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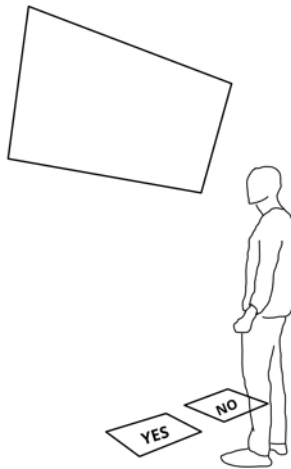
LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN
INSTITUT FÜR INFORMATIK
LEHRSTUHL FÜR MEDIENINFORMATIK

Masterarbeit

Vote With Your Feet

Hyperlocal Public Polling for Urban Screens

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Abstract

Technological advances have led to an ongoing spread of public displays in urban areas. However, they still mostly show passive content such as commercials and digital signage. Researchers took notice of their potential to spark situated civic discourse in public space and have begun working on interactive public display applications. Attracting people's attention and providing a low barrier for user participation have been identified as major challenges in their design.

This thesis presents *Vote With Your Feet*, a hyperlocal public polling tool for urban screens allowing users to express their opinions. Similar to vox populi interviews on TV or polls on news websites, the tool is meant to reflect the mindset of the community on topics such as current affairs, cultural identity and local matters. It shows one Yes/No question at a time and enables users to vote by stepping on one of two tangible buttons on the ground. This user interface was introduced to attract people's attention and to lower participation barriers.

Vote With Your Feet was informed by a user-centred design approach that included a focus group, expert interviews and extensive preliminary user studies in the wild. Deployed at a bus stop, *Vote With Your Feet* was evaluated in a field study over the course of several days. Observations of people and interviews with 30 participants revealed that the novel interaction technology was perceived as inviting and that *Vote With Your Feet* can spark discussions among co-located people.

Zusammenfassung

Technische Fortschritte haben zu einer zunehmenden Verbreitung von Bildschirmen im öffentlichen Raum geführt. Allerdings zeigen diese nach wie vor hauptsächlich passive Inhalte wie Werbung oder Beschilderung an. Forscher haben jedoch das Potential dieser Bildschirme entdeckt und begonnen, interaktive Anwendungen zu schaffen, die für den öffentlichen Raum bestimmt sind und eine Förderung des Bürgerdialogs zum Ziel haben. Dabei hat sich herausgestellt, dass es zu den größten Herausforderungen zählt, die Aufmerksamkeit der Personen zu gewinnen und eine einfache Benutzung zu ermöglichen.

In dieser Masterarbeit wird *Vote With Your Feet* vorgestellt, eine Anwendung für Umfragen auf Bildschirmen im öffentlichen Raum. Ähnlich zu Fernsehinterviews mit Personen aus der Bevölkerung oder Umfragen auf Nachrichtenwebseiten, bildet diese Anwendung die öffentliche Meinung in den Bereichen Zeitgeschehen und lokale Themen sowie Ansichten zur kulturellen Identität ab. Benutzer können ihre Stimme abgeben, indem sie auf eine von zwei fliesenähnlichen Platten treten, die auf dem Boden vor dem Bildschirm angebracht sind. Diese Benutzerschnittstelle wurde gewählt, um auf die Bildschirmanwendung aufmerksam zu machen und eine mühelose Teilnahme an der Umfrage sicherzustellen.

Vote With Your Feet wurde in einem nutzerorientierten Gestaltungsprozess entwickelt, der eine Fokusgruppe, Experteninterviews sowie vorläufige Nutzerstudien in großem Umfang umfasste. Die Anwendung kam an einer Bushaltestelle zum Einsatz und wurde dort über mehrere Tage evaluiert. Dabei wurden etliche Personen beobachtet und 30 Teilnehmer in Interviews befragt. Die Auswertung zeigte, dass die neuartige Benutzerschnittstelle als einladend wahrgenommen wurde. Des Weiteren konnte festgestellt werden, dass *Vote With Your Feet* zu Gesprächen und Diskussionen anregte.

Acknowledgements

This thesis was conducted at the Urban Informatics Research Lab at Queensland University of Technology in Brisbane, Australia. It was an invaluable experience and I am grateful that I was given this opportunity. I would like to express my appreciation to the people that made this stay happen: Marcus Foth (QUT), Heinrich Hußmann (LMU) and Florian Gall (CDTM). Thank you.

This project builds upon previous research efforts at QUT by Marcus Foth, Ronny Schroeter, Jan Seeburger, Leonardo Parra Agudelo and Robin Palleis. I have benefitted from their contributions tremendously. Finally, I would like to thank everybody else who provided ideas and support along the way, especially Florian Alt, Gilbert Beyer (both LMU) and Jaz Choi (QUT).

Publications

Vote With Your Feet was presented at OzCHI conference in Adelaide in late 2013. Furthermore, a paper (authored by Fabius Steinberger, Marcus Foth and Florian Alt) will be submitted to the Pervasive Displays conference 2014 in Copenhagen. The corresponding submissions can be found in appendix F and G.



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1. Introduction

As a result of technological advances and more affordable prices, public displays (also called urban screens) are increasingly installed in urban areas. Dubbed as the backbone of the “communication medium for the 21st century” [18], their spread opens up new opportunities. Specifically, they pose a step towards Weiser’s vision of calm technology from 1997 [100], which gave direction to what has become the research body of ubiquitous computing. Referring to information overload, he pleads for the formation of “[m]achines that fit the human environment instead of forcing humans to enter theirs” [99]. Revisiting this vision 20 years later, Schmidt et al. argue that “[e]ven though mobile phones are ubiquitous, they’re only one, albeit important, part in the ubicomp infrastructure currently emerging” [75]. Referring to the drop in display prices mentioned above, they point out how public displays would complement this infrastructure.

Urban informatics sheds light on urban screens from a different angle. Driven by the global trend of urbanisation, it explores “urban experiences [...] 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” [26]. Putting equal emphasis on people, place and technology, this research body aims at supporting citizen engagement [28], e.g. by extending the visibility of civic issues, supporting social discourse or influencing the sense of community.

The following section delves deeper into the untapped potential of public displays. After addressing the research opportunity, the section thereafter presents the contribution of this thesis and the research questions investigated. The introductory chapter concludes with an overview of this thesis.

1.1. Untapped Potential of Public Displays

Despite the ongoing spread of public displays in urban areas, the content mostly displayed is advertisement and digital signage [1]. A variety of public displays photographed in Brisbane, Melbourne and Adelaide are pictured in figure 1.1. Each of them is used for either displaying advertisements, video footage or directions, all of which are passive use case scenarios that do not engage the user. One of the few instances of an interactive screen is *The Cube* (bottom centre photo) which allows users to play with the content and explore the Great Barrier Reef in an application called *Virtual Reef* [69].

To unleash further potential of public displays, researchers have begun challenging the status quo of pure information representation [27] and working towards urban screen content shaped by users. Similar to the paradigm of Web 2.0 which is characterised by user participation [98], these efforts aim at creating new experiences in public urban spaces by opening up public displays to all users and allowing them to influence the content [18, 78].

1. Introduction

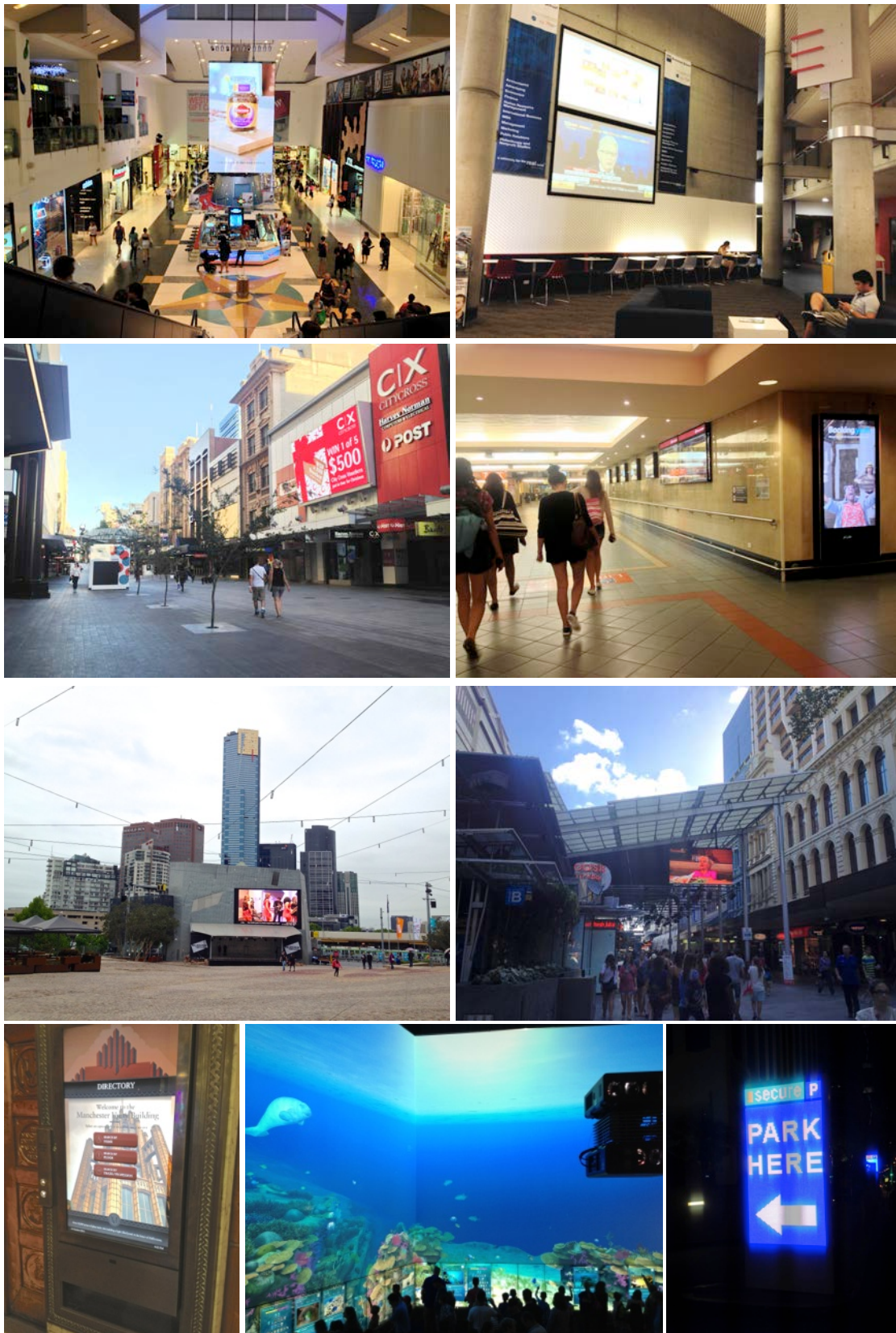


Figure 1.1: Public displays usually show video footage or digital signage. Top left: Advertisement in Chermside shopping mall, Brisbane. Top right: TV news at QUT, Brisbane. Second row left: Advertisement in Rundle mall, Adelaide. Second row right: Advertisement in Roma Street train station, Brisbane. Third row left: Advertisement and events announcements in Federation Square, Melbourne. Third row right: TV content in Queen Street mall, Brisbane. Bottom row left: Digital signage in Block Arcade mall, Melbourne. Bottom row centre: Interactive *Virtual Reef* [69] application at QUT, Brisbane. Bottom row right: Digital signage in Brisbane.

Building upon this agenda, the potential to spark situated civic discourse by utilising public display technologies has been recognised by a number of scholars [25]. While it is claimed that civic engagement and participation within many communities is in decline [41], urban screens allow members of the public to express their opinions [86]. Satchell et al. [74] found a clear desire for making voices being heard in communities. They suggest that technology could offer simpler means of making one's voice heard by members.

In their influential book "Public Space" [11], Carr et al. describe the human needs that public spaces fulfil. Research on public displays has begun addressing some of those needs, including passive and active engagement with the environment and its people as well as the excitement of novel discoveries within the space. The motivation for doing so is attributed to the fact that in highly diverse contexts, such as fast-growing metropolitan areas or master-planned communities, a sense of place does not arise by itself as a product of history and tradition anymore. Instead, the local community must explicitly create it through active efforts of place building [5, 53]. To present one example of how this might be envisioned, urban screens could mirror the sentiment of the local community or display previously hidden information about co-located people in real-time [24]. *Virtual Fish* [104] is a concept where relationships between community members are visually represented by the actions of fish within a digital aquarium. The *Living Light Lab* [45] seeks to visualise hyperlocal information by means of an interactive light installation. For this, it either uses data feeds, e.g. regarding energy consumption, or engages passers-by to indicate their mood by voting with their RFID-enabled Oyster card (used for London public transport).

Lastly, Foth et al. [27] argue that there is a need for new contributions to interaction design theory that open and map the post-cinematic user experience space afforded by new generations of screens. They critically challenge conventional dichotomies such as "local / global, online / offline, private / public, large / small, mobile / static", recognising that "they do not adequately represent the fluid and agile capabilities of many new screen interfaces". Being one of these addressed screen interfaces, public displays are considered to have the potential to provide a range of functionalities for urban interactions.

1.2. Hyperlocal Public Polling on Urban Screens

This thesis introduces *Vote With Your Feet*, a hyperlocal public polling tool for urban screens (sketched in figure 1.2). It allows users to express their opinion on issues such as current affairs, cultural identity and local matters. Similar to vox populi interviews on TV or polls on news websites, it is meant to reflect the mindset of the local community. It encourages participation via two tangible buttons on the ground. By stepping on one of them, users may cast their vote on a Yes/No question. The term *hyperlocal* refers to the two dimensions of time and location.



Figure 1.2: Sketch of *Vote With Your Feet* from a user's perspective.

The research questions explored in this thesis are as follows:

- (i) How can tangible buttons on the ground help to attract attention and to lower the barrier for user participation?
- (ii) What are the implications of polling in public and its impact on performative interaction, discomfort and answering honestly?
- (iii) How can information about the local community be reflected?
- (iv) Which are the most popular poll topics and how can users contribute content?
- (v) What are the social interactions triggered by *Vote With Your Feet*?

These questions were explored by means of design research. As summarised by Cronje [15], this entails working in a cycle of developing, describing, exploring and explaining, or, put differently, building, testing, learning and applying. Figure 1.3 shows how in this cycle both design and research outputs are produced.

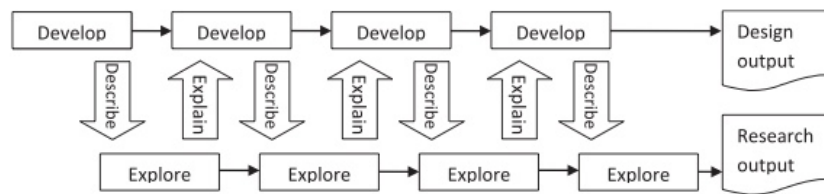


Figure 1.3: The design research cycle by Cronje [15].

1.3. Overview

This thesis is structured as follows. Chapter 2 presents related work in a literature review. Focussing on civic discourse, polling, and user engagement with urban screens, it points out to which extent *Vote With Your Feet* builds upon or differs from related projects.

Chapter 3 then describes the concept of *Vote With Your Feet* in detail. Inspired by the *Design Space Explorer Framework for Media Façades* [17], it covers the following aspects of the urban screen application: Purpose, content, interaction and participation, location, and situation.

Chapter 4 lays out the activities that shaped the major design decisions. In particular, it explains how a focus group, expert interviews and usability goals impacted the concept. Furthermore, it describes how preliminary user studies revealed usability issues and affected the final version of *Vote With Your Feet*.

Chapter 5 gives a rundown of the technical realisation. Split into the sections hardware and software, it provides specifics of the implementation and the reasoning behind the technological choices.

Chapter 6 delves into the field study which was conducted to evaluate *Vote With Your Feet* in the wild. Besides the research objectives, it covers how the study was set up and how data was collected and subsequently analysed.

The obtained results are discussed in chapter 7. The findings are structured into the sections attention, motivation, polling in public, social interaction, reflection of the local community, and popular poll questions.

Finally, the thesis concludes with chapter 8. It first takes a look back at the project and critically reflects the current prototype of *Vote With Your Feet*. Lastly, it provides recommendations based on the obtained study results and potential directions for future research.

2. Related Work

In the research area of public displays, various aspects have been studied to date. Scholars looked into how public displays were perceived by people by exploring different mental models [54, 97] and different types of display content [101]. Many variations have been trialled, ranging from multi-screen applications [44, 18] and content from different stakeholders [50, 51, 19] to a multitude of input technologies for urban screens. Direct and indirect interaction modalities include presence, body position, body posture, facial expression, gaze, speech, gesture, remote control, keyboard, touch, and mobile phones [54, 2, 1, 66, 48]. Some researchers looked into the design process and prototyping practices [72, 71, 29], while others created playful or social experiences [46, 103, 12, 93, 57, 49].

Alt et al. [3] summarised the most popular research aspects of studies undertaken in the recent past. Their review contains the following areas: audience behaviour, user experience, user acceptance, user performance, display effectiveness, privacy, and social impact. Dalsgaard et al. [16] provide eight challenges for urban media facade design: developing new user interfaces, integration into physical structures and surroundings, increased demands for robustness and stability, developing content to suit the medium, aligning stakeholders and balancing interests, diversity of situations, transforming social relations, and emerging and unforeseen use of places and systems.

The following literature review focuses on three domains most relevant for this project, that is, urban screens stimulating civic discourse, polling, and user engagement.

2.1. Civic Discourse

Public displays have been described as a promising communication platform for citizens [8]. For instance, they could be used for public discussions on local affairs or for gathering residents' feedback for institutions like city councils. Other tools, such as dedicated websites, or other forms of communication, such as town hall meetings, require people to remember ways of accessing them or to devote time and effort. In that sense, public displays are considered to be more easily available and opportunistic [94]. Additionally, public space has historically always been open to all and seen as a place where people can express themselves. This ranges from casual encounters or leisure time activities on one side to demonstrations on the other side [21]. Consequently, numerous researchers have looked into reviving these qualities within master-planned precincts or fast-growing metropolitan areas by use of public display applications.

A number of studies aimed at sparking discussions, both on-screen and off-screen. For instance, *Discussions in Space* [76] engaged citizens by initiating and displaying debates on urban screens. Its goal was to collaboratively improve the city by collecting citizens' thoughts and handing them to municipal decision makers. However, it relied on mobile phone input and therefore included a barrier for user participation. This is similar to *YourScreen* [78], *Capital Music* [79] and *TexTales* [4]. All of them revealed the importance of looking into new ways for lowering barriers and attracting people's attention.

2. Related Work

Opinionizer [7] and *Wordster* [46] on the other hand shed light on how to trigger real-world social interaction among co-located people. These public display applications initiate social discourse by visualising humorous and provocative statements and by displaying controversial public issues respectively. Essentially, they were an experiment in understanding how public displays can spark real-world social interactions as well as nurture and reveal collaborative expression. *Vote With Your Feet* was inspired by this notion and aimed at extending it. By displaying users' sentiments after their engagement with the screen as well, it further connects them over time.

Digital community boards such as *Digifieds* [1], *Streetinfographics* [14] and the noticeboard by Redhead et al. [70] provide a way for users to shape the content of the public display. *Vote With Your Feet* differs from them in that it only requires a minimum amount of effort to participate, i.e. to cast a vote. However, it builds upon their insights regarding textual user input.

