2.0, has been explored by researchers, city governments, and built environment practitioners to increase engagement levels and to diversify the reach of such initiatives (Fredericks and Foth 2013). Multi-disciplinary approaches, which rely on the expertise of designers, urban planners, and computer scientists have also explored the use of situated digital technologies for more inclusive community engagement strategies (Fredericks et al. 2015; Hespanhol et al. 2015; Golsteijn et al. 2016; Koeman et al. 2015; Valkanova et al. 2014).

Building on this previous work and our own field studies of pop-up engagement interventions, we propose a *collaborative* and *inclusive* methodology for the design,

implementation and deployment of situated urban HCI interventions, which we refer to as middle-out design. Middle-out design is also a community engagement process, but for the purpose of determining the design, implementation and deployment of an urban HCI intervention. Compared to traditional community engagement initiatives, these interventions are not limited to the collection of feedback from local communities regarding future urban planning interventions. By following this approach, it is possible to draw on the collective knowledge from stakeholders at the top and everyday people at the bottom. The notion of middle-out design can therefore contribute towards greater communication across multiple actors and levels of society in the design, implementation and decision making process for the deployment of urban HCI interventions.

BACKGROUND

Urban HCI

Technological developments have impacted all aspects of daily life. Of particular interest to our research is how access and use of technology affects the experience of people within cities. Urban HCI refers to 'the situation that is composed of the built environment, the interface and any associated computer system and the social context' (Fischer and Hornecker 2012, p.307). Fischer and Hornecker (2012) differentiate urban HCI from other areas of HCI research, such as ubiquitous computing, by taking 'situated architectural effects … into account'. The use of urban screens, public displays and media architecture provides platforms for investigation and contribution to the area of urban HCI where researchers, interaction designers, artists, computer scientists, architects and planners converge interests within the built environment. Urban HCI recognises the value of trans-disciplinary perspectives when incorporating interactive technologies within public spaces (Behrens et al. 2014; Fischer and Hornecker 2016). Urban HCI interventions use these platforms to interrupt the usual or daily use of space by city inhabitants, providing playful interactions and experiences. Our research focuses on the use of urban HCI interventions to create meaningful connections between people and urban space for the purpose of community engagement around city making.

Top-Down Vs Bottom-Up Community Engagement

City governments have taken a centralised top-down approach to the design and implementation of community engagement. In many cases, the needs, wants and aspirations of local communities are not taken into consideration in the early planning and design phases. In

the past, central decision makers saw themselves as the key actors and anyone else as impediments that disrupt the process (Sabatier, 1986). Social commentators such as Innes and Booher (2004), Sarkissian (2009), Schroeter (2012), and Fredericks (2015) argue that traditional top-down approaches are outdated, non-inclusive, fragment communities, and rarely achieve genuine engagement outcomes. As a result, communities around the world have taken it upon themselves to drive bottom-up initiatives through city hacking interventions (Fredericks et al. 2016). DIY, guerrilla and pop-up movements have been driven by community groups in cities across the world. Examples, such as Park(ing) Day, yarn bombing, guerrilla gardening and the occupy movements are collaborative grassroots initiatives that appropriate public space for community engagement, to improve the quality and experience of a place, or be used to communicate political messages (Caldwell and Foth, 2014). Foth et al. (2015) explain that these small urban interventions create a tailored city within the city by occupying or transforming urban space. However, actions undertaken by citizens can often be associated with illegal activity as they operate outside existing regulations and laws in the attempt to be involved in the city making process (Foth et al. 2015; Fredericks et al. 2016).

Middle-Out Approaches

The term middle-out was originally coined by Kinchla and Wolfe (1979) to describe a visual processing sequence for identifying and recognising shapes. Middle-out assumes that there is knowledge from higher (top-down) and lower (bottom-up) information channels that come together and meet in the middle (Kinchla and Wolfe 1979). The term has since been used by researchers in computing, engineering, biochemistry, and biological and social sciences. Costa and Ferrão (2010) proposed a middle-out approach for improving economic and environmental performance for waste products and raw materials. They used an interactive process that integrated managers (top-down) and workers (bottom-up) to equally contribute to the design of products. This allowed managers to set the design agenda but gave workers the opportunity to provide their own insights and improve on the process.

Similarly, Janda and Parag (2013) adopted a middle-out approach for improving energy performance in buildings by engaging with building professionals and practitioners. They developed a conceptual model that allows professionals to exert their influence from the middle-out. The model took into account existing policies and building practices (top-down) as well as client choices (bottom-up). The model enables designers to be guided in many different ways, drawing on the collective knowledge of all actors. Fredericks et al. (2016) introduce the notion of middle-out 'community placemaking' for collaborative city making. This concept uses a combination of bottom-up and top-down community

engagement approaches to involve members of the community in the city making process. We propose to further build on the middle-out examples described above by employing a more collaborative and inclusive process for community engagement, spanning the design of initiatives as well as their implementation and the overall decision-making process for deployment.