As part of their findings, Schroeter et al. identified ways to increase the frequency and quality of user submissions for digital discussion boards. The sweet spot, as they called it, can be hit by providing content related to the current location of the public display, by closely targeting the application towards its audience (which in their case was mostly young people), and by choosing a location that provides a moment of pause for e.g. passers-by. Furthermore, they found behavioural patterns and came up with a number of user archetypes: The Troll (spams), The Clown (entertains), The Social Player (flirts), The Interested Lurker (reads), The Shy Lurker (reads if nobody is looking), and The Uninterested Non-User (ignores) [76]. These outcomes were taken into account during the development of *Vote With Your Feet*. As a result, it included locally relevant poll questions and did not try to cater to every single passer-by, given that there would always be people who are not interested.

2.2. Polling

Polling in the context of this thesis refers to opinion polls, i.e. a survey of public opinion. Being the most widespread of its kind, polls are often designed to predict winners of political elections. Whereas other times, polls are not meant to accurately represent the opinion of a population based on sampling and extrapolating. They are rather meant to reflect the variety of points of view within a population or reveal a rough tendency towards one standpoint.

In research, there have been various studies on polling systems, ranging from deployments indoors (e.g. in classrooms [20] or meetings [61]) to public spaces (e.g. in bars [58]). Some specifically dealt with urban screens, such as *MyPosition* [94]. Featuring an interactive poll visualisation, it uses a Kinect camera to sense user input (see figure 2.1). This approach comes at the expense of an obvious interaction affordance. As stated by Elrod et al., a “walk-up-and-use” system needs to be self-explanatory in a way that first-time or one-time users need no prior introduction or training [102]. Furthermore, *MyPosition* permanently displays the current results, which is likely to influence people’s voting behaviour.

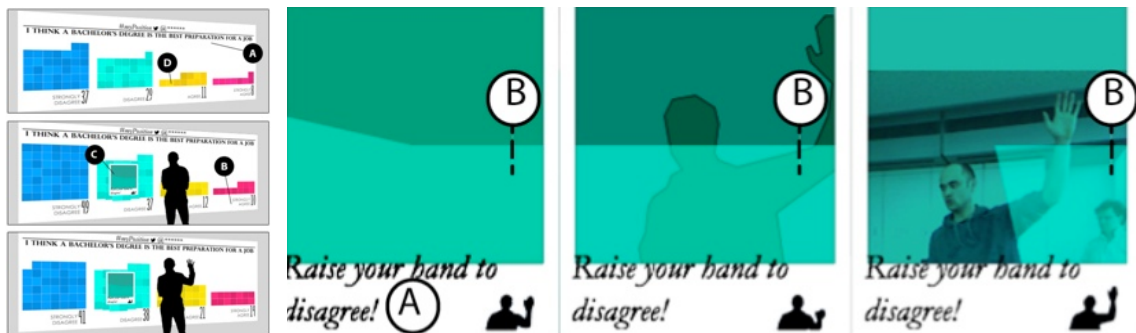


Figure 2.1: *MyPosition* is an interactive poll experimenting with various visualisations [94].

Bringing a physical component to the user interaction, *Swipe I Like* [6] and *PosterVote* [96] lower the barrier of entry by making use of readily available hardware that is more easily understandable by users. While the tangible buttons of *Vote With Your Feet* are a benefit in the same way, those applications do not publicly display the obtained votes for everybody to read, giving rise to a new opportunity.



Figure 2.2: *Free2Choose*, part of Anne Frank Museum in Amsterdam, encourages people to think about the importance of human rights by asking them to vote on current conflicts from around the world [88].

Currently or recently undertaken projects include *Smart Citizen Sentiment Board* [82], *United Colours of Dissent* [92], *Viewpoint* [86] and *Free2Choose* [88], which all are participatory installations that visualise people's sentiment in real time. However, it is unlikely that people would use any of them in public on their own. They either require instructions or rely on people being led to a certain location. For instance, *Free2Choose* is an interactive installation part of the Anne Frank Museum in Amsterdam (shown in figure 2.2). In this museum, visitors end up in a room where they are encouraged to participate in a poll application. The poll installation does not need to attract the visitors' attention since it is part of the museum experience. On the contrary, one could argue that this might be a very much perfect location for a public display rather than disputing over the term "public" and whether it is openly accessible to everybody. Either way, it was designed to encourage people to think about the crucial importance of human rights by showing short films with up-to-day conflicts from around the world. At the end of each film, a question is asked that museum visitors can vote on. While it is interesting to see how people have voted, the results themselves are less important, as stressed by the creators of *Free2Choose*. It is much more important that the participants think about those conflicts and their standpoints. *Vote With Your Feet* builds upon this spirit and, as a matter of fact, was heavily influenced by *Free2Choose*.

2.3. Engagement with Public Displays

User behaviour around public displays was found to be much different from around personal computing devices. While people knowingly turn their attention to their notebooks or mobile phones, they usually do not go out and look for a public display to use. They rather happen to come across a public display, e.g. while waiting, and become motivated by external factors to use them [54]. In light of this circumstance, a number of challenges have been identified in the context of user engagement, which will be briefly summarised in the following.

Public displays are often ignored by urban dwellers. This can happen both unconsciously or knowingly, e.g. when presumed that an urban screen shows merely commercials or content similarly irrelevant to them. This behaviour is called display blindness [34, 55] or display avoidance [42]. A second behavioural pattern is called interaction blindness, which describes how potential users take notice of a public display but do not know that it is interactive [59]. The occurrence of getting someone to interact at last is called first click problem [39]. Even if all these matters are resolved, a public display will fail its function in case the users feel uncomfortable performing tasks in public. Rogers et al. refer to this as social awkwardness or embarrassment [7]. However, there have also been studies where people did not hesitate to perform tasks in public but rather actually enjoyed themselves [62]. Lastly, novelty might distract from actual content as users' engagement might be largely driven by the experience of interacting with a new technology [36].

Müller et al. established attracting people's attention and motivating users to interact as two key challenges in the design of public displays [52]. They came up with the audience funnel which describes when and under what circumstances passers-by can turn into users. It also includes the phases *attention* and *motivation* as illustrated in figure 2.3. *Vote With Your Feet* was designed with the audience funnel in mind and also evaluated in this regard (see chapter 7).

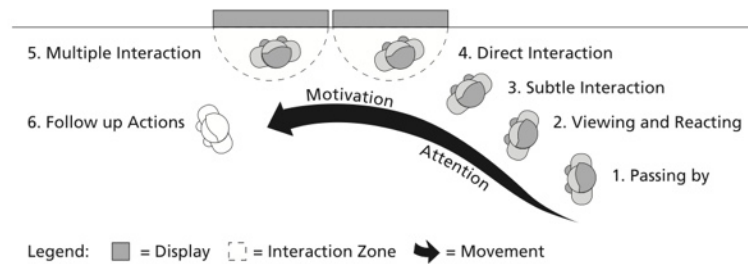


Figure 2.3: The audience funnel illustrates the phases *attention* and *motivation* that turn a passer-by into a user [54].

Similarly, Finke et al. chronicled the various interaction states, i.e. enter, glance, decode, observe, input, feedback, result [22]. Additionally, Fischer et al. gave a rundown of the types of spaces around urban media facades (pictured in figure 2.4) [23], whereas Greenberg et al. specified interpersonal zones ranging from intimate and personal to social and public [31]. These zones demonstrate that public display applications must be designed differently than applications for personal devices. In particular, the design should involve spectators and make use of the social space provided in public.

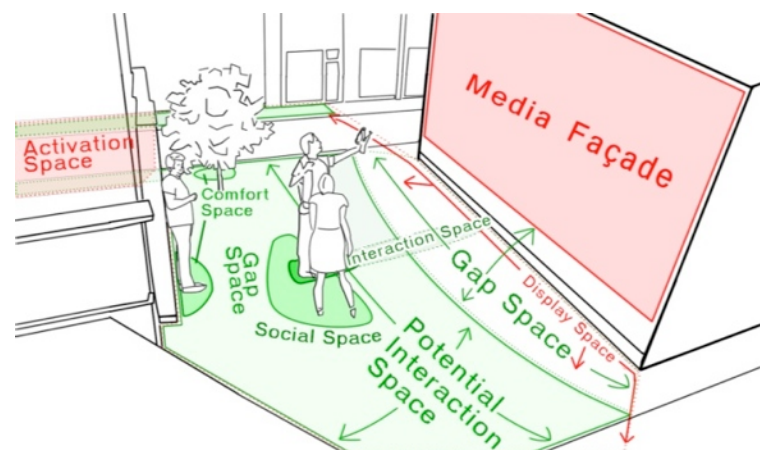


Figure 2.4: Types of spaces around media facades [23].

A well-known approach to increase attention and motivation is the enticement of people by other people. Labeled as the honeypot effect by Brignull and Rogers [7], it describes how people who currently interact with a public display take anxiety away from by-standers or spark their curiosity. As a result, by-standers feel allured to try the public display application themselves. Staying in the realm of spatial characteristics, Huang provides recommendations regarding screen positioning [34]. However, these could not be taken into account for *Vote With Your Feet*, since the fixed placement of the screen was a given constraint (see section 3.2).

Furthermore, attention can be aroused through the screen content itself. Proposed methods include behavioural urgency, avoiding change blindness [54], bayesian surprise [35] and improving the graphic design [42]. However, for this project, it was nearly impossible to attract attention through the screen itself. This judgement was based on previous experiments with the designated urban screen (see section 5.1). Consequently, this issue was addressed by the idea of

placing tangible buttons on the ground. This bore the question whether those buttons could lead to benefits like lowering the barrier for user participation or to drawbacks like discomfort or awkwardness.

2.4. Conclusions

Overall, the research space of engaging people in discussions and reflecting upon their opinions through public displays has gained a lot of traction. Based on the learnings from the literature review, the author decided to further investigate the potential of polling. Given their simple yet stimulating character, polls seemed to present a method for sparking civic discourse and addressing issues of locally relevant nature.

Challenges in the design of public display applications have been identified, in particular attracting people's attention and motivating people to interact. However, many of the discovered difficulties remain unresolved. In particular, many previously trialled input modalities require too much effort, such as involving mobile phones. This thesis aims at exploring a simpler input modality. Specifically, tangible buttons on the ground are studied as a way to attract people's attention and as a method for effortless user participation. After Foth, Palleis and Agudelo had looked into an interaction design approach for civic innovation and urban engagement [25], Palleis considered using tangible buttons on the ground in the context of public displays for the first time [63]. Their performance seemed promising in a first expert study of his application *Local Commons* (which he conducted as part of his stay at the Urban Informatics Research Lab at QUT in 2013, see figure 2.5). Given that the tangible buttons had not been thoroughly evaluated in the wild, the author decided to re-use them for this project and extensively study this mode of interaction.

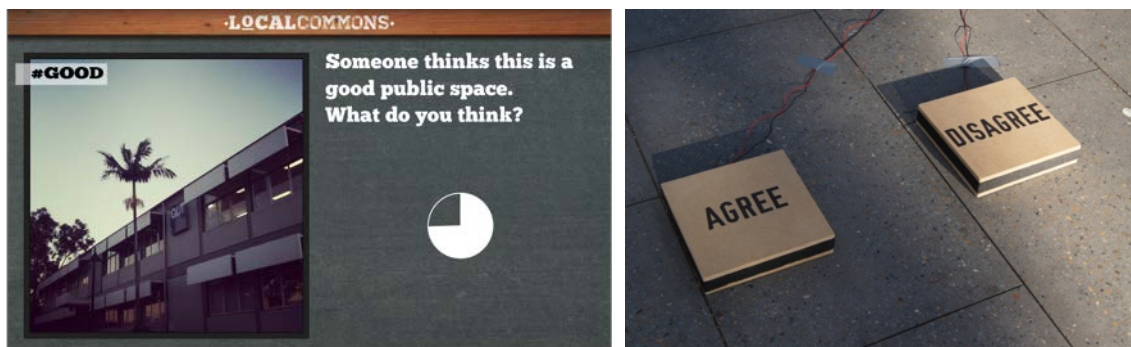


Figure 2.5: Their promising performance in a first expert study by Palleis [63] led the author to study the tangible buttons extensively for *Vote With Your Feet*.

3. Vote With Your Feet

Besides building upon the opportunities revealed in chapter 2 (*Related Work*), *Vote With Your Feet* was informed by design activities such as preliminary user studies. These will be explained in chapter 4 (*Design Process*). First, this chapter describes the concept at its final stage. Inspired by the *Design Space Explorer Framework for Media Façades* [17], it covers the following aspects of the urban screen application: Purpose, content, interaction and participation, location, and situation. Applying this framework helps providing a structured overview of the concept and alleviates comparisons to related work.

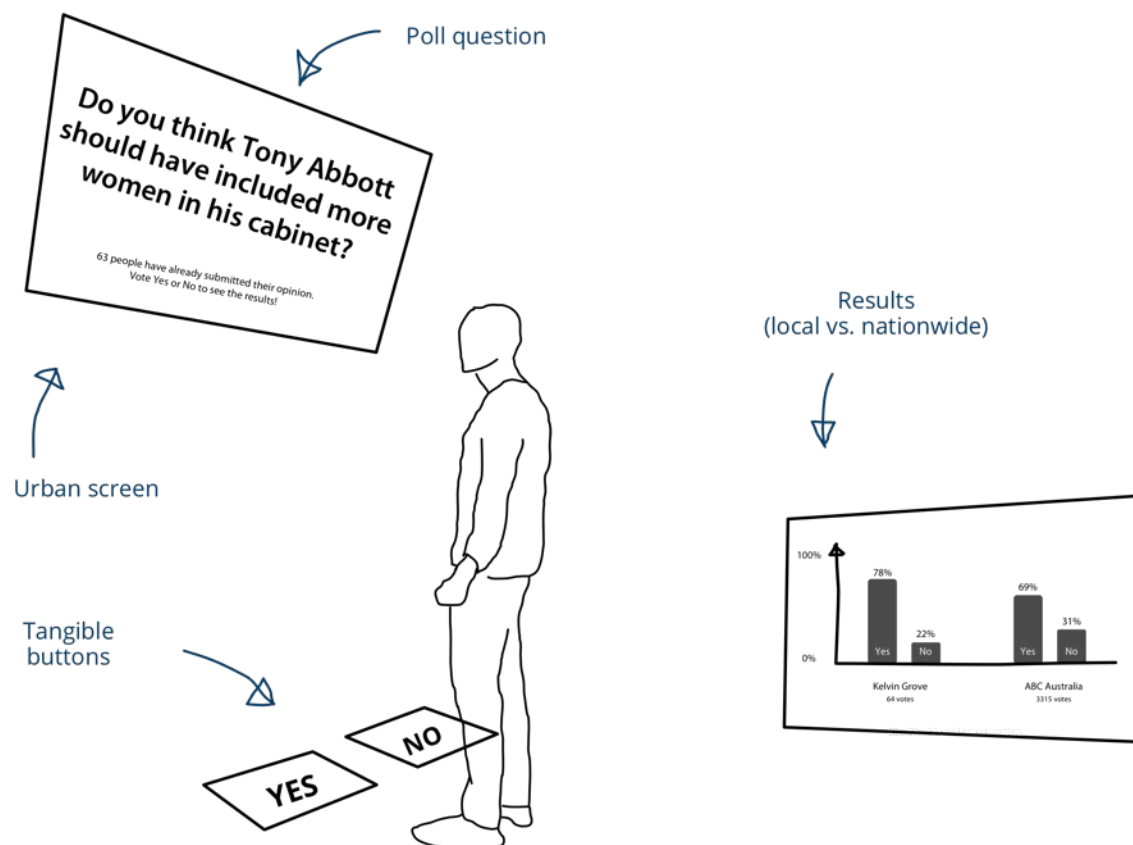


Figure 3.1: Concept sketch of *Vote With Your Feet*.

3.1. Purpose

Vote With Your Feet is a hyperlocal polling tool that allows users to express their opinion on current affairs and other issues. Similar to vox populi interviews on TV, it is meant to reflect the mindset of the community and its diversity. It shows one Yes/No question at a time and allows the user to vote by stepping on one of two tangible buttons (see figure 3.1). By displaying results from local users but also national results (taken from newspaper polls) side by side, it can create a sense of place, spark conversations, and inspire people to think about their own opinion. As a tangible media installation that bridges physical and digital urban layers, the

project experiments with a bottom-up approach in terms of stimulating opinions and stimulating civic discourse. The figure of speech *to vote with one's feet*, which usually refers to the expression of dissatisfaction by walking away, is thus given another meaning.

3.2. Content

The *Vote With Your Feet* application consists of two main views. The first shows a Yes/No question, the second its results (see figure 3.2). The question is shown until a user answers it or until the end of a set timeout of 30 seconds. It then either displays its results for the duration of the same timeout or goes straight to a new question. Each question comes with an image and a note hinting at the source of the question (e.g. “This question was asked by a user.”). To encourage people to participate, the question view says “17 people have already submitted their opinion. Vote Yes or No to see the results!” (17 being an example). The application also indicates that a new question would be shown shortly, e.g. for users who are not interested in the current question. The question view provides a countdown and says “14 until next question” (14 being an example of the current countdown status). The results view explains how users can go to the next question faster. It says “Press any button to continue or wait 12” (12 being an example of the current countdown status). Lastly, the application explains how users can suggest their own questions. This aspect is described in section 3.3.

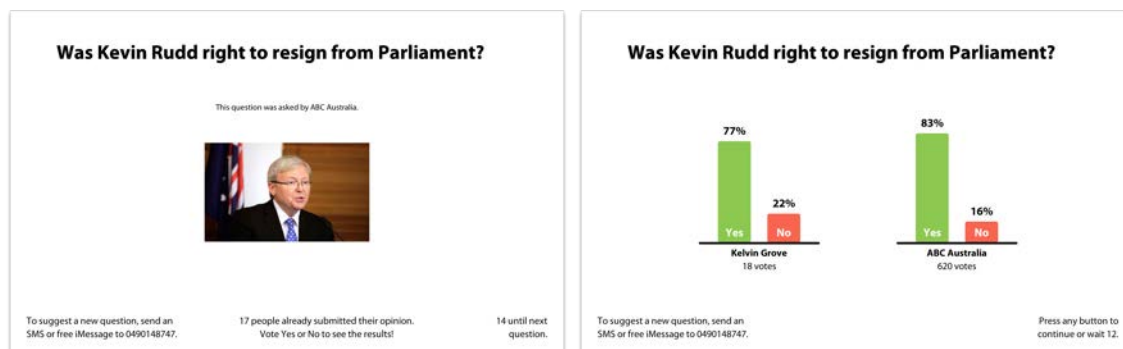


Figure 3.2: Screenshots of the two main views of the *Vote With Your Feet* application for a political question (left) and its results (right).

The poll questions can be clustered into four categories, which will be presented in the following. A complete listing of all poll questions can be found in appendix A.

Politics and current affairs. These questions were taken from the Australian news website *ABC* which features weekly polls called *The Drum Polls* [89]. This category included questions such as: “Was Kevin Rudd right to resign from Parliament?”, “Do you think Tony Abbott should have included more women in his cabinet?”, “Should Australia have committed more than \$10 million towards the relief effort in the Philippines?” A standout characteristic of this category is screen incorporating the national results from the *ABC* website in addition to the local results based on user input of *Vote With Your Feet*. This allows users to compare the sentiment of their local community to the sentiment of a larger community (i.e. Australia).

Local community and local events. This category goes back to the *Sweet Spot* by Schroeter et al. who recommend content related to the current location in order to drive user engagement [77]. These questions were partly provided by the author and partly by community experts (see section 4.1, *expert interviews*). For instance, some questions were issued by the student support centre of the nearby university, e.g.: “Are you ready for your exams?”, “Did you know there is a video game room at the library?” When *Vote With Your Feet* was showcased at OzCHI ’13, a conference organiser and a keynote speaker contributed questions related to the event and to his talk respectively, such as: “Do you enjoy the catering?”, “Do you need to walk around a kitchen design to understand if it suits you?” Furthermore, the questions provided by the author referred to demographics and people’s identity, e.g.: “Do you consider Brisbane your hometown?”, “Did you grow up in Australia?”

User-submitted questions. As pointed out earlier, one of the objectives of this project was to enable users to generate and spread their own content, opposed to merely consuming it. As a first step into this direction, users could suggest new questions via text message (as described in section 3.3).

Meta. Lastly, there were questions related to *Vote With Your Feet* itself. These were mostly of interest to the author, but to some extent also to the users. From the author’s perspective, they helped gather insights into the way users perceived some of the characteristics of the application. From a user’s perspective, they shed light on other users’ behaviour and understanding. Examples include: “Did you know that some questions were submitted by users?”, “Do you answer these questions honestly?” (See figure 3.3)

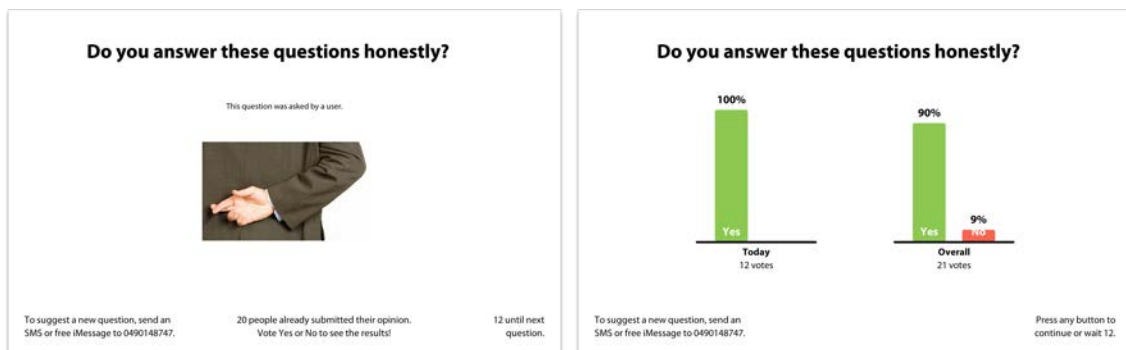


Figure 3.3: One of the questions that refers to *Vote With Your Feet* itself.

By displaying hyperlocal poll results, *Vote With Your Feet* experiments with mirroring the sentiment of the nearby community. It is a first step in terms of looking into ways for reflecting information about a community and its people, as proposed by Foth et al. [24], and goes further than self-expression which is what Davies et al. seek [18]. Unlike the first category, the users’ results in the second, third and fourth category cannot be compared to the results of another community at this point. To provide some more context anyway, the results were displayed for the current day as well as for the overall application life cycle (i.e. “Today” vs. “Overall”).

3.3. Interaction and Participation

Vote With Your Feet relies on tangible interaction using buttons on the ground. One user at a time can participate in the polling system by stepping on either one of the two Yes/No buttons (see figure 3.4). After the user has successfully cast their vote, both visual and sound feedback is produced to confirm the user's input. Unlike related work (e.g. [94], [82]), the results are only shown after the user casts their vote. This is done to avoid users from being influenced.

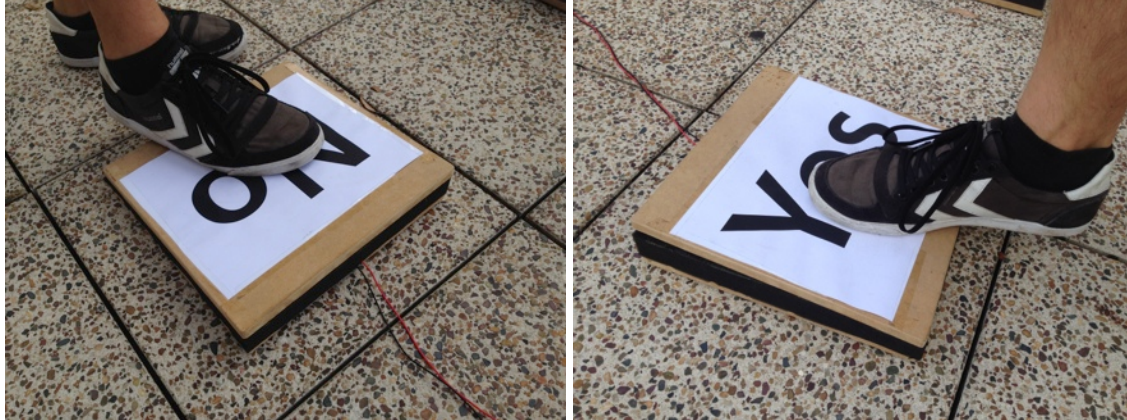


Figure 3.4: User can cast their vote by stepping on one of the two tangible buttons labeled “Yes” and “No”.

Based on an extensive literature review (see chapter 2), tangible buttons on the ground have not been studied before for engaging people with public displays. The rationale behind this choice of technology is based on both learnings from related work and previous experiences with the form factor of the designated urban screen and its surroundings. Previously trialled input modalities at this particular screen include social media channels, text messages, gesture interaction using a Kinect, and QR codes [78], [79], [76]. None of these performed strongly as they either failed to attract people's attention or presented too big of a barrier for users (e.g. requiring users to take out their phone to scan a QR code). Furthermore, Taylor et al. report how all users opted for tangible interaction and none interacted via text message during the entire deployment of *Viewport* [86].

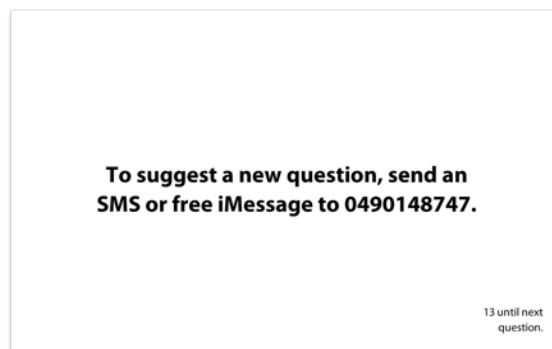


Figure 3.5: The application encouraging users to submit their own question.

Apart from casting their vote using the tangible buttons on the ground, users can interact with the application in a second way. That is, new questions can be submitted via text message or free iMessage. As shown in figure 3.5, users are encouraged to do so by a dedicated screen message which appears every five questions. As explained in-depth in the implementation chapter (section 6.2), the reasoning behind this choice of technology was informed both by literature and the rapid prototyping frame of mind.

3.4. Location

Vote With Your Feet was deployed at a bus stop in Kelvin Grove Urban Village in Brisbane, Australia. The area combines education, residential, health, retail, recreational and business facilities within one precinct. It promotes social sustainability with its emphasis on community facilities and shared public space and by the inclusion of information technology to form a connected community [40]. Being a flagship urban renewal project by the Queensland Government, it is intended to showcase visual evidence of connectivity within the community, which has inspired projects such as the *Virtual Fish* by Young et al. [104].

As pictured from different points of view in figure 3.6, the bus stop is a sheltered place within an urban area. It consists of two wooden benches to sit on, the screen and a roof. In its vicinity, there are trash bins, a phone booth as well as a sign post where people queue and enter the bus. Most importantly, this location presents an in-the-wild setting with a variety of different people.



Figure 3.6: The bus stop in Kelvin Grove Urban Village in Brisbane, Australia, was the deployment location of *Vote With Your Feet*.

Bus stops have been the location of choice for a variety of public display applications in the past. Explored areas range from creating ad-hoc music playlists [9, 79], improving the passenger experience [90], engaging young teens [33] to experimenting with futuristic bus terminals of adaptable and participatory nature [91, 80]. Notably, the exact same urban screen at this particular bus stop was first used by Schroeter and Seeburger [76, 78].

3.5. Situation

People near the screen (i.e. potential users) can be categorised into two groups. First, there were people waiting for the bus and e.g. sitting down, chatting or checking their phones. Second, there were passers-by going to lunch, work, university, the local markets or home. Seeburger et al. provides in-depth data about people's behaviour at this particular bus stop, e.g. the numbers of people walking, standing, sitting and glancing at the screen. [78]

Summarising the upside of this context, the presented location and situation serve as a fitting context for public displays due to its high traffic of diverse people and due to the fact that people seem to look for ways to kill time while waiting for their bus. This judgement is supported by several authors who identified places where people wait, where they go to obtain information or where they pass regularly as preferable [13, 77, 87].

On the downside, however, it needed to be considered that people tend to look down rather than up towards the screen. With respect to attracting attention this issue was addressed by placing the main user interface on the ground. Furthermore, it was necessary to keep in mind that most people's objective was catching the bus, thus only allowing for a limited amount of interaction time. This matter was resolved by allowing users to begin, pause and quit anytime. (See *interaction and participation*.)

4. Design Process

The design of *Vote With Your Feet* was informed by the literature review described in chapter 2 as well as by concept development activities. The main concepts of the prototype were fleshed out during the early phase. In particular, a focus group and expert interviews delivered valuable input for the overall design (section 4.1). In order to create a great user experience, a number of design goals were put together (section 4.2). In the later phases running up to the field study, the development focus shifted towards refining the design, extending the system and addressing usability issues. The development was structured in a way that would repeatedly involve users in the evaluation of the latest features and changes (sections 4.3 and 4.4).

4.1. Concept Development

The major concept elements were generated in a number of concept development activities, which will be laid out in the following.

Focus group. First, a focus group was carried out which helped open up the design space and gather as many ideas and points of view as possible. This was done with a group of six people from within the Urban Informatics Research Lab. It took place during one of the *Friday Rumble* sessions which are informal team meetings that occur on a regular basis. These are usually used for brainstormings, design walk-throughs or guest talks. During this brainstorming session, a range of topics was explored and debated. Amongst others, the different topics included social interaction in public places, playfulness, issues while waiting at a bus stops, and opportunities for communities using technologies. Besides inspiring several concept ideas, two of the main usability goals were produced during this focus group: *low barrier for user participation* and *short interaction times*.

Sketching. Second, the author came up with a variety of more specific concept ideas which were sketched out on paper or digitally. A number of them were affected by the themes discussed in the focus group. Related concepts, both ranging from inside and outside of academia, were collected and printed out to serve for further inspiration. As shown in figure 4.1, all sketches and printouts were put up at the author's desk and made visible for colleagues. This was done to foster spontaneous discussions within the lab and to encourage colleagues to voice their thoughts and suggestions. This activity was proposed by Greenberg et al. in *Sketching User Experiences: The Workbook* [30].

Ultimately, two examples of public polling from outside of academia gave birth to the concept of *Vote With Your Feet*. These two inspirations were the *Free2Choose* exhibition in the Anne Frank Museum in Amsterdam [88] on the one hand, and the audience polls on the German TV show *Pelzig hält sich* [67] on the other hand. Further details of the concept idea were then shaped and influenced by closely examining related work (see chapter 2).



Figure 4.1: Sketches and related concepts were made visible to colleagues to foster discussions within the lab.

Expert interviews. Lastly, after the main idea of hyperlocal public polling had been established, two expert interviews were conducted. These were done to receive some outside perspective and round off the concept. As presented in section 3.2, the *Vote With Your Feet* application displays questions of a variety of different themes. These were shaped as a result of discussions with the two experts. One was a communication officer of the university who is involved in delivering university-related content through social media and on-campus public displays. The second was a member of the university’s student support team. Due to her function and due to her office being across the screen location, she is up-to-date in terms of the local community. Both gave insights into their experiences delivering content and suggested a series of potential poll questions. Some of them ended up being displayed on the screen, as part of the content category *local community and local events*.

4.2. Usability Goals

Usability issues or a lack of context considerations can stand in the way of user experiences. Therefore, the following usability goals were put together to help overcome potential obstacles.

Bypass visibility issues. As outlined in section 3.5, the glare and positioning of the screen presented major issues for all previous applications deployed at the bus stop in terms of attracting attention. Whereas the glare might be less of a concern after dark, the positioning of the screen could not be improved. Rather than classifying it as a design decision that could be handled differently somewhere else, this issue was acknowledged as a real-world problem that is likely to occur in many other instances. As a result, bypassing these issues was one of the main usability goals that emerged from looking at the given resources and constraints. This had to be tackled by looking into ways of engaging users past the screen itself, e.g. considering tangible interaction.

Provide low barrier for user participation. Related to the above objective, providing a low barrier of entry for user participation had been established as another goal. It arose from examining numerous public display applications and their success factors with respect to participation. Although previous endeavours looked into ways of making user participation more easily and inviting, there was still considerably room for improvement. They still required a fair bit of effort from the user, e.g. taking out a smartphone and scanning the QR code or

launching Facebook or Twitter. The goal for *Vote With Your Feet* was to make participation as effortless as an online poll on a news website. In particular, it was supposed to work regardless of people's technological understanding or age.

Minimise discomfort. Public displays face several challenges due to their very nature of being set up in public space. Users feeling exposed while interacting with a public display application is one of them. Addressing this matter, researchers have previously applied playfulness [46] or facilitated multi-user [57] or remote [79] interaction. During the design of *Vote With Your Feet*, these options were considered, as well as content that relates to its potential users and an inviting interface that makes it obvious to its users that they are allowed to use the application.

Short interaction times. Considering that *Vote With Your Feet* would be deployed at bus stop, it was important to take its context into account. Since a large number of users would be people waiting for the bus, their specific needs and limitations needed to be borne in mind from early on in the design process. This especially meant allowing for short interaction times as potential users should not worry about missing their bus. The bus arrives every ten minutes, which provided an upper limit for those users. For most it was a much shorter amount of time as many people do not make their way to the bus stop until only a few minutes prior to the arrival of the bus. Means to this end include avoiding introductory procedures or lengthy setups as well as making it possible to stop at any given time.

4.3. Preliminary User Studies

Following a user-centred design process, several preliminary studies were conducted throughout the development of *Vote With Your Feet*. The main goal of the test runs was testing the latest features and study their usability. Furthermore, they served to gather first insights into the user experience and to practice conducting in-the-wild studies early on. Lastly, they provided a way of identifying technical issues and learning about the effort involved in deploying the system. As Storz et al. pointed out, the effort involved in creating real system deployments and the impact of environmental factors on a deployment are never to be underestimated [84].



Figure 4.2: Usability testing at a bus stop in Brisbane (left) and gathering expert feedback at OzCHI '13 in Adelaide (right). The poster shown in the right photo can be found in appendix F.

Over the course of three weeks, the latest version of *Vote With Your Feet* was assessed in a total of four 120-180 minutes sessions. These preliminary studies took place in the same real-world setting for which the system was designed for (see section 4.4). Additionally, *Vote With Your Feet* was exhibited at OzCHI conference in Adelaide in late November 2013 (the corresponding poster publication [83] can be found in appendix F). Over the course of eight coffee and lunch breaks, expert feedback was gathered from conference participants. (See figure 4.2)

4.4. Improvements Resulting from the Preliminary User Studies

In the following, the main usability improvements resulting from the preliminary studies will be laid out.

Feedback for user input. Both a visual animation (see figure 4.3) and a sound effect were added to the software to indicate to the users that their input was recognised. The sound effect is important because people tend to look down while voting so they cannot see any visual cues at most times. As an additional benefit, it also draws nearby people’s attention and serves as a reward as pointed out by several study participants.

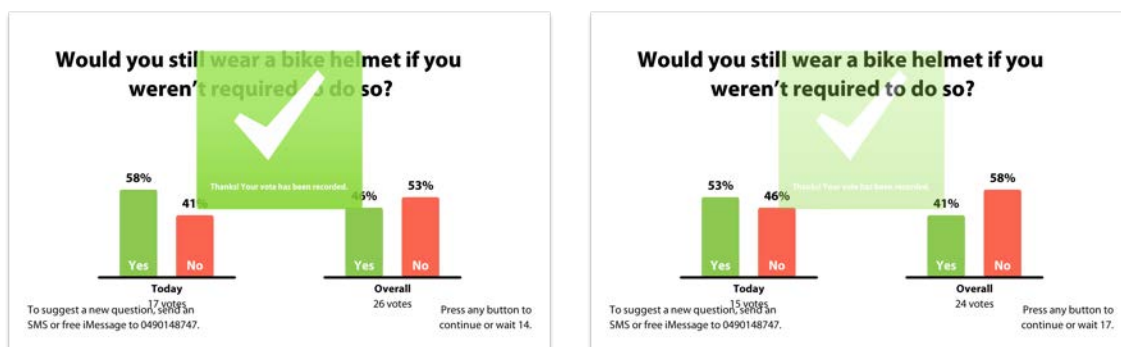


Figure 4.3: The green arrow captioned “Thanks! Your vote has been recorded” serves as visual user feedback. After a few seconds it fades out.

Readability. One of the major challenges designing *Vote With Your Feet* was to get the readability right. This was hard because of two reasons. First, the screen is outdoors and can be thus poorly visible in daylight. Second, it is placed in a case behind a glass lid which even worsens the glare. In order to minimise these effects, the font size was increased and the choice of colours improved. In the beginning, white text on a dark background was used, which worked well indoors for testing. However, using this mixture the text was too hard to make out outdoors. A white background not only stood out more in daylight but also next to the dark case of the screen. Figure 4.4 shows the evolution of the graphical user interface.