MIDDLE-OUT DESIGN FOR URBAN HCI

We define middle-out design for urban HCI as the process to draw on the collective knowledge of all actors to provide greater opportunities for more inclusive and collaborative community engagement processes. This approach allows for an integration of the objectives from top-down decision makers (government organisations, private enterprise) with those of the everyday people (represented through citizens and community groups) from the bottom, meeting somewhere in the middle. We describe our middle-out design approach for community engagement through the following three stages: (1) *Design*, (2) *Implementation*, and (3) *Deployment*. All three stages involve stakeholders from the top and the bottom through a range of methods, such as workshops, focus groups and observations. That way they are able to contribute to all aspects of the urban HCI intervention. In the case of interventions that aim to collect feedback from the local community on urban planning decisions, this can for example involve the design of the engagement channels, the community engagement strategy, and the engagement questions for the public.

Our intention is to build on current discourse within urban HCI to acknowledge the realities and benefits of middle out design for city making. To better understand how middle-out design can inform the design of urban HCI interventions, we present an analysis of three field studies: *Digitally Augmented Pop-Up, The InstaBooth, and Pop-Spot.* Similarly, these engagement programs drew on the collective knowledge from the decision makers at the top with those from citizens and community groups at the bottom. Each of these studies was part of a community engagement program with the aim to engage local communities around specific topics. The urban interventions that are presented in the following section commonly relied on participatory or co-design methods (Bodker, & Pekkola, 2010; Muller, 2003; Muller & Kuhn, 1993) to involve end-users and stakeholders in the ideation, design, development, deployment and analysis of the interventions. These methods were carried out through a variety of design workshops, focus groups, and informal meetings with local community groups and stakeholders.

Digitally Augmented Pop-Up was designed as a series of situated pop-up interventions using a gazebo structure, incorporating traditional physical media and digital technologies in collaboration with an electricity supplier to obtain community feedback around tree trimming and powerlines (Figure 1).

Figure 1: Digitally Augmented Pop-Up

Stage 1 – Design: As the engagement agenda was directed from the electricity supplier (top-down) we also wanted to bring in the collective knowledge of local stakeholders (bottom-up) into the design of the engagement activities. We held informal meetings with representatives from a variety of councils and local community organisations. During this process we introduced our pop-up engagement concept, discussed potential engagement activities, survey questions, pop-up setup, deployment locations, and identified the issues people wanted to talk about. The information collected informed the initial design of the pop-up structure and the engagement activities.

Stage 2 – Implementation: To validate the initial design of the pop-up we held a focus group in which we presented mock-ups of the engagement activities to practitioners with backgrounds in graphic design, public relations and communication and stakeholder engagement. Focus group participants interacted with the proposed activities through experience prototyping and bodystorming techniques (Buchenau and Suri 2000). This enabled the focus group participants to provide feedback around the design of the pop-up and how the activities could be adapted to be more relevant to the overall topic.

Stage 3 – Deployment: The *Digitally Augmented Pop-Up* was deployed in four locations across the Sydney metropolitan area to engage with a diverse range of demographics. In collaboration with the electricity supplier and community groups the deployment locations and the engagement objectives were identified. This included areas that were culturally and linguistically diverse, public housing suburbs, local farmer's markets and affluent suburbs. In addition to this, representatives from the electricity supplier attended each of the pop-up interventions to answer participants' questions and assist with the engagement activities. Similarly, representatives from the community groups promoted the pop-up interventions to members of the community. The overall support from all stakeholders resulted in a collaborative and inclusive pop-up design that benefited everyone that was involved.

InstaBooth is an architecturally designed structure consisting of a combination of digital and physical (hybrid) interactive technologies (Figure 2).

Stage 1 – Design: The InstaBooth was developed by a transdisciplinary team of researchers who designed it as a urban HCI intervention that can be flat-packed and easily transported. The design of the booth structure and the interactive components within it were produced through a series of co-design workshops with key stakeholders and end users.

Stage 2 – Implementation: We conducted three workshops to present mock-ups of the *InstaBooth* along with the engagement activities to practitioners from architecture, design, HCI and urban planning. Drawing upon different contextual experiences and design perspectives highlighted that the structure needed to allow for flexibility and how engagement activities can be appropriated according to the overall objective.

Stage 3 – Deployment: In collaboration with different stakeholders the *InstaBooth* has been deployed in over 10 different locations in both urban and regional areas of Queensland. It has been used to conduct community engagement surrounding the topics of urban development, city planning, student experience, envisioning futures, and policy development. The deployments have been initiated from the top (government initiatives for policy development) as well as input from the bottom (community groups). These community partners are well organised groups of people who act with the intention to address local problems or represent the interest of local citizens.