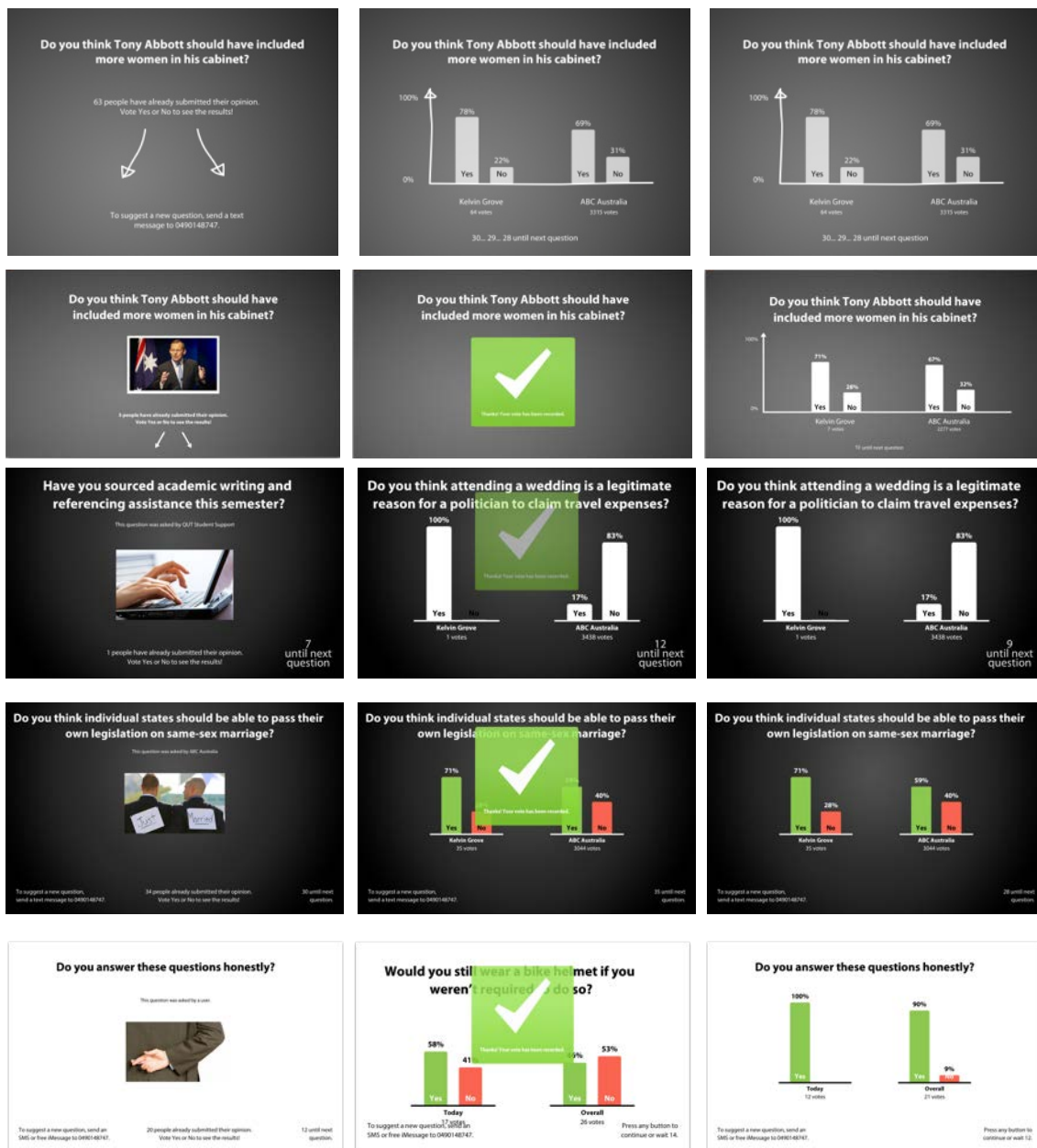


Figure 4.4: The evolution of the graphical user interface. Top row: Initial design sketch. Second row: Implementation of initial design. Third row: Improved contrast and better separation of the two bars by making use of the law of proximity. Fourth row: Using colours to make it easier to tell “Yes” and “No” apart. Bottom row: Improved contrast by switching to a white background.

Timing and user control. After displaying the results for one question, the application automatically continues to the next questions after a set amount of time. When this happened too fast, users were put-off because they did not have the chance to finish looking at the results. When the app did this too slowly though, users got bored and lost interest quickly. Subsequently, there was some tweaking and fine-tuning involved to get the timeout right. Additionally, next to the timeout countdown a text label was added which says “step on any button to continue to next question”. This gives additional control to the users and allows them to interact at their own pace.

Buttons affordance. Initially the majority of users assumed the buttons were touch-sensitive and fragile like a smartphone. Many were too gentle when casting their vote with their feet and subsequently the application could not receive their input. In order to improve the physical stepping affordance, the “Yes” and “No” text labels on the buttons were enhanced and now hint at actually stepping. As shown in figure 4.5, it says “Step on here to vote”, resulting in the majority of people putting much more weight on the buttons.

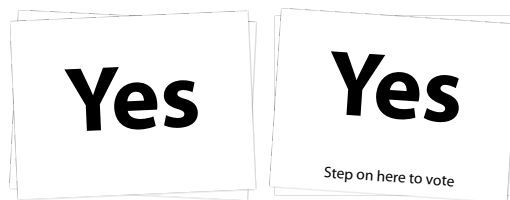


Figure 4.5: Adding the note “Step on here to vote” (right) improved the physical stepping affordance and reduced the number of users who believed the buttons to be touch-sensitive and fragile (left).

5. Implementation

This section presents the technology behind the system. The development was driven by the objective of delivering a functional prototype for evaluation within a real-world context. Many technological decisions were made to support rapid prototyping. This was considered an important prerequisite to execute a user-centred design approach. The goal of this section is to provide documentation for the key components of the system, as well as explain the rationale behind the adopted solutions. Section 5.1 provides in-depth information regarding the hardware, whereas the software will be covered in detail in section 5.2.

5.1. Hardware

Overview. *Vote With Your Feet* consists of various hardware and software components: a large screen, speakers, a computer running the *Vote With Your Feet* application, two tangible buttons and a MaKey MaKey board. Figure 5.1 illustrates all involved system components and their interconnections.

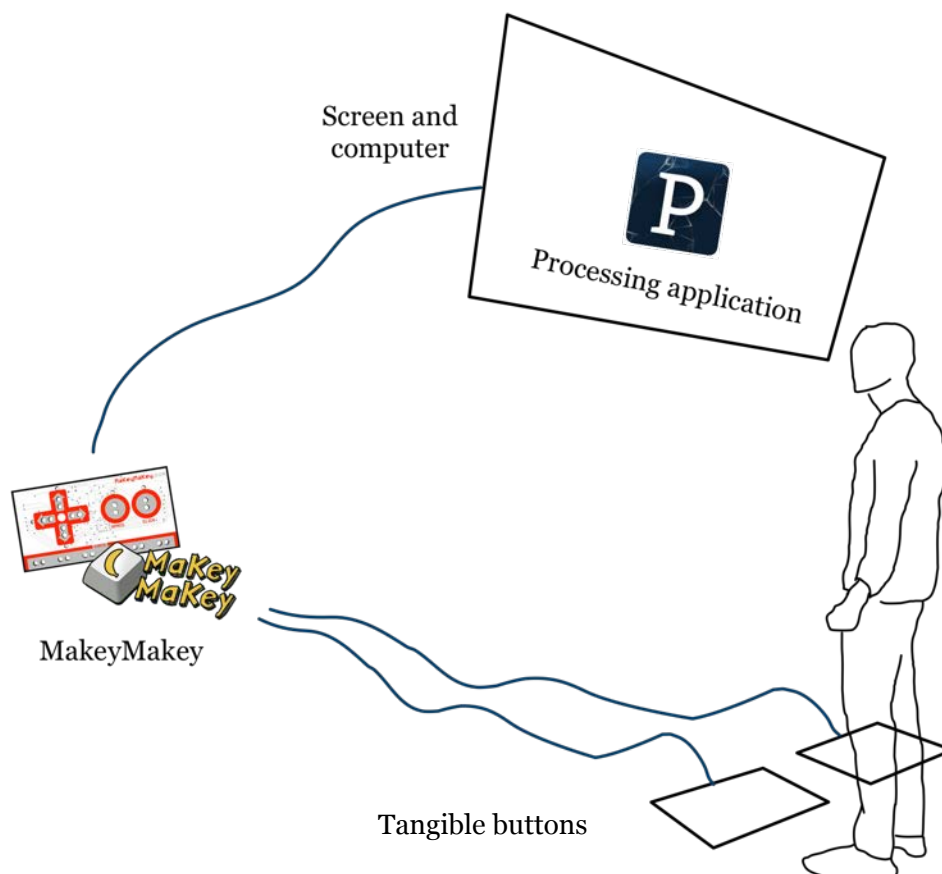


Figure 5.1: The software and hardware components of *Vote With Your Feet*

Buttons. The two tangible buttons were custom-built by Robin Palleis for a previous project in our research group [63]. Made of timber on top and bottom and foam in between, they are robust pads of 40 cm * 40 cm * 10 cm in size. Similar to simple off-the-shelf buttons, an electric contact is being closed when pushing the button, or stepping on it in this case.

The buttons are labeled “Yes” and “No” respectively and sport a note “Step on here to vote” (see figure 5.2). They were put onto the ground below the screen and moved about 1.5 m towards the street, i.e. towards the viewer. Neither the buttons nor the wires were permanently fixed using screws, tape or else.



Figure 5.2: The tangible buttons used for user input.

MaKey MaKey. In order for the application to read the button states, a MaKey MaKey board [47] serves as the interface between hardware and software. MaKey MaKey is a simple prototyping kit that turns physical objects into touchpads, game controllers or other tangible user interfaces. In essence, it is a printed circuit board with an ATmega32u4 microcontroller running Arduino Leonardo firmware. It uses the Human Interface Device (HID) protocol to communicate with computers, and can send key presses, mouse clicks, and mouse movements. It was connected to the computer via USB and put into the screen case next to the computer and its speakers.

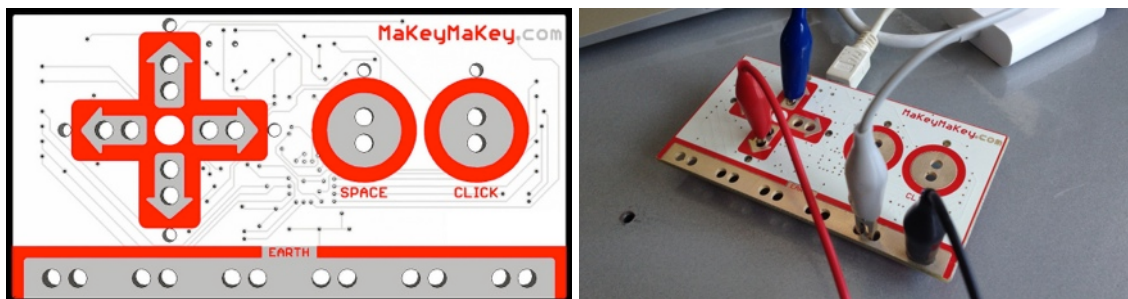


Figure 5.3: The *MaKey MaKey* board provides easily accessible alligator clipping inputs for *Up*, *Down*, *Left*, *Right*, *Space* and *Click* key press events.

For sensing user interaction on the two tangible buttons, the *Yes* and *No* contacts were wired to the *Up* and *Down* inputs of the MaKey MaKey. As a result, *Up* and *Down* key press events are

sent to the computer (see figure 5.3). These act like regular keyboard events and trigger a method to handle the user's vote (more on this in the software section). Using a MaKey MaKey board provided the benefit of being able to use a regular keyboard for testing purposes. It allowed for fast development and testing iterations without setting up additional testing instructions in the software. Not having to deal with any hardware related issues is the second major benefit of using MaKey MaKey. By encapsulating all hardware related functionality and offering a simple software abstraction in form of key press events, it frees up considerable time, effort and resources that usually go into hardware prototyping, e.g. soldering, debugging and programming.

Screen. The urban screen used for this project was set up a few years prior to this project specifically for the purpose of public displays research. It is enclosed in a vandal resistant and waterproof case and it also was installed in such a way that permanent access to power and internet is ensured. Linden et al. stress the importance of a high degree of robustness and availability of public displays being deployed [44]. Due to this nature, the positioning of the screen cannot be changed, although it might be desirable to do so in order to avoid the glare caused by the glass case front as well as to improve the subpar visibility resulting from the unusually high positioning. However, these issues present real-world constraints that must be taken into account when designing public display applications.



Figure 5.4: The main screen used for testing, deploying and evaluating *Vote With Your Feet* at a bus stop. Its enclosing case is water proof and also protects the hardware from vandalism.

The screen is a 50-inch display sporting a resolution of 1280 * 1024 pixels. Although several other screens sized between 20 and 30 inches were used for testing and preliminary studies, this one was used for the main evaluation as it was incorporated into a real-world setting. In figure 5.4 it is pictured both in its setting at the bus stop and in detail. A computer running Windows 7, speakers and the MaKey MaKey board were situated in the enclosing case of the screen as well.

5.2. Software

Overview. The *Vote With Your Feet* application was developed in Processing [68], a programming language and environment created with rapid prototyping in mind. Due to it being based on Java, it is possible to run Processing applications on all three major desktop operating systems Windows, Mac and Linux. This was a decisive factor at the beginning of development, since the application had to be executed on the Windows based computer at the bus stop as well as on other computers, e.g. for testing or demo purposes. The following paragraphs will provide insights into the implementation of the core software features.

Graphical user interface. The user interface consists of three different views: the *question view*, the *results view* and the *suggest view*. The latter asks users to submit a new question. The *draw()* method, which lies at the heart of each Processing application, is responsible for displaying the correct view depending on the current application state. The state changes either upon user interaction or a timeout, resulting in a switch between the *question view* and *results view*. The *suggest view* is periodically displayed after every fifth question.

Each view is dynamically assembled by drawing its various subviews based on the current question, vote numbers etc. This modular structure makes it possible to reuse code for multiple occurrences of similar elements and provides flexibility when changing attributes like colour or font for a type of user interface element. The following source code serves as an example, it shows the composition of the *results view*:

```
void displayResults() {
    displayQuestion();
    displayGraph();
    displayCountOfVotes();
    displaySources();
    displayTimeoutCountdown();
    displayFeedbackThankYou();
}

void displayGraph() {
    // bar for local yes vote
    int percentage = 100 * localYesCount / localVotesCount;
    int x = localCenterX - margin/2 - barWidth/2;
    displayBar(x, percentage, yesLabel, yesColor);

    // calculate percentage and x for remaining 3 bars and draw them
}
```

Responsive design. One of the standout characteristics of the *Vote With Your Feet* application is its responsive design. The application can be run on numerous screens of varying resolutions by adapting to the size of the screen and dynamically arranging the user interface elements. In order to achieve this, the positioning of the user interface elements is determined during runtime based on the *width* and *height* attributes of the application window. By adhering to this design practice, a great flexibility was achieved in terms of different locations for deployment. It became clear early on in the development process that this step was necessary to be able to run the application in locations other than the bus stop. It proved to be a valuable quality of the

software as it could then be further developed on a laptop, demonstrated in meeting rooms (figure 5.5) and evaluated in different locations.



Figure 5.5: *Vote With Your Feet* in a meeting room. Due to its responsive design, the application could be run on different screen sizes for testing purposes.

Data persistence. In order to run the application over the course of multiple sessions without having to start from scratch each time, it was necessary to permanently store the users' votes. Such data is usually stored in a database and then queried or imported as a temporary copy during runtime. However, in order to stay agile during the development process it was important to keep the complexity of the overall system at a minimum. Instead of integrating a database the *Vote With Your Feet* application therefore had to adopt a more lightweight solution. By opting for storing the data in a text file as comma separated values (CSV), this was ensured while still preserving the necessary degree of robustness. A sample data set can be seen in figure 5.6, including the questions and their corresponding distribution of votes, which makes up the core of the data.

| text | localYesCount | localNoCount | globalYesCount | globalNoCount | photoFilename | localCountSource | globalCountSource | questionSource |
|--|---------------|--------------|----------------|---------------|---------------------|------------------|-------------------|----------------------------|
| Do you think Tony Abbott should have included more women in his cabinet? | 2 | 1 | 1548 | 729 | tonyabbott.jpg | OzCHI | ABC Australia | ABC Australia |
| Do you think individual states should be able to pass their own legislation on same-sex marriage? | 4 | 0 | 1796 | 1248 | samesexmarriage.jpg | OzCHI | ABC Australia | ABC Australia |
| Do you think attending a wedding is a legitimate reason for a politician to claim travel expenses? | 2 | 2 | 584 | 2854 | travelexpenses.png | OzCHIe | ABC Australia | ABC Australia |
| Was Kevin Rudd right to resign from Parliament? | 4 | 2 | 1648 | 362 | kevinrudd.jpg | OzCHI | ABC Australia | ABC Australia |
| Should Australia have committed more than \$10 million towards the relief effort in the Philippines? | 1 | 3 | 561 | 236 | philippines.jpg | OzCHI | ABC Australia | ABC Australia |
| Do you consider Adelaide your hometown? | 1 | 4 | 2 | 6 | adelaide.jpg | Today | Overall | a user |
| Did you grow up in Australia? | 3 | 3 | 15 | 9 | australia.jpg | Today | Overall | a user |
| Have you worked in HCI for 5 years or longer? | 0 | 2 | 0 | 2 | hci.jpg | Today | Overall | a user |
| Do you find the venue suitable for OzCHI? | 4 | 2 | 4 | 2 | venue.jpg | Today | Overall | a conference organizer |
| Do you enjoy the catering? | 1 | 2 | 1 | 2 | catering.jpg | Today | Overall | a conference organizer |
| Do you find the conference stimulating? | 5 | 0 | 5 | 0 | stimulating.jpg | Today | Overall | a conference organizer |
| Will you be attending next year's OzCHI Conference? | 1 | 3 | 1 | 3 | 2014.png | Today | Overall | a conference organizer |
| Do you have trouble reading floor plans? | 6 | 2 | 6 | 2 | floorplan.jpg | Today | Overall | keynote speaker Bruce Thor |
| Do you need to sit on furniture to understand if it is comfortable? | 4 | 1 | 4 | 1 | furniture.png | Today | Overall | keynote speaker Bruce Thor |
| Do you need to walk around a kitchen design to understand if it suits you? | 3 | 2 | 3 | 2 | kitchen.jpg | Today | Overall | keynote speaker Bruce Thor |

Figure 5.6: A sample data set of questions and votes, stored in a CSV file.

Processing supports this way of managing data by offering the *Table* and *TableRow* classes that handle reading and writing CSV files. The following code snippet illustrates the necessary steps to ensure data persistence in the *Vote With Your Feet* software. It includes reading data from a CSV file, retrieving a single data row, updating one of its values and writing the changes to the CSV file:

5. Implementation

```
// load from csv file
Table table = loadTable(filename);

// get question
TableRow currentQuestion = table.getRow(index);

// update value
currentQuestion.setInt("localNoCount", newLocalNoCount);

// save to csv file
saveTable(table, filename);
```

User-submitted questions. User-generated content on public displays has been a rare occurrence so far. A major challenge in engaging users to contribute is to lower the barrier for user participation as much as possible. Previous efforts in our research group for text input included facilitating social media channels and text messages. A study by Schroeter et al. [76] identified text messages to be more popular than Twitter for text input (600 text messages vs. 50 tweets). Consequently, text messages were the chosen input modality for *Vote With Your Feet*. They were sent to the author’s iPhone, therefore being free of charge for other iPhone users (“iMessages”). Figure 5.7 shows a screenshot of the *suggest view*.

The arrangement allowed the author to moderate each incoming submission before adding it to the CSV file. An even bigger benefit, however, is the absence of complexity both for the user and the developer. Text messages present a familiar technology for mainstream users and do not require any additional setup such as signing-up for the system. It also required zero additional development efforts apart from adding the *suggest view*, fittingly in light of the aforementioned objective regarding rapid prototyping and inspired by sketching practices as preached by Buxton [10].

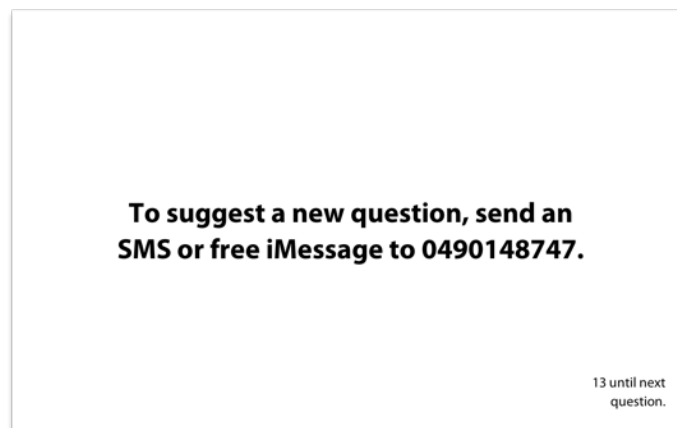


Figure 5.7: Screenshot of the *suggest view* which asks users to submit their own questions.

6. Field Study

Following a qualitative design research approach, the features of *Vote With Your Feet* and its impact on people was assessed by means of observations and interviews. The field study looked into the following aspects of the urban screen application: Attention and motivation, polling in public, social interaction, reflection of the local community, and popular poll questions. The objective of this chapter is to describe these study goals in detail. Furthermore, it covers the setup of the field study as well as how data was collected. Lastly, it explains how the data analysis was inspired by the grounded theory method.

6.1. Research Questions

The main objective of the field study was the evaluation of *Vote With Your Feet* in a real-world setting with respect to the research aims addressed in the introductory chapter. An overview of these research aims is given in table 6.1. This sections expands on them and, at the end, explains which aspects were intentionally excluded from the field study.

| Research Questions | |
|--------------------|---|
| (i) | How can tangible buttons on the ground help to attract attention and to lower the barrier for user participation? |
| (ii) | What are the implications of polling in public and its impact on performative interaction, discomfort and answering honestly? |
| (iii) | How can information about the local community be reflected? |
| (iv) | Which are the most popular poll topics and how can users contribute content? |
| (v) | What are the social interactions caused by <i>Vote With Your Feet</i> ? |

Table 6.1: Overview of the questions this thesis aims to answer.

(i) Attention and motivation. Being a novel mode of user interaction, the tangible buttons on the ground were put in place to solve issues related to attracting attention and motivating users to interact. The terms attention (*what made you notice Vote With Your Feet?*) and motivation (*what made you participate in With Vote With Your Feet?*) are used as described by Müller et al. [54]. The research question that arose was: How can tangible buttons on the ground help attract attention and lower the barrier for user participation?

(ii) Polling in public. Polling usually is a very much private (e.g. voting on a news website) and often anonymous activity (e.g. voting in federal elections) which is very unlike the nature of interacting with a public display. Consequently, the second research question was: What are the implications of polling in public and its impact on performative interaction, discomfort and answering honestly? Specifically, the author was interested in whether participants valued a low barrier of user participation over a less exposed means of interaction.

(iii) Reflection of the local community. Much of the content of the *Vote With Your Feet* application relates to the location of the screen, allowing users to compare their local results to the results from *ABC*. By displaying hyperlocal questions and poll results, *Vote With Your Feet* experiments with reflecting information about a community and its people, as put forward by Foth et al. [24]. This gave birth to the research question: To which extent can *Vote With Your Feet* reflect information about the local community? What do users value about viewing the poll results?

(iv) Popular poll questions. In order to appeal to its users, the *Vote With Your Feet* application displays poll questions about different topics. Therefore, another research question was: Which are the most popular poll topics and how can users contribute content? That is, what are themes of interest and what kind of questions are submitted by users? Investigating this subject matter was considered valuable because its findings would ensue content improvements and lead to poll questions that more specifically address issues that the community can profit from.

(v) Social interaction. Public displays are often situated in highly frequented areas. They therefore have the potential of engaging co-located people in social interaction. Accordingly, the research question was: What are the social interactions caused by the *Vote With Your Feet*?

The objective was to conduct an exploratory, qualitative design study. That is, the emphasis was on studying and collecting rich data about user experience rather than quantitative analysis. While the author made it a point to make *Vote With Your Feet* accessible and inviting, the study did not aim at measuring participation numbers. The reasoning behind this is the fact that a system like *Vote With Your Feet* can have various repercussions among different types of participants which might not be best measured in numbers. For instance, this includes social interaction among people who may not be active users but still discuss the questions or results. Satchell et al., who describe non-use as “often active, meaningful, motivated, considered, structured, specific, nuanced, directed, and productive”, provide in-depth information about this [73]. Furthermore, the author acknowledges that “one size does not fit all” [32], i.e. this technology can hardly appeal to everybody. Consequently, this study aimed at studying the experiences of the people who did engage with *Vote With Your Feet* as well as understanding the sentiment of those who did not.

6.2. Setup

Location. The field study took place at the bus stop in Brisbane’s Kelvin Grove Urban Village, which was introduced in section 3.4. To ensure high ecological validity, it was vital to conduct the evaluation in public space and include real-world dynamics.

Time. The study ran over the course of several days in late 2013. Overall, it consisted of five 120 minutes sessions. These sessions were spread throughout different times of the day, that is, morning (8am - 10am), lunch time (11am - 1pm), and evening (6pm - 8pm). These time slots were chosen to maximise user participation as they were the busiest times of the day. The morning session took place on a Saturday during the local farmers market where residents go to buy fruits and vegetables. During the lunch time sessions, people were walking to one of the nearby food places. As for the evening sessions (see figure 6.1), there were residents running errands or walking their dogs for instance. Whenever *Vote With Your Feet* was not being tested, the screen ran promotional videos provided by the university.



Figure 6.1: *Vote With Your Feet* being deployed in the evening.

Participants. Any person passing by the screen could be a potential user and study participant, either actively by using *Vote With Your Feet* or passively by ignoring it or as a spectator. The location of the screen is mostly visited by residents, people working at the local businesses as well as staff and students of the nearby university. The study was conducted after the semester when exams had finished. Therefore, the data largely represents an eclectic mix of the general public and the findings can be generalised more easily.

Supervision. At all times during the field study, the author was present at the location. He either hid several meters away from the bus stop or blended in with the crowd of passengers acting as if he was waiting to board the bus just like everybody else. Apart from being able to observe and interview study participants, this was important for a number of reasons. Firstly, to ensure nobody tripped over the wires that connected the buttons to the screen. Although they were put in place carefully, they could have been moved by the wind or by a person in such a way that the buttons could have presented a hazard. Secondly, unlike the screen, the buttons were not permanently installed in a vandal resistant way. To intervene in any vandalism related action, the author paid close attention to the hardware and all nearby persons. Fortunately, neither of these two concerns became an issue during the field study. Thirdly, while the best part of participants pushed the buttons in a gentle way, there was a specific user group that acted very

differently: kids who did not weigh enough to make the buttons register their vote. Consequently, they often ended up jumping up and down on the buttons or kicking them. In some cases, they were then asked to refrain from those actions. Lastly, the author replied to any questions or concerns that people had when they were unsure about the nature of the installation.

6.3. Data Collection

Ethical clearance. In Australia, any research involving the participation of humans must be undertaken in accordance with the National Statement on Ethical Conduct in Human Research [56]. The purpose of the National Statement is to promote ethical conduct in all aspects of human research. For this study, a Negligible/Low Risk application was submitted, meaning that the only foreseeable risks to participants are inconvenience and discomfort. Nevertheless, this process involved a series of paperwork and took about two months in total. The application can be found in appendix E.

The author was granted to undertake observations of passers-by, spectators as well as active users of *Vote With Your Feet* and to interview people given their explicit consent (see appendix C for the interview consent form). All data needed to be reported in a de-identified way. Ethical clearance for this research did not include taking photos or recording any audio or video footage of humans (figure 6.2). The author decided against applying for these in order to avoid lengthening the already extensive ethics procedure.



Figure 6.2: Ethical clearance for this study did not include taking photos of human users.

Observations. Throughout the entire deployment of *Vote With Your Feet*, all persons in the vicinity of the screen were observed by the author. Making sure not to influence people's behaviour, the author avoided being exposed as a researcher. He either acted as a student waiting for his bus or hid well behind the bus stop (figure 6.3 pictures that location).



Figure 6.3: Passers-by, spectators and users were observed from well behind the bus stop to avoid being exposed as a researcher and to avoid influencing people's behaviour.

People's behaviour was documented in field notes which also captured the context of users and spectators. This included whether these persons were waiting for their bus or just passing by, complemented by the surrounding crowd while differentiating between strangers and acquaintances. The distance of passers-by to the screen and whether they noticed and ultimately used the application was covered in the field notes as well. As an example, figure 6.4 shows two pages of the field notes.

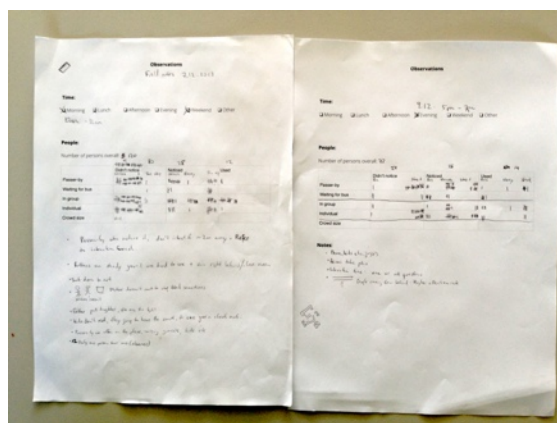


Figure 6.4: Context information was documented in field notes. For instance, these two pages captured if users were passing by or waiting for the bus.

Interviews. In order to gain more in-depth insights into people's thoughts and actions, the data collection was rounded off by interviews (see appendix B for the interview questionnaire). Both users and spectators were approached after they turned their attention away from *Vote With Your Feet*. People who did not notice the application were not interviewed.

Overall, 22 interviews were conducted with 30 participants (14 single persons and eight couples). They were made up of 21 users and nine spectators. The participants comprised 16 female and 14 male persons who were between 20 and 55 years old. Four were by themselves, 11 surrounded by acquaintances, seven by strangers and seven by both acquaintances and strangers. A demographic overview of all interview participants can be found in table 6.2.

| Interview Participants | | | | |
|-------------------------------|----------------|------------|---|-----------------|
| | Gender | Age | Work, live or study in the area? | Role |
| P1 | Female | 44 | Marketing | User |
| P2 | Female | 36 | Resident | Spectator |
| P3 | Male | 28 | University staff | Spectator |
| P4 | Male | 29 | Research | Spectator |
| P5, P6 | Female, male | 21, 30 | Retail, law | Users |
| P7 | Female | 20 | Student | User |
| P8 | Female | 22 | International student | Spectator |
| P9 | Female | 32 | Retail | User |
| P10, P11 | Female, female | 22, 22 | Students | User, spectator |
| P12 | Male | 55 | Resident | User |
| P13, P14 | Male, male | 26, 28 | IT | User, spectator |
| P15 | Male | 46 | Resident | User |
| P16, P17 | Male, male | 23, 24 | Students | Users |
| P18, P19 | Female, female | 20, 21 | Students | Users |
| P20 | Female | 23 | Student | User |
| P21, P22 | Female, male | 32, 34 | Residents | Users |
| P23, P24 | Male, male | 27, 30 | Research | Spectators |
| P25 | Female | 20 | International student | User |
| P26 | Male | 25 | Business | Spectator |
| P27 | Male | 25 | IT | User |
| P28, P29 | Female, female | 40, 37 | Residents | Users |
| P30 | Female | 29 | Resident | User |

Table 6.2: Demographic overview of all interview participants.

As a side note, several people who did notice *Vote With Your Feet* but refrained from interacting with it also did not want to be interviewed. Similarly, groups of people (as opposed to single persons) were not only more likely to interact with the application but also more willing to participate in an interview. Subsequently, the interview data might largely represent the points of view of people who felt most comfortable using a public display intervention such as *Vote With Your Feet*.

The interviews mostly consisted of open-ended questions with opportunities to tell stories and unfold a conversation. During the interviews, the questionnaire (see appendix B) was used by the author to help moderate the conversation and to write down replies. The majority of interviews lasted less than 10 minutes which was often an upper limit provided by the fact that the bus arrives every 10 minutes. Therefore, some of the interviews focused on the most unusual themes based on the participant's specific actions and behaviour. This method, called opportunistic sampling, was summarised in *Qualitative Evaluation and Research Methods* by Patton [65]. He points out how fieldwork often involves on-the-spot decisions about sampling during actual data collection. With qualitative inquiry designs, it is not possible to capture everything. It is, therefore, necessary to make decisions about which activities to observe and which people to observe and interview. These decisions cannot all be made in advance. Opportunistic sampling takes advantage of whatever unfolds as it unfolds.

6.4. Data Analysis

The collected data from the field study is of qualitative nature. It contains text-based field notes produced while observing participants. Additionally, it is made up of text-based interview data. As proposed by Silverman in his handbook on doing qualitative research [81], the data was analysed inspired by grounded theory [60] to draw bottom-up findings. This contained breaking up the interview data into single text snippets (see appendix D). Those were then clustered into several themes that also related to the initial research questions (see figure 6.5). Identified findings based on this activity were then triangulated with the field notes to establish connections and uncover potential causes of behavioural patterns. The results are reported in chapter 7.



Figure 6.5: Single text snippets from the interview data were clustered into several themes.

7. Discussion of Results

This chapter presents the obtained results from the field study. It discusses these results with respect to the addressed study goals (see section 6.1) and critically reflects to which extent the research aims were met in the deployed version of *Vote With Your Feet*. The chapter is structured into the following six sections: Attention, motivation, polling in public, social interactions, reflection of the local community, and lastly popular poll questions and user-submitted questions.

7.1. Attention

Revisiting the research aims (section 6.1), one of the objectives of the field study was gaining insights into the aspects attention and motivation, that is, investigate what made participants notice *Vote With Your Feet* as well as what made participants interact with it. This section reports findings regarding the first aspect, whereas the latter is covered in the next section (*Motivation*, 7.2).

When inquiring about what caught people's attention, four causes came up during the interviews: the buttons on the ground, the wires leading from the buttons to the screen, other users, and the screen itself. These interview findings coincide with the field notes made during the observations.

Buttons. The vast majority of interview participants (23 of 30) reported the buttons on the ground caught their initial attention. This finding makes the placement of the buttons an important success factor in the design of *Vote With Your Feet*. To provide insights on a more detailed level, the interview data revealed the participants' initial perceptions and what caused their reactions and curiosity.

A first user segment was enticed by the prospect of polling. A couple (P21, P22) reported how they "saw the big Yes and No, wanted to check what was going on and then read two questions on the screen to see about what kind of thing the Yes and No wanted to ask us". Summarising the sentiment of a number of participants, one interviewee said "The big Yes and No texts caught my attention. I had never seen such a voting before."

On the contrary, it was the novel technology rather than the prospect of a survey that appealed to a second user segment. As one woman (P30) reported, "it was the buttons I was trying to understand. I already saw them the other day and wanted to find out more today. So that made me take a closer look." One participant (P15) straight up said "I saw the buttons on the ground and thought: that's interactive multimedia, cool!", subsequently revealing he was an artist himself.

Wires. Besides the buttons, a few people were attracted by the wires leading up to the screen. To understand this, the hacked nature of the prototype must be taken into consideration. That is, the buttons were not embedded into the ground and did not look like floor tiles. Moreover, the

wires are likely to be substituted by a wireless technology in a finalised product. That bears the question: What if a more polished prototype better resembled the environment? Would it still attract the same level of attention?

Honeypot effect. A few participants were enticed by other people already using the application. In this case, called *honeypot effect* [7], there were two scenarios. In the first scenario, it went as described by one interviewee (P18) who said “I saw that girl who was already using it. So I waited until she finished and then had a look myself.” In the second scenario though, bystanders were encouraged to take part, e.g. when a woman offered a group of kids to try it themselves who previously had been curiously observing.

Screen. Notably, only one participant (P26) referred to the screen itself. This makes the screen the least fruitful attractor and reconfirms the need to find alternative means for attracting attention in case of poorly positioned screens. On a side note, considerably fewer people noticed *Vote With Your Feet* in the morning or around noon. This was most likely due to the sun being right behind or above the screen during these hours which inherently excluded the screen from the field of view that is most paid attention to. In addition, the screen cast its shadow onto the tangible buttons, making it difficult to catch sight of them as well (see figure 7.1). Users’ engagement with *Vote With Your Feet* peaked in the evening. This fact can be annotated to the increased visibility of the screen after dark. Additionally, people tended to be more relaxed during this time of the day. This might be attributed to less hot temperatures or the fact that there are more residents than staff passing the screen, e.g. while walking their dogs.



Figure 7.1: Due to the position of the sun, it was hard to notice *Vote With Your Feet* in the morning and early noon.

7.2. Motivation

The study revealed four major factors that made users interact with *Vote With Your Feet*: Interest in the poll questions, way to pass time, inviting user interface, and novelty. None of these causes are exclusive. As a matter of fact, most users reported more than one of them. This section explains all four causes in detail. Subsequently, it lays out what caused spectators to refrain from interacting with *Vote With Your Feet*. Unlike the aspect *attention* (covered in the previous section), it was not possible to gain insights regarding people’s motivation by the means of

observation. Therefore, the interviews were of greater importance to produce findings about what made people use *Vote With Your Feet*.

Interest in the poll questions. First of all, an interest in the poll questions and the desire to submit one's own opinion was the main motivation as indicated by a large group of interview participants (19 of 30). For some, using the application then simply happened as an impulse. Speaking for a number of participants, an interviewee (P3) said, "The question was about politics which I'm interested in. It seemed easy to answer the question, so I just went ahead and did it." For others, it was mostly the urge to voice their own opinion. This sentiment was represented by a man (P12) who said "I wanted to take part in the poll and contribute, so I submitted my answer." Finally, there also were users who were curious about the poll results. In order to see them, they had to vote themselves. One interview participant (P7) indicated how he "wanted to see the results because the question was interesting". Two male students (P16, P17) guessed what others had voted for and admitted how they "though it might be fun to try and vote for whatever was the opposite what the majority might have answered". This was one of the rare occurrences of users intentionally not answering the poll questions truthfully (more on this in section 7.3).

Way to pass time. Secondly, a number of interviewees (7 of 30) referred to *Vote With Your Feet* as a way to pass time while waiting for the bus. This insight is supported by the observations. To be more specific, in the group of users the percentage of persons waiting for the bus (62%) was higher than the percentage of passers-by (38%). As one participant (P27) said, "I'm waiting for the bus, so I've got time. Usually I'd be checking Facebook on my phone or something. Today this was here, so since I've got time to kill I just did it."

Inviting user interface. Third of all, *Vote With Your Feet* was perceived as inviting and easy to participate in. This point of view came in three different shades. On the one hand, some users (8 of 30) referred to the buttons and how they looked fun to use. This was indicated by statements such as "It looked fun so I wanted to try it out. First I thought it was maybe touch sensitive like a smartphone" (P5) or "I think the best part is that it's so interactive and easy. We didn't even specifically plan on coming here and yet we were standing here for 10 or 15 minutes answering questions" (P6). As a matter of fact, they only spent three minutes or so with the polling system, however, they seemed to be quite immersed. On the other hand, some users (3 of 30) brought the bus stop location up. They pointed out how it is perceived as a public place (P21, P22): "you just know you're allowed. Everyone can participate at a bus stop. It's not just at the side of a building where it's a bit more intimidating and you're unsure if you're even allowed." Finally, the sound feedback seemed to entice some users. Two women said how they "loved the sound" (P30) and that "the clicking sound was so rewarding" (P25).

Novelty. Lastly, novelty played a role in enticing people to interact with *Vote With Your Feet*. Participants mentioned this in statements such as "I had never seen something like this before, so I was curious" (P8) or "it looked so different and new, so I wanted to try it out" (P8). One interviewee (P1) revealed how she was interested in these kinds of technologies and that "as a matter of fact I'm on my way to a meeting about how to use tech in marketing events. So I wanted to see how this ticked."

Reasons for not interacting. In order to better understand why some people chose to *not* actively participate in a poll of *Vote With Your Feet*, spectators were approached for interviews just as well. Being asked why they refrained from interacting with the application, they provided various reasons. One participant (P30) indicated that he did not feel compelled to submit a vote as a result of the poll question. He said, “I saw the question and thought the answer was obvious, so I didn’t bother voting.” Besides this instance, the desire for more controversial poll questions was also raised by a woman (P29) who pointed out that “some of the university related questions, e.g. regarding federal education funding, were bound to be answered in favour for the university, this being a university precinct.” Quite to the contrary, two participants (P23, 24) did not submit their vote because they were unsure what to vote for. They said, “we actually sat down to discuss the question. We haven’t voted yet because we’re still talking about it.” While not actively using the application, this type of outcome is considered especially valuable. It shows how interventions like *Vote With Your Feet* can make people reflect and spark discussions.