Figure 2: The InstaBooth

Pop-Spot was architecturally designed as a modular booth structure incorporating five thematically themed engagement activities, consisting of digital, physical and mechanical input and output channels (Figure 3). It was deployed on a university campus to obtain feedback from staff and students around transport infrastructure on and around the campus. Different to the previous two studies, *Pop-Spot* was an independent initiative that was not directed by a top-down governing authority.

Stage 1 – Design: We employed a collaborative approach by incorporating a transdisciplinary research team, consisting of an urban planner, architect, electrical engineer, interaction designer and computer scientist. The research team held several workshops over a 12-month period to develop, design and test the engagement activities and the architectural designs of its structure.

Stage 2 – Implementation: Similar to the previous two studies we held informal meetings and presented our mock-up designs and the proposed engagement activities at a focus group with six industry professionals. This allowed us to collect early feedback and insight into the design of *Pop-Spot* and the engagement activities. Based

Figure 3: Pop-Spot

on the feedback we were able to redesign the configuration to ensure that each of the engagement activities were thematically connected, and encouraged participants to interact with the activities they felt most comfortable with.

Stage 3 – Deployment: We collaborated with the university facilities department (top-down) to obtain approval to deploy our pop-up intervention. This included meetings to discuss potential locations and the overall objectives of the pop-up intervention. However, a limitation with this study is the lack of involvement from bottom-up stakeholders in the deployment stage.

DISCUSSION

The urban HCI interventions discussed in this paper have several factors in common. Each field study involved the three stages of middle-out design for community engagement which included different stakeholders depending on the context of deployment and engagement objectives. In all studies, the researchers behind the interventions played the critical role of acting as a mediator between top-down and bottom-up stakeholders. By taking the middle position, they were able to communicate with all stakeholders and to integrate their objectives into the final intervention. This suggests that a successful middle-out design approach relies on an independent entity, which does not have a direct interest in the intervention and the outcome of the deployment study. We suggest that designers and community groups may be able to take this role, thus moving from the bottom to a middle perspective. For example, in some of the *InstaBooth* deployment studies, we worked with community groups, that already took on this role by coordinating meetings and obtaining feedback from local councils and community members.

Each study was designed through collaborative design methods, which allowed us to incorporate the interest and input of stakeholders from their ideation and inception. This approach led us to integrate digital and physical modes of interaction in the design of the urban interventions. In our studies, this mostly concerned the interactive components used to conduct the community engagement. Offering digital and physical channels in an urban HCI intervention provides opportunities for more inclusive and broader participation from citizens with varying demographics and backgrounds. Top-down stakeholders were a vital part of the implementation and deployment of the urban interventions as they provided relationships and connections to property owners or councils, streamlining the permission for the deployment of the interventions. Their existing networks and infrastructure can also be leveraged for raising awareness about the intervention. For example, for some of the *InstaBooth* deployments we were able to use their connections to public media channels, such as radio and newspapers, to promote awareness to local communities. Although, this was not the case in any of our field studies, community groups can similarly take a role in promoting the intervention to their members. In one instances, the stakeholders took active parts in the engagement process by providing volunteers to help transport, setup, and staff the intervention. This way the stakeholders conducted some of the face to face engagement with participants and became much more invested in the overall strategy.

Through the different urban interventions, contributions from participants were collected in the form of digital and physical media. These media along with notes from field observations were then analysed together with stakeholders through data analysis workshops, informal meetings, and focus groups. This step was critical for understanding the value of the data and the interventions from their points of view. Similarly, the involvement of stakeholders in the analysis of post-deployment data in other urban HCI studies can add additional perspectives and value. The three stages of the middle-out design approach build on existing participatory and co-design methodologies employed in HCI research by involving stakeholders in every stage of the process. The approach presented in this paper expands these previous practices. For example, participatory design sessions are typically run in controlled environments such as design studios, whereas middle-out design involves deployment and engagement in urban space. Co-design suggests the involvement of a variety of stakeholders across multiple stages of a design process, but it typically stops when the product or artefact are in production. Middle-out design suggests to continue involving stakeholders during the deployment and in the analysis of post-deployment data.

Limitations and challenges. It can be difficult to engage stakeholders due to time and resource limitations. The amount and forms of data generated through a middle-out approach can be overwhelming and challenging to handle, collect, organise, and analyse. Establishing robust conclusions is difficult due to the many variables around deployments in public space. The value and contribution of an intervention to wider city making decisions can often take many months or years to see any effect.

CONCLUSION

The discourse around urban HCI is evolving and our findings propose that it can draw upon the practice of community engagement, involving perspectives from the top and the bottom. We provide a framework for designers of urban HCI interventions to think beyond the deployment – making the engagement with stakeholders before, during *and* after the deployment part of the design process and considering the post-deployment lifespan and evolution of urban interventions as well as their value and potential to address wider city making aspects.

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