Finally, there were also reasons of more practical nature. For instance, some passers-by simply did not intend on spending any time at the bus stop at that moment. E.g. one woman (P2) said, “I didn’t use it right now because I’m visiting a friend. So I was gonna get her first and then maybe try it together.” On a side note, kids were quite eager to step on the buttons as well. Their main motivation seemed to be hearing the sound feedback and seeing the visual feedback on the screen. Most kids were not heavy enough to trigger their vote, so they started jumping onto the buttons or got their parents to lift them up.

Overall, this data indicates that the presented interaction technology was not one of the causes that prevented users from participating, thus meeting the goal of providing a low barrier for user participation. Furthermore, the location of the intervention being a bus stop required the application to allow for quick interactions. Being a seemingly simple and straightforward usability goal (see section 4.2), it was important nonetheless for users not to worry about missing their bus. To meet this goal, users could stop interacting anytime, either for checking if the bus was coming or for actually boarding it. Based on the observations during the field study, the implemented mechanism proved to be successful. In fact, some interview participants made use of the same behaviour by breaking off the interview to get on the bus.

7.3. Polling In Public

Due to their inherent nature, public displays are situated in social settings. This is unusual for conventional polls or surveys which tend to be private and anonymous. It seemed like a potential conflict in the context of *Vote With Your Feet*: On the one hand, the tangible buttons on the ground present a means to lower the barrier for user participation. On the other hand, however, they pose a very much exposed form of interacting with information technology. This is unlike interactive public displays with different input modalities, such as smartphone or touchscreen input. In the case of *Vote With Your Feet*, users might be observed by nearby people as they step on one of the buttons to submit their vote. In order to avoid low participation, one of the usability goals was to minimise discomfort for users through an inviting or playful interface (see section 4.2). The field study looked into how people felt about the exposed

interaction resulting from the tangible buttons on the ground. That is, did users feel comfortable voting in public and did they answer the poll questions honestly?

Based on the observations, the vast majority of active users was not concerned at all about other people watching. This was consistent with the interviews, in which only one single participant (P27) indicated moderate concerns. As a matter of fact, some participants even reported that the exposed interaction and “whole-body commitment“ (P7) aspect was one of their favourite ones (see figure 7.2). As one couple (P5, P6) said, “It seemed like I committed to our answer with my whole body. It’s not just tapping a little button on your phone with your finger. This applied especially to the questions asking for a proper opinion or something that’s supposed to be morally correct.” This provides evidence that *Vote With Your Feet* also contains a performative element rather than just an information exchange, similar to what has been explored in other studies (e.g. [95]).

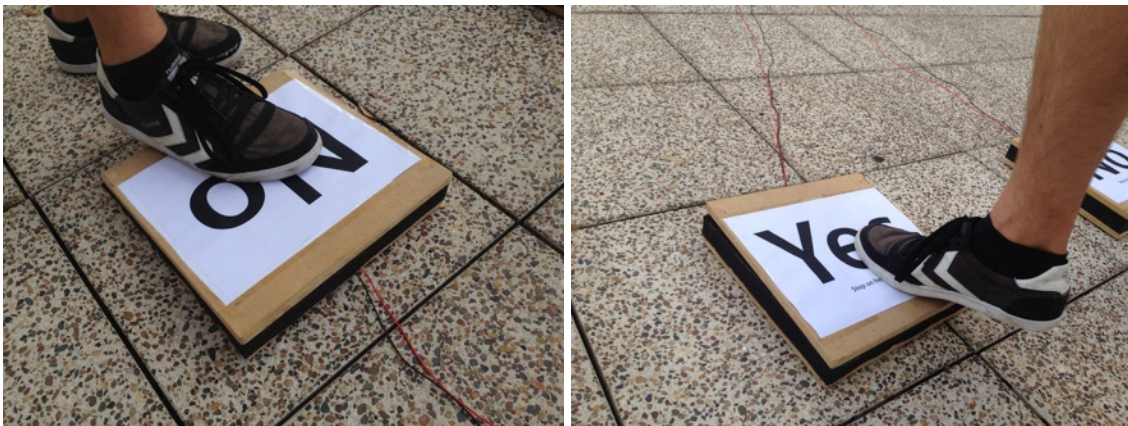


Figure 7.2: Voting requires “whole-body commitment”, as described by a study participant.

However, some interview participants shed more light onto this matter and pointed out that it depended on the type of poll questions being asked. Had it been much more personal questions, they would not have felt comfortable disclosing their answer in public. As one woman (P1) said, “had the poll asked about my sex life or body issues for instance, it would’ve been a whole other story.” The users seemed to feel fine about the provided questions (see section 3.2) though.

The interviews also revealed a number of people (2 out of 30) who felt less inclined to participate in public poll. A few of those participants not surrounded by other people while interacting reported that they enjoyed having the chance to test it by themselves without being observed. For instance, one resident (P12) said, “I probably wouldn’t have done it if a bunch of people had been observing me. It was good I could try it out by myself here.” This goes to show that public display applications do not completely exclude shy people. They can still entice them in situations in which people do not feel observed or overly exposed.

Furthermore, the field study investigated whether people answered the poll questions honestly and whether some users would try to submit fake votes on purpose. The vast majority (28 of 30) reported that they answered honestly. Two interview participants (P16, P17), however, revealed that they voted for whatever they thought was the minority vote. Strikingly, users were curious

about this aspect themselves. Specifically for this, a poll question was added to the application: “Do you answer these questions honestly?” Subsequently, users could get an overview about the amount of hoaxing. A couple (P21, P22) said “we asked ourselves if other people answered honestly. It was fun to see that exact question on the screen.” On a side note, it is obvious that hoaxing can also occur when replying to this question. However, participants could just as well lie during the interviews.

7.4. Social Interactions

This section provides findings regarding social interaction among co-located people based on observations. Overall, lots of social interaction happened between groups of friends or colleagues and in a few instances even among strangers. The most frequently re-occurring patterns were as follows.

Often times, acquaintances were involved in discussions, e.g. regarding the wording of the poll question or the addressed issue. One couple (P13, P14), for instance, said that one of the questions was not phrased in a distinct way. The question was: “Do you think individual states should be able to pass their own legislation on same-sex marriage?” This had two participants debate the spirit of the question, which could either refer to same-sex marriage or federal legislation.

Furthermore, there were couples who first decided on their answer together and then voted together. Some reported that they did not necessarily agree every time, but did appreciate having talked about the questions. Some users who seemed to feel emotional about a specific poll question made their kids, friends or colleagues vote as well and in one case even their dog. They never tried to involve strangers though. However, there were instances of curious, patiently waiting and shy spectators who were invited by other users to try it out themselves. Lastly, a few times passers-by shouted their opinion towards users and spectators. Although nobody encouraged them to do so, some even took a moment to elaborate further before going on with their day.

Summarising, *Vote With Your Feet* provides a platform for people to voice their opinions. Evidence from the field study shows how opinions were not only voiced by casting a vote using the application. People also discussed the poll questions among each other, which indicates that *Vote With Your Feet* could spark social discourse.

7.5. Reflection of the Local Community

Revisiting one of its novel features, the *Vote With Your Feet* aimed at mirroring the sentiment of the local community. This was a first step in terms of looking into ways for reflecting information about a community and its people, as put forward by Foth et al. [24]. Besides displaying the results of the local submissions, the application also shows results taken from *ABC* website. The interviews revealed three major insights about what users valued about

viewing the poll results: A way to learn about the local community, to compare own opinions to others' opinion, and to question own opinions. The replies will be explained in the following.

A way to learn about the local community. First, users wanted to make sense of their local community and were curious about others' sentiments. One interviewee (P12) compared the two result types and said, "it was interesting to see that Kelvin Grove mirrored the ABC Australia results." Another person (P1) brought up the idea of extending the result types to more locations. She said, "I want this to be at every bus stop, then compare results. It would be really interesting to see how this area differs from, say, the CBD or another campus." Others indicated how they enjoyed reading the results as a way to learn more about the people around them. One participant (P25) reported, "I loved looking at the results. I'm an international student so I could learn about this area and compare the results. I was surprised to see so many people answering didn't come from Australia or Brisbane either. Maybe there are more internationals like me than I had expected." A girl (P10) who was part of a group of friends said, "I work around here so I suspected I knew the answers to the questions about demographics. My friend, however, isn't from around here, she's just visiting. So I got to explain some of the results a bit more in-depth and she learned both from me and the app."

A way to compare own opinions. Second, many participants were interested in comparing their own opinion with the rest of the users. One (P27) openly said, "I loved comparing mine vs. others. In the end, I care about myself the most, I guess." A different interviewee (P1) said, "I was surprised to see that my opinion was aligned with the majority, I hadn't expected that." In that sense, *Vote With Your Feet* does not only help people better understand their community but also themselves.

A way to question own opinions. Third and finally, a number of users also reported that they questioned their own opinion after having read the results. As one person (P12) described such an instance, "it was interesting that people voted about 50% / 50% on the Kevin Rudd question. That made me reflect on my own opinion, because that result made it seem like a controversial issue."

7.6. Popular Poll Questions and User-Submitted Poll Questions

To gain a sense of what topics the users are most interested in, the participants were asked about their favourite questions and what other questions they would like to see on the screen.

Regarding the most popular questions, the majority of interview participants said the polls about politics and current affairs appealed most to them out of all topics (see section 3.2). Those people who recently started working, studying or living in the area, such as new residents or international students, referred to the polls about demographics and cultural identity as most interesting. For instance, a couple (P21, P22) said, "the questions about this area were most interesting. We just moved here a year ago so it's interesting to see what others think." A girl who was an international student (P8) said, "the question about whether you considered Brisbane your hometown was interesting. As someone who just recently moved here, I voted no."

The complete set of poll questions was shuffled, intended to provide some variety and to avoid users from losing interest in case they did not care about one of the topics. On the one hand, some participants explicitly said they appreciated this aspect, such as the couple (P5, P6) that reported, “the mix of more serious and political or broader questions as well as more local questions made it so engaging. I think that’s the reason why we stayed here for such a long time.” On the other hand, it also led to some confusion as this interviewee (P30) pointed out: “I’m a resident, so when the thing started asking questions about uni, I wasn’t sure anymore whether I was supposed to participate.” Not being the target audience for the polls provided by the student support centre, she questioned whether she was allowed to use *Vote With Your Feet* at all.

When asked about what other polls they would like to vote on, a few participants mentioned their desire for more controversial questions. Similarly to what another user said (section 7.3), one person (P22) pointed out that “the questions were not controversial enough, some were almost too obvious to say yes to. E.g. the one about education funding, considering it was asked in a university precinct.”

As laid out in detail in the sections 3.2 and 4.1, this project aimed at challenging one-way communication in the context of public displays and at providing users a way of contributing their own content, amongst other goals. This was implemented by encouraging users to submit their own poll questions. Over the course of the field study, only very few (3) questions came from interview participants (see appendix A) and all of them were provided as part of the interview rather than via text message. When asked about this, the majority said they appreciated the feature but could not think of a good question right on the spot. As one participant (P9) said, “I loved that you can nominate your own questions. I wanted to do that but couldn’t think of one right that instance. But I’d love to do it later.” So while well received by participants during the interviews, *Vote With Your Feet* lacked users actually submitting their suggestions. This aspect of the prototype presents a shortcoming. However, it sounds similar how user participation works on the internet. Nielsen’s 90-9-1 principle says that only 1% of internet users contribute content regularly and 9% occasionally, whereas 90% merely consume content [64].

8. Conclusion

This chapter takes a look back at the project and assesses the obtained findings. It starts by summarising the project and then presents a number of limitations with respect to the field study. Subsequently, the study results are revisited, yielding recommendations for the development of future systems. Finally, the chapter concludes with a deliberation of how this concept could develop in the long term, proposing extensions and avenues for future research.

8.1. Summary

The research space of engaging people in discussions and reflecting upon their opinions through public displays has gained a lot of traction in recent years. Polls, given their simple yet stimulating character, are increasingly being studied as a way of sparking civic discourse and addressing issues of locally or socially relevant nature. Challenges in the design of public display applications have been identified, in particular attracting people's attention and motivating people to interact. This thesis proposes tangible buttons on the ground as a method for improving these issues.

This thesis presents the design, implementation and evaluation of *Vote With Your Feet*, a hyperlocal public polling tool for urban screens (figure 8.1). Characterised by this distinctive user interface, its two tangible buttons on the ground invites people to cast their vote. The urban screen application shows poll questions about current affairs, local matters, and cultural identity. It also encourages users to suggest their own questions. By complementing the local poll results with poll results taken from a news website, it provides further context and allows users to make sense of their community's sentiment.



Figure 8.1: Sketch of *Vote With Your Feet* from a user's perspective.

Vote With Your Feet was informed by a literature review as well as by concept development activities. In particular, a focus group, two expert interviews and extensive preliminary user studies had a significant impact on the concept, on poll questions and on the GUI design. The urban screen used for this application was positioned above people's heads, in a way that it was out of sight for most users. Consequently, positioning and visibility of the screen presented major challenges (also in previous projects) and affected most design decisions as well.

The *Vote With Your Feet* application was implemented in Processing. It receives user input data from a MaKey MaKey board which was wired to the tangible buttons on the ground. With the objective of rapid prototyping in mind, these hardware and software choices were made to quickly deliver a functional prototype. This made it possible to test run early iterations in the wild from day one on.

Deployed in the wild, *Vote With Your Feet* was evaluated over the period of several days. Specifically, the application was run on an urban screen at a bus stop within a busy precinct consisting of shops, housing, offices and educational institutions. Therefore it was accessible to a large variety of different people. To gather insights into people's behaviour, the interactions of hundreds of people with *Vote With Your Feet* were observed and documented in field notes. Furthermore, 22 interviews with a total of 30 people were conducted to gain a better understanding of the users, their interests and concerns.

This field study revealed that the buttons bear a low barrier for user participation, having been described with terms such as "inviting" by interviewees. Equally important given the positioning of the urban screen, the buttons provide an effective way for getting noticed by passers-by. Furthermore, *Vote With Your Feet* made some users debate the addressed issues of the poll questions or contemplate about their opinions. Apart from the learnings concerning the novel interaction technology, this presents the most valuable finding and leads to new opportunities for sparking civic discourse in urban areas.

8.2. Study Limitations

This section takes a critical look at the field study and acknowledges its limitations.

Validity. The field study took place at a bus stop in Brisbane's Kelvin Grove Urban Village, which was introduced in section 3.4. To ensure high ecological validity, it was vital to conduct the evaluation in public space and include real-world dynamics. Consequently and unlike in a lab study, external influences could not be minimised or controlled to maximise internal validity. Additionally, findings from this particular study may only be generalised to a limited extent due to the uniqueness of any given location and its social dynamics, sacrificing external validity. As pointed out by Alt et al., the body of research dealing with public displays tends to prioritise ecological validity over internal and external validity. This results from public displays being a public and social phenomenon by their inherent nature [3].

Scope. The field study took place during the period of five 120 minutes sessions. 30 participants were interviewed and hundreds of participants observed. This represents an extensive set of in-the-wild data for evaluating aspects concerning e.g. the tangible buttons on the ground. Before this project, these buttons had only been tested by a handful of expert users which had been recruited and briefed as part of Palleis' project [63]. Adhering to a user-centred design process, *Vote With Your Feet* had been repeatedly tested with real-world users during its development. This adds another four 120-180 minutes sessions to the deployment time of *Vote With Your Feet*, besides the eight coffee and lunch break demonstrations during OzCHI '13 conference. This

adds up to a total of around 1500 minutes or 25 hours of testing outside the lab. On the downside, the majority of conducted interviews were limited in time, thus preventing the author from gaining more in-depth insights. This was due to the fact that participants needed to catch their bus and could not stay longer for the interview. For future studies, an alternative way of interviewing people must be established, such as accompanying participants on their bus ride and conducting the interview aboard.

Novelty effect. A number of interactive applications had been tested at the same location before the deployment of *Vote With Your Feet*. However, the majority of interview participants indicated that they had never seen such a system before. Therefore, the success of *Vote With Your Feet* might be partly attributed to the novelty of this system. This does not necessarily lower the value the study outcome, considering that many technologies spark people's interest due to their novelty. However, the findings from this field study cannot reveal longterm effects.

8.3. Recommendations

This section revisits the unique features of the *Vote With Your Feet* concept. By referring back to the results of the field study, a number of design implications are given.

Physical Interaction. The field study revealed that the tangible buttons on the ground could substantially drive the potential of attracting people's attention. Furthermore, this form of interaction was perceived as inviting and easy to participate. Unlike touch interaction, physical interaction works over distance and feels more natural. Combined with a fun sound feedback mechanism, it can be recommended for motivating users to start and keep interacting.

Low barrier vs. exposed interaction. The field study provided evidence that discomfort during exposed interaction was not an issue for the majority of users. It turned out that users value a low barrier over the drawbacks of being exposed to spectators. Consequently, future projects should focus on making participation effortless, and worry about exposed interaction only if it actually proves to be an issue.

Content. The *Vote With Your Screen* application displayed poll questions of different types of topics. Based on the learning from this user study, future applications should display a mix of thought-provoking and location-based questions. Notably, users expressed a desire for controversial questions. In terms of the results, displaying the local results next to the results taken from the national news website *ABC* proved to be an effective way of arousing users' curiosity and providing them with a means for learning how their local community differs from somewhere else. However, to see this concept at its full potential, future projects should consider deployments in various locations (e.g. different bus stops within the same city) and display their results for comparison.

8.4. Future Work

This projects dove into a number of different directions, such as tangible interaction or user-generated content in the context of public displays, all of which open up avenues for future research.

Multiple locations. *Vote With Your Feet* could be deployed in multiple locations. It allows to validate the concept of *Vote With Your Feet* regardless of the specific location. The deployment in multiple locations may have two different goals in mind. First, in order to facilitate polls in different locations and to display the different poll results for comparisons (e.g. different cities or different bus stops within one city). This could even be extended to run competitions between different sites or to benchmark their respective engagement. Secondly, a multi-location approach could be used to increase exposure of the application and gain more users within one area, e.g. by making use of displays in nearby shops and cafes. An undertaking like that could build upon findings from the research area of open display networks (dubbed as the “communication medium for the 21st century” [18]), e.g. in terms of content distribution and curation [38], design considerations [37], social media characteristics [50] or ethics for user studies [43].

User-generated content. While interview participants appreciated that *Vote With Your Feet* lets users suggest their own question, there was a lack of any users actually doing so during the field study. This aspect of the prototype presents a shortcoming. It requires further effort to get the design of this feature right and address the fact that most users cannot think of a good question right on the spot, which was the main issue mentioned in the interviews. Related to this feature, *Vote With Your Feet* could be extended and improved in another way. A third button for Maybe / Sometimes / I Don’t Know could be added or a way for users to elaborate. Some participants already did this, such as a woman who told everybody at the bus stop that she voted neither Yes nor No on a particular question and continued to explain the specifics of her opinion and under what circumstances her answer varied. A combination of *Discussions In Space* [76] and *Vote With Your Feet* could be a first step towards realising such a concept. This could bring the benefits of both together, such as the low barrier for user participation of *Vote With Your Feet* and the civic discourse potential of *Discussions In Space*.



Figure 8.2: *HCI after dark*, a new research project at the Urban Informatics Research Lab.

After dark. Another potential avenue for future research is the exploration of the potential of *Vote With Your Feet* for scenarios in the evening or night. Given that public displays excel after dark in terms of visibility, it might be worthwhile looking into use cases specifically targeted at

this. This could be executed as part of a new research project called *HCI after dark* at the Urban Informatics Research Lab (see figure 8.2). It aims at increasing safety and a sense of security in urban areas by night through digital technologies. *Vote With Your Feet* might contribute to these objectives by crowdsourcing people's reasons for feeling unsafe.

Polling. To enable better trusted and more meaningful polls, a number of aspects of *Vote With Your Feet* would need to be improved. This contains aiming at a more realistic representation of the community's sentiment by preventing misuse, such as users voting twice. Furthermore, it should ensure that people cast their vote in an unbiased manner. Although *Vote With Your Feet* displays the results of a poll only after somebody submits their vote, users might be influenced in case they had been observing previous users. Furthermore, the wording of the poll questions could be improved. Specifically, every question should be asked in a distinctive manner.

Integration. Finally, the *Vote With Your Feet* concept and the findings from this study could be used for undertaking research in other areas. Being a multi-purpose tool at its core, it could be used for sourcing information from users in various use case scenarios. For instance, it could help bringing crowd sourcing to urban public places, extending current web-based systems for community-driven data collection such as *Streetwise* [85]. Another potential direction for future research might be a deeper integration of this tool for civic engagement and serious games endeavours. Lastly, the performative character of the interaction via tangible buttons on the ground could open up doors for a new kind of interactive application in public space.

Photo Credits

Unless stated otherwise, all photos were taken by the author.

References

- [1] Alt, F., Kubitzka, T., Bial, D., Zaidan, F., Ortel, M., Zurmaar, B., Lewen, T., Shirazi, A.S. and Schmidt, A. 2011. Digifieds: insights into deploying digital public notice areas in the wild. *MUM '11: Proceedings of the 10th International Conference on Mobile and Ubiquitous Multimedia*. ACM (NY, USA, 2011), 165–174.
- [2] Alt, F., Schneegaß, S., Girgis, M. and Schmidt, A. 2013. Cognitive effects of interactive public display applications. *Proceedings of the 2nd ACM International Symposium on Pervasive Displays*. ACM (NY, USA, 2013), 13–18.
- [3] Alt, F., Schneegaß, S., Schmidt, A., Müller, J. and Memarovic, N. 2012. How to evaluate public displays. *PerDis '12: Proceedings of the 2012 International Symposium on Pervasive Displays*. ACM (NY, USA, 2012).
- [4] Ananny, M. and Strohecker, C. 2009. TexTales: Creating Interactive Forums with Urban Publics. *Handbook of Research on Urban Informatics The Practice and Promise of the Real-Time City*. chapter 5, 68–86, IGI Global (Hershey, PA, 2009)
- [5] Appadurai, A. 1996. *Modernity at Large: Cultural Dimensions of Globalization*. University of Minnesota Press (Minnesota, USA, 1996).
- [6] Behrens, M.M. 2011. Swipe 'I like': location based digital narrative through embedding the “Like”button in the real world. *5th International Conference on Communities & Technologies - Digital Cities 7*. ACM (NY, USA, 2011).
- [7] Brignull, H. and Rogers, Y. 2003. Enticing people to interact with large public displays in public spaces. *Proceedings of INTERACT*. 3, IFIP (2003), 17–24.
- [8] Briones, C. and Mottram, C. 2008. The urban screen as a socialising platform: exploring the role of place within the urban space. In: Eckardt, F. and Geelhaar, J. and Colini, L. and Willis, K.S. and Chorianopoulos, K. and Hennig, R., (eds.) *MEDIACITY: Situations, Practices and Encounters*. (pp. pp. 285-305). Frank & Timme GmbH (Berlin, Germany, 2008).
- [9] BusBuzz | MIT Mobile Experience Lab: <http://mobile.mit.edu/portfolio/busbuzz/>. Accessed: 2013-09-02.
- [10] Buxton, B. 2010. *Sketching User Experiences: Getting the Design Right and the Right Design*. Morgan Kaufmann (Massachusetts, USA, 2010).
- [11] Carr, S., Francis, M., Rivlin, L.G. and Stone, A.M. 1993. *Public Space*. Cambridge University Press.
- [12] Chatham, A. and Floyd' Mueller, F. 2013. Adding an interactive display to a public basketball hoop can motivate players and foster community. *Proceedings of the 2013*

- ACM international joint conference on Pervasive and ubiquitous computing*. ACM (New York, New York, USA, Sep. 2013), 667.
- [13] Churchill, E.F., Nelson, L. and Denoue, L. 2003. Multimedia fliers: Information sharing with digital community bulletin boards. *Communities and technologies*. ACM (NY, USA, 2003).
- [14] Claes, S. and Moere, A.V. 2013. Street infographics: raising awareness of local issues through a situated urban visualization. *PerDis '13: Proceedings of the 2nd ACM International Symposium on Pervasive Displays*. ACM (NY, USA, 2013), 133–138.
- [15] Cronje, J. 2013. What is this thing called “design” in design research and instructional design. *Educational Media International*. 50, 1. ICM (Mar. 2013), 1–11.
- [16] Dalsgaard, P. and Halskov, K. 2010. Designing urban media façades: cases and challenges. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM (NY, USA, 2010), 2277–2286.
- [17] Dalsgaard, P. and Hansen, L.K. 2008. Performing perception—staging aesthetics of interaction. *Transactions on Computer-Human Interaction*. 15, 3. ACM (NY, USA, Nov. 2008).
- [18] Davies, N., Langheinrich, M., Jose, R. and Schmidt, A. 2012. Open Display Networks: A Communications Medium for the 21st Century. *Computer*. 45, 5 (2012), 58–64.
- [19] Edmonds, E., Muller, L. and Connell, M. 2006. On creative engagement. *Visual Communication*. 5, 3 (2006), 307–322.
- [20] Elmore, M. and Gieskes, K. 2011. Work in progress -- Student learning as a function of attendance in large engineering classes. (Oct. 2011).
- [21] Eriksson, E., Hansen, T.R. and Lykke-Olesen, A. 2007. Reclaiming public space: designing for public interaction with private devices. *Proceedings of the 1st international conference on Tangible and embedded interaction*. ACM (NY, USA, Feb. 2007).
- [22] Finke, M., Tang, A., Leung, R. and Blackstock, M. 2008. Lessons learned: game design for large public displays. *Proceedings of the 3rd international conference on Digital Interactive Media in Entertainment and Arts*. ACM (NY, USA, 2008), 26–33.
- [23] Fischer, P.T. and Hornecker, E. 2012. Urban HCI: spatial aspects in the design of shared encounters for media facades. *the 2012 ACM annual conference*. ACM (NY, USA, May 2012), 307–316.
- [24] Foth, M. and Podkalicka, A.M. 2007. Communication policies for urban village connections: beyond access? *Proceedings Communications Policy Research Forum*. (Sydney, Australia, 2007).
- [25] Foth, M., Agudelo, L.P. and Palleis, R. 2013. Digital soapboxes: towards an interaction design agenda for situated civic innovation. *UbiComp '13 Adjunct: Proceedings of the 2013 ACM conference on Pervasive and ubiquitous computing adjunct publication*. ACM (NY, USA, 2013).
- [26] Foth, M., Choi, J.H.-J. and Satchell, C. 2011. Urban informatics. *CSCW '11: Proceedings of the ACM 2011 conference on Computer supported cooperative work*. ACM (NY, USA, Mar. 2011), 1–8.

- [27] Foth, M., Fischer, F. and Satchell, C. 2013. From movie screens to moving screens: mapping qualities of new urban interactions. *Media Cities*. (2013).
- [28] Foth, M., Forlano, L., Satchell, C. and Gibbs, M. 2011. *From Social Butterfly to Engaged Citizen: Urban Informatics, Social Media, Ubiquitous Computing, and Mobile Technology to Support Citizen Engagement*. The MIT Press (Massachusetts, USA, 2011).
- [29] Gehring, S., Hartz, E., Löchtefeld, M. and Krüger, A. 2013. The media façade toolkit: prototyping and simulating interaction with media façades. *UbiComp '13: Proceedings of the 2013 ACM international joint conference on Pervasive and ubiquitous computing*. ACM (NY, USA, Sep. 2013).
- [30] Greenberg, S., Carpendale, S., Marquardt, N. and Buxton, B. 2011. Sketching User Experiences: The Workbook, 1st edition. *Sketching User Experiences: The Workbook, 1st edition*. Morgan Kaufmann (Massachusetts, USA, Dec. 2011).
- [31] Greenberg, S., Marquardt, N., Ballendat, T., Diaz-Marino, R. and Wang, M. 2011. Proxemic interactions: the new ubicomp? *interactions*. 18, 1 (Jan. 2011), 42–50.
- [32] He, H.A., Greenberg, S. and Huang, E.M. 2010. One size does not fit all: applying the transtheoretical model to energy feedback technology design. *CHI '10: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM (NY, USA, Apr. 2010), 927–936.
- [33] Hosio, S., Kostakos, V., Kukka, H., Jurmu, M., Riekkki, J. and Ojala, T. 2012. From school food to skate parks in a few clicks: using public displays to bootstrap civic engagement of the young. *Pervasive Computing, IEEE*. (2012), 425–442.
- [34] Huang, E.M., Koster, A. and Borchers, J. 2008. Overcoming assumptions and uncovering practices: When does the public really look at public displays? *Pervasive Computing, IEEE*. (2008), 228–243.
- [35] Itti, L. and Baldi, P. 2009. Bayesian surprise attracts human attention. *Vision research*. 49, 10 (2009), 1295–1306.
- [36] Jacucci, G., Morrison, A., Richard, G.T., Kleimola, J., Peltonen, P., Parisi, L. and Laitinen, T. 2010. Worlds of information: designing for engagement at a public multi-touch display. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM (NY, USA, 2010), 2267–2276.
- [37] Jose, R., Cardoso, J., Alt, F. and Clinch, S. 2013. Mobile applications for open display networks: common design considerations. *Proceedings of the 2012 International Symposium on Pervasive Displays*. ACM (NY, USA, 2013).
- [38] José, R., Pinto, H., Silva, B., Melro, A. and Rodrigues, H. 2012. Beyond interaction: Tools and practices for situated publication in display networks. *Proceedings of the 2012 International Symposium on Pervasive Displays*. ACM (NY, USA, 2012), 8.
- [39] Ju, W. and Sirkin, D. 2010. Animate objects: How physical motion encourages public interaction. *Persuasive Technology*. (2010), 40–51.
- [40] Kelvin Grove Urban Village Design Guidelines: 2010. <http://www.communities.qld.gov.au/resources/housing/partnerships/guidelines/design-guidelines-full.pdf>. Accessed: 2013-09-18.

- [41] Knack, S. 2001. Robert D. Putnam, Bowling alone: The collapse and revival of American community. *Public Choice*. 108, 3-4 (2001), 390–395.
- [42] Kukka, H., Oja, H., Kostakos, V., Gonçalves, J. and Ojala, T. 2013. What makes you click: exploring visual signals to entice interaction on public displays. *CHI '13: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM (NY, USA, Apr. 2013).
- [43] Langheinrich, M., Schmidt, A., Davies, N. and José, R. 2013. A practical framework for ethics: the PD-net approach to supporting ethics compliance in public display studies. *PerDis '13: Proceedings of the 2nd ACM International Symposium on Pervasive Displays*. ACM (NY, USA, Jun. 2013), 139–143.
- [44] Lindén, T., Heikkinen, T., Kostakos, V., Ferreira, D. and Ojala, T. 2012. Towards multi-application public interactive displays. *Proceedings of the 2012 International Symposium on Pervasive Displays*. ACM (NY, USA, 2012), 9.
- [45] Living Light Lab | Sensing the Networked City: <http://moritzbehrens.com/2013/living-light-lab/>. Accessed: 2013-11-20.
- [46] Luoju, P., Koskela, J., Ollila, K., Mäki, S.-M., Kulpa-Bogossia, R., Heikkinen, T. and Ojala, T. 2013. Wordster: collaborative versus competitive gaming using interactive public displays and mobile phones. *PerDis '13: Proceedings of the 2nd ACM International Symposium on Pervasive Displays*. ACM (NY, USA, Jun. 2013), 109–114.
- [47] MaKey MaKey: An Invention Kit for Everyone: <http://www.makeymakey.com/>. Accessed: 2013-11-18.
- [48] Memarovic, N., Cheverst, K., Langheinrich, M., Elhart, I. and Alt, F. 2013. Tethered or free to roam: the design space of limiting content access on community displays. *Proceedings of the 2nd ACM International Symposium on Pervasive Displays*. ACM (NY, USA, 2013), 127–132.
- [49] Memarovic, N., Elhart, I. and Langheinrich, M. 2011. FunSquare: first experiences with autopoiesic content. *MUM '11: Proceedings of the 10th International Conference on Mobile and Ubiquitous Multimedia*. ACM (NY, USA, Dec. 2011), 175–184.
- [50] Memarovic, N., Elhart, I., Michelotti, A., Rubegni, E. and Langheinrich, M. 2013. Social networked displays: integrating networked public displays with social media. *UbiComp '13 Adjunct: Proceedings of the 2013 ACM conference on Pervasive and ubiquitous computing adjunct publication*. ACM (NY, USA, Sep. 2013), 55–58.
- [51] Memarovic, N., Langheinrich, M. and Alt, F. 2012. The interacting places framework: conceptualizing public display applications that promote community interaction and place awareness. *Proceedings of the 2012 International Symposium on Pervasive Displays*. ACM (NY, USA, 2012), 7.
- [52] Michelis, D. and Müller, J. 2011. The audience funnel: Observations of gesture based interaction with multiple large displays in a city center. *Intl. Journal of Human-Computer Interaction*. (2011).
- [53] Motta, W., Schieck, A.F.G., Schnädelbach, H., Kostopoulou, E., Behrens, M., North, S. and Ye, L. 2013. Considering Communities, Diversity and the Production of Locality in the Design of Networked Urban Screens. *Interact 2013*. IFIP (2013), 315–322.

- [54] Müller, J., Alt, F., Michelis, D. and Schmidt, A. 2010. Requirements and design space for interactive public displays. *MM '10: Proceedings of the international conference on Multimedia*. ACM (NY, USA, Oct. 2010), 1285.
- [55] Müller, J., Wilmsmann, D., Exeler, J., Buzeck, M., Schmidt, A., Jay, T. and Krüger, A. 2009. Display Blindness: The Effect of Expectations on Attention towards Digital Signage. *Pervasive '09: Proceedings of the 7th International Conference on Pervasive Computing*. ACM (NY, USA, May 2009).
- [56] National Statement on Ethical Conduct in Human Research (2007) - Updated December 2013: 2007. <http://www.nhmrc.gov.au/publications/synopses/e72syn.htm>. Accessed: 2014-01-06.
- [57] O'Hara, K., Glancy, M. and Robertshaw, S. 2008. Understanding collective play in an urban screen game. *CSCW '08: Proceedings of the 2008 ACM conference on Computer supported cooperative work*. ACM (NY, USA, Nov. 2008), 67–76.
- [58] O'Hara, K., Lipson, M., Jansen, M., Unger, A., Jeffries, H. and Macer, P. 2004. Jukola: democratic music choice in a public space. *DIS '04: Proceedings of the 5th conference on Designing interactive systems: processes, practices, methods, and techniques*. ACM (NY, USA, Aug. 2004), 145.
- [59] Ojala, T., Kostakos, V., Kukka, H., Heikkinen, T., Lindén, T., Jurmu, M., Hosio, S., Kruger, F. and Zanni, D. 2012. Multipurpose interactive public displays in the wild: Three years later. *Computer*. 45, 5 (2012), 42–49.
- [60] Oktay, J.S. 2012. *Grounded Theory*. Oxford University Press.
- [61] Paek, T., Agrawala, M., Basu, S., Drucker, S., Kristjansson, T., Logan, R., Toyama, K. and Wilson, A. 2004. Toward universal mobile interaction for shared displays. *Proceedings of the 2004 ACM conference on Computer supported cooperative work*. ACM (NY, USA, 2004), 266–269.
- [62] Pakanen, M., Polli, A.M., Lee, S., Lindley, J. and Goncalves, J. 2013. Tending a virtual garden: exploring connectivity between cities. *UbiComp '13 Adjunct: Proceedings of the 2013 ACM conference on Pervasive and ubiquitous computing adjunct publication*. ACM (NY, USA, Sep. 2013), 761–764.
- [63] Palleis, R. *Local Commons - Communicating Local Issues through Place-Based Interventions*. Diplomarbeit, Ludwig-Maximilians-Universität München, 2013.
- [64] Participation Inequality: Encouraging More Users to Contribute: 2006. <http://www.nngroup.com/articles/participation-inequality/>. Accessed: 2013-12-17.
- [65] Patton, M.Q. 1990. *Qualitative Evaluation and Research Methods*. SAGE Publications, Incorporated.
- [66] Peltonen, P., Kurvinen, E., Salovaara, A., Jacucci, G., Ilmonen, T., Evans, J., Oulasvirta, A. and Saarikko, P. 2008. It's Mine, Don't Touch!: interactions at a large multi-touch display in a city centre. *CHI '08: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM (NY, USA, Apr. 2008), 1285–1294.
- [67] Pelzig hält sich - ZDF.de: <http://pelzig.zdf.de/>. Accessed: 2014-01-08.
- [68] Processing.org: <http://processing.org/>. Accessed: 2013-11-21.

- [69] QUT - The Cube - About The Cube: <http://www.thecube.qut.edu.au/about-cube>. Accessed: 2014-01-17.
- [70] Redhead, F. and Brereton, M. 2009. Designing Interaction for Local Communications: An Urban Screen Study. *INTERACT '09: Proceedings of the 12th IFIP TC 13 International Conference on Human-Computer Interaction: Part II*. IFIP (Aug. 2009).
- [71] Resatsch, D.M.A.F. 2007. Unlocking the Interactive Capabilities of Large Outdoor Displays. *Information Display*. (Dec. 2007), 1–6.
- [72] Rubegni, E., Memarovic, N. and Langheinrich, M. 2011. CATS: Using scenario dramatization to rapidly design public displays for stimulating community interaction. *Proceedings of the 29th ACM international conference on Design of communication*. ACM (NY, USA, 2011), 263–266.
- [73] Satchell, C. and Dourish, P. 2009. Beyond the user: use and non-use in HCI. *the 21st Annual Conference of the Australian Computer-Human Interaction Special Interest Group*. ACM (NY, USA, Nov. 2009), 9–16.
- [74] Satchell, C., Foth, M., Hearn, G. and Schroeter, R. 2008. *Suburban nostalgia: the community building potential of urban screens*. ACM.
- [75] Schmidt, A., Pfleging, B., Alt, F., Sahami, A. and Fitzpatrick, G. 2012. Interacting with 21st-Century Computers. *Pervasive Computing, IEEE*. 11, 1 (2012), 22–31.
- [76] Schroeter, R. and Foth, M. 2009. Discussions in space. *OZCHI '09: Proceedings of the 21st Annual Conference of the Australian Computer-Human Interaction Special Interest Group*. ACM (NY, USA, Nov. 2009).
- [77] Schroeter, R., Foth, M. and Satchell, C. 2012. People, content, location: sweet spotting urban screens for situated engagement. *DIS '12: Proceedings of the Designing Interactive Systems Conference*. ACM (NY, USA, Jun. 2012), 146–155.
- [78] Seeburger, J. and Foth, M. 2012. Content sharing on public screens: experiences through iterating social and spatial contexts. *OzCHI '12: Proceedings of the 24th Australian Computer-Human Interaction Conference*. ACM (NY, USA, Nov. 2012), 530–539.
- [79] Seeburger, J., Foth, M. and Tjondronegoro, D. 2010. Capital music: personal expression with a public display of song choice. *NordiCHI '10: Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries*. ACM (NY, USA, Oct. 2010), 777.
- [80] Senseable City Lab (MIT), Adaptive Bus Stop Florence by Riccardi: 2009. <http://senseable.mit.edu/eyestop/ppt%20florence.pdf>. Accessed: 2013-09-02.
- [81] Silverman, D. 2013. *Doing Qualitative Research*. SAGE Publications Limited.
- [82] Smart Citizen Sentiment Dashboard Sao Paulo | Sensing the Networked City: http://moritzbehrens.com/2013/scsd_sp/. Accessed: 2013-11-20.
- [83] Steinberger, F. and Foth, M. 2013. Vote with your feet: hyperlocal public polling on urban screens (Poster). *OZCHI '10: Proceedings of the 22nd Conference of the Computer-Human Interaction Special Interest Group of Australia on Computer-Human Interaction*. ACM (NY, USA, 2013).

- [84] Storz, O., Friday, A., Davies, N., Finney, J., Sas, C. and Sheridan, J.G. 2006. Public Ubiquitous Computing Systems: Lessons from the e-Campus Display Deployments. *Pervasive Computing, IEEE*. 5, 3 (2006), 40–47.
- [85] Streetwise (formerly B-TEC) | I-SEED: <http://iseed.org/programs/streetwise/>. Accessed: 2013-11-20.
- [86] Taylor, N., Marshall, J., Blum-Ross, A., Mills, J., Rogers, J., Egglestone, P., Frohlich, D.M., Wright, P. and Olivier, P. 2012. Viewpoint: empowering communities with situated voting devices. *CHI '12: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM (NY, USA, May 2012), 1361.
- [87] Taylor, N., Taylor, N., Cheverst, K. and Cheverst, K. 2011. Rural Communities and Pervasive Advertising. *Pervasive Advertising*. (2011).
- [88] The Anne Frank House: Free2choose exhibition: <http://www.annefrank.org/en/Museum/Exhibitions/Free2choose/>. Accessed: 2013-11-20.
- [89] The Drum Polls - The Drum (Australian Broadcasting Corporation): <http://www.abc.net.au/news/thedrum/polls/>. Accessed: 2013-12-19.
- [90] Ti, J. 2011. Enhancing public transport passenger experience via mobile-mediated applications and services. *OzChi 2011 Doctoral Consortium Proceedings*. ACM (NY, USA, 2011).
- [91] Transforming the Urban Bus Stop | MIT Mobile Experience Lab: <http://mobile.mit.edu/portfolio/redefining-urban-bus-stops/>. Accessed: 2013-09-02.
- [92] United Colors of Dissent: <http://info.ucod.org/>. Accessed: 2013-11-20.
- [93] Vajk, T., Coulton, P., Bamford, W. and Edwards, R. 2007. Using a Mobile Phone as a “Wii-Like” Controller for Playing Games on a Large Public Display. *International Journal of Computer Games Technology*. 2008, 1 (Dec. 2007), 1–6.
- [94] Valkanova, N., Walter, R., Moere, A.V. and Müller, J. 2014. MyPosition: Sparking Civic Discourse by a Public Interactive Poll Visualization. *CSCW*. ACM (NY, USA, 2014).
- [95] Verhoeff, N. 2012. Navigating Screenspace: Towards Performative Cartography. *Moving Data The iPhone and My Media*.
- [96] Vlachokyriakos, V. 2013. PosterVote: Expanding the Action Repertoire for Local Political Action. (Sep. 2013), 1–10.
- [97] Vogel, D. and Balakrishnan, R. 2004. Interactive public ambient displays: transitioning from implicit to explicit, public to personal, interaction with multiple users. *Proceedings of the 17th annual ACM symposium on User interface software and technology*. ACM (NY, USA, 2004), 137–146.
- [98] Web 2.0: Compact Definition - O'Reilly Radar: 2005. <http://radar.oreilly.com/2005/10/web-20-compact-definition.html>. Accessed: 2014-01-17.
- [99] Weiser, M. 2002. The computer for the 21st Century. *Pervasive Computing, IEEE*. 1, 1 (2002), 19–25.
- [100] Weiser, M. and Brown, J.S. 1997. The coming age of calm technology. (1997), 75–85.

- [101] Wouters, N., Huyghe, J. and Moere, A.V. 2013. OpenWindow: citizen-controlled content on public displays. *PerDis '13: Proceedings of the 2nd ACM International Symposium on Pervasive Displays*. ACM (NY, USA, Jun. 2013).
- [102] Elrod, S., Bruce, R., Gold, R., Goldberg, D., Halasz, F., Janssen, W., Lee, D., McCall, K., Pedersen, E., Pier, K., Tang, J. and Welch, B. 1992. *LiveBoard: a Large Interactive Display Supporting Group Meetings, Presentations and Remote Collaborations*. Xerox Corporation. Palo Alto Research Center (1992)
- [103] Yahoo! Bus Stop Derby: <http://www.busstopderby.com/>. Accessed: 2013-09-02.
- [104] Young, G.T., Foth, M. and Matthes, N.Y. 2007. Virtual fish: visual evidence of connectivity in a master-planned urban community. *OZCHI '07: Proceedings of the 19th Australasian conference on Computer-Human Interaction: Entertaining User Interfaces*. ACM (NY, USA, Nov. 2007), 219–222.

A. Poll Questions

Politics and current affairs:

| Poll Question | Source |
|--|------------|
| Do you think Tony Abbott should have included more women in his cabinet? | abc.com.au |
| Was Kevin Rudd right to resign from Parliament? | abc.com.au |
| Should Australia have committed more than \$10 million towards the relief effort in the Philippines? | abc.com.au |
| Should the Federal Government honour the education funding deals made before the election? | abc.com.au |
| Do you think individual states should be able to pass their own legislation on same-sex marriage? | abc.com.au |
| Do you think attending a wedding is a legitimate reason for a politician to claim travel expenses? | abc.com.au |
| Do you think protection visas are a cruel way of treating asylum seekers? | User |
| Would you still wear a bike helmet if you weren't required to do so? | Colleague |

Local (Kelvin Grove, Brisbane):

| Poll Question | Source |
|---|---------------------|
| Do you consider Brisbane your hometown? | Author |
| Did you grow up in Australia? | Author |
| Do you prefer Kelvin Grove over Gardens Point? | Author |
| Have you lived in Brisbane for 3 years or more? | Author |
| Do you go to the Kelvin Grove markets on Saturdays? | Author |
| Are you satisfied with the variety of lunch places around here? | Author |
| Should the university provide a bigger shelter for this bus stop? | Author |
| Have you sourced academic writing and referencing assistance this semester? | QUT Student Support |
| Did you know there is a video game room at the library? | QUT Student Support |

A. Poll Questions

| Poll Question | Source |
|---|---------------------|
| Will you be enrolling for 2014 in December? | QUT Student Support |
| Are you ready for your exams? | QUT Student Support |

Local (OzCHI conference, Adelaide)

| Poll Question | Source |
|--|----------------------|
| Do you consider Adelaide your hometown? | Author |
| Did you grow up in Australia? | Author |
| Have you worked in HCI for 5 years or longer? | Author |
| Do you find the venue suitable for OzCHI? | Conference organiser |
| Do you enjoy the catering? | Conference organiser |
| Do you find the conference stimulating? | Conference organiser |
| Will you be attending next year's OzCHI conference? | Conference organiser |
| Did you secretly come to this year's OzCHI to go wine tasting at Barossa Valley? | Author |
| Do you have trouble reading floor plans? | Keynote speaker |
| Do you need to sit on furniture to understand if it is comfortable? | Keynote speaker |
| Do you need to walk around a kitchen design to understand if it suits you? | Keynote speaker |
| Did you go to a talk because of ChiFish? | User |
| Should OzCHI 2015 be held in Hobart? | User |
| Did you enjoy yesterday's conference dinner? | User |
| Are you smarter than a fifth grader? | User |

Meta:

| Poll Question | Source |
|---|---------------|
| Did you know that some questions were submitted by users? | Author |
| Do you answer these questions honestly? | Author |
| Did you vote on any question more than once? | Author |

| Poll Question | Source |
|--|---------------|
| Did you learn something about other OzCHI participants because of this installation? | Author |
| Do you feel comfortable voting in public? | Author |
| Did any of these questions make you think or discuss the topic? | Author |

B. Interview Questionnaire

Experience

User Non user Spectator Surrounded by:

How did you notice the application? What was your initial reaction?

What made you (not) use the application? (Could you relate to the question? Were there people with or around you?)

Please describe your experience with the application? With the tangible buttons?

Did you perceive voting as anonymous? Why (not)? Would you have preferred a less exposed mode of input, e.g. via your mobile phone? Did you answer honestly?

Did you feel like you learned something about fellow Kelvin Grove students, residents or staff? Does the installation provide a sense of community? Does the installation make you feel more connected to the people around you? (Refer to local vs. Australia, today vs. overall)

Which questions were most interesting to you? What question would you like to submit?

Did the questions make you think? Did the installation spark discussions with others?

Additional Information

Age: Gender: Occupation:

Suggest your own question, we'll try to put it on the screen:

Comments:

C. Interview Consent Form

| PARTICIPANT INFORMATION FOR QUT RESEARCH PROJECT - Interview - | |
|--|--|
| User Engagement with a Public Urban Screen QUT Ethics Approval Number 130000656 | |
| RESEARCH TEAM | |
| Principal Researcher: | Associate Professor Marcus Foth, Director, QUT Urban Informatics |
| Associate Researcher: | Fabius Steinberger, Research Intern, QUT Urban Informatics |
| DESCRIPTION | |
| This project is being undertaken as part of a research study conducted by the Urban Informatics Research Lab at QUT. The purpose of this study is to evaluate an urban screen application. | |
| You are invited to participate in this study, because we are interested in talking to people that are in the vicinity of the screen at the 391 bus stop at the Kelvin Grove Urban Village. We would like to learn about your experience with the screen (whether you ignored it or not, how you used it, etc.). Our goal is to further extend our understanding of how to better design applications for urban screens. Your contribution contributes to the success of this study. | |
| PARTICIPATION | |
| Participation will involve completing an interview that will take approximately 5 minutes of your time. Questions will include "Did you feel close to other persons?" and "Did you feel comfortable using this technology in public space?". | |
| Your participation in this study is voluntary. If you do agree to participate you can withdraw from the study without comment or penalty. If you withdraw, on request any identifiable information already obtained from you will be destroyed. Your decision to participate or not participate will in no way impact upon your current or future relationship with QUT. | |
| EXPECTED BENEFITS | |
| It is expected that this project will not benefit you directly. However, it may benefit you in the future by generating findings and knowledge that allows for a better design and deployment of interactive public displays in urban spaces. | |
| RISKS | |
| There are no risks beyond normal day-to-day living associated with your participation in this project. | |
| PRIVACY AND CONFIDENTIALITY | |
| All comments and responses are anonymous and will be treated confidentially unless required by law. The names of individual persons are not required in any of the responses. | |
| Any data collected as part of this project will be stored securely as per the QUT Management of Research Data policy. Please note that non-identifiable data collected in this project may be used as comparative data in future projects. | |
| CONSENT TO PARTICIPATE | |
| We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate. | |
| QUESTIONS / FURTHER INFORMATION ABOUT THE PROJECT | |
| If have any questions or require further information please contact one of the research team members below. | |
| Fabius Steinberger Research Intern, Urban Informatics Research Lab School of Design, Creative Industries Faculty, QUT 0490 148 747 fabius.steinberger@qut.edu.au | Associate Professor Marcus Foth Director, Urban Informatics Research Lab School of Design, Creative Industries Faculty, QUT 07 3138 8772 m.foth@qut.edu.au |
| CONCERNS / COMPLAINTS REGARDING THE CONDUCT OF THE PROJECT | |
| QUT is committed to research integrity and the ethical conduct of research projects. However, if you do have any concerns or complaints about the ethical conduct of the project you may contact the QUT Research Ethics Unit on [+61 7] 3138 5123 or email ethicscontact@qut.edu.au . The QUT Research Ethics Unit is not connected with the research project and can facilitate a resolution to your concern in an impartial manner. | |
| <i>Thank you for helping with this research project. Please keep this sheet for your information.</i> | |

User Engagement with a Public Urban Screen

QUT Ethics Approval Number 1300000656

RESEARCH TEAM CONTACTS

| | |
|---|--|
| Fabius Steinberger | Associate Professor Marcus Foth |
| Research Intern, Urban Informatics Research Lab School of Design, Creative Industries Faculty, QUT | Director, Urban Informatics Research Lab School of Design, Creative Industries Faculty, QUT |
| 0490 148 747 fabius.steinberger@qut.edu.au | 07 3138 8772 m.foth@qut.edu.au |

STATEMENT OF CONSENT

By signing below, you are indicating that you:

- Have read and understood the information document regarding this project.
- Have had any questions answered to your satisfaction.
- Understand that if you have any additional questions you can contact the research team.
- Understand that you are free to withdraw at any time, without comment or penalty.
- Understand that you can contact the Research Ethics Unit on [+61 7] 3138 5123 or email ethicscontact@qut.edu.au if you have concerns about the ethical conduct of the project.
- Understand that non-identifiable data collected in this project may be used as comparative data in future projects.
- Agree to participate in the project.

Name _____

Signature _____

Date _____

D. Interview Data

This section lists notable quotes from the interviews used for the data analysis. Here, they are presented in the same structure as in chapter 7 (*Discussion of Results*): Attention, motivation, polling in public, social interaction, reflection of the local community, and popular poll questions.

Attention

“I saw the question and thought the answer was obvious, so I didn’t bother voting. I was curious what was next though, so I waited a bit to see the next question.”

“I saw the buttons on the ground and thought: that’s interactive multimedia, cool! So I went ahead and tried it out.”

“The big Yes and No texts caught my attention.”

“I saw the buttons, wanted to check what’s going on and then read two questions on the screen.”

“The buttons on the ground were easy to try out, they were just there. Usually they want you to use your phone or that sort of thing.”

“I was trying to understand the buttons so I check them.”

“I didn’t see it, I was looking at my phone.”

“We saw the Yes and No.”

“Saw the buttons already the other day, wanted to find out more today.”

“The buttons looked really cool.”

“I’d never seen such a voting before.”

“I saw that girl who was already using it.”

Lady offered kids to try it out as well. They were spectators and curiously observing.

Motivation

“Impulsiveness. I thought the question was interesting, so that made me use the application.”

“I’m waiting for the bus, so I’ve got time. The question was interesting.”

“It looked fun so I wanted to try it out. First I thought it was touch sensitive like a smartphone.”

“I didn’t use it right now because I’m visiting a friend. So I was gonna get her first and then try it together later.”

“I wanted to see how it ticks. I’m interested in this sort of thing, as a matter of fact I’m on my way to a meeting about tech for events right now.”

“I had never seen something like this before, so I was curious.”

“It was easy to participate.”

“We thought it might be fun to try it out and vote for whatever we thought was the opposite of what the majority might have voted.”

“We actually sat down to discuss the questions. We haven’t voted yet because we’re still talking about it.”

“I saw the question and thought the answer was obvious, so I didn’t bother voting. I was curious what was next though, so I waited a bit to see the next question.”

“I was waiting for the bus, so this was a good opportunity to try this out. It looked so different and new, so I wanted to try it out.”

“I wanted to contribute and submit my own opinion.”

“Question was interesting and I wanted to see the results.”

“It looked so inviting with the big Yes and No. A bus stop is also such a public place, you just know you’re allowed to participate. Everybody can participate here, it’s not just at the side of building where you’re not sure if you’re allowed to take part.”

“It made me feel quite happy, maybe because the clicking sound was so rewarding and because I could voice my opinion.”

“I think the best part is that it’s so interactive and easy to participate. We didn’t even plan on coming here and yet we were standing here for 10 or 15 minutes answering questions.” (it was only 2-3 minutes)

“I used it because it seemed like I was invited to use it, I guess because it doesn’t seem intimidating at all.”

“It’s so easy so we just went ahead.”

“I’m waiting here for the bus so I just did it. I LOVED the sound.”

“I was interested in the question (politics). The buttons seemed easy.”

Polling In Public

“Not at all.”

“I probably wouldn’t have done it if a bunch of people had been observing me. It was good I could try it out myself here.”

“I answered the questions honestly. I didn’t have any privacy concerns, even though there were lots of other people around.”

“It seemed like you really commit to your answer with your whole body. It’s not just clicking a little button with your finger. So you commit to your behaviour or opinion. This applied especially to the questions asking for a proper opinion or something that’s supposed to be right or morally correct.”

“It’s not like you’re opinion is on a secret little post it note. But no, I didn’t have any concerns.”

“I was a bit worried that other people didn’t answer honestly.”

“Some people might be embarrassed. It didn’t matter to me if people were watching me though.”

Reflection of the Local Community

“Judging from the three questions that I saw, the results were not surprising. In this case, casting my vote was more interesting than seeing other people’s opinions.”

“It’s important to see the number of people who already voted. That way you can tell what the results represent.”

“It was interesting to see that Kelvin Grove mirrored the ABC results.”

“It didn’t expect the result to be 80%/20% for that question.”

“There were too few number of votes to make sense of the results.”

"I can't be sure if I learned something about Kelvin Grove residents, but certainly about previous users."

"I was surprised to see that my opinion was aligned with the majority, I didn't expect that."

"It was interesting that people voted 50% / 50% on the Kevin Rudd question. That made me reflect on my own opinion, because that result made it seem like a controversial issue."

"In most cases I knew my own opinion but I was also interested in other people's opinions."

"I didn't pay much attention to the results."

"It was fun to compare the two locations: here and everywhere."

"I wanted to see my own opinion vs. others' opinion."

"I want this to be at every bus stop, then compare results."

"I was surprised to see that only a dozen people have voted. I would've thought the numbers were much higher in the evening if this thing had been running since early in the morning."

"I was curious to see if people voted the same way as I or the opposite."

"We actually discussed that one question about the lunch places around here."

"I work around here so I suspected I knew the answers to the questions about demographics. My friend however isn't from around here, she's just visiting. So I got to explain some of the results a bit more in-depth and she learned both from me and the app."

"We asked ourselves if other people answered honestly. It was fun to see that exact question being asked, as if to respond to our concern/curiosity."

"Overall, both seeing the results and answering were interesting to us."

"It was interesting to compare my own opinion with others. I agreed with the majority."

"I loved looking at the results. I'm an international student so I could learn about this area and compare the results. I was surprised to see so many people answering they didn't come from Australia or Brisbane. Maybe there are more international students like me than I had expected."

"I loved comparing mine vs. others."

Social Interaction

"We discussed the wording of some of the questions and the spirit behind them. E.g. regarding the 10 Mio \$ question or the one about gay marriage."

Asian girl started using it, then another white girl saw here and also used it. They then talked and laughed and later went their own ways.

"We discussed all the questions. Even if we didn't agree, it did make us discuss these issues among ourselves. So it was pretty great for a spontaneous talk about these things."

"Yes we discussed some of the questions."

Popular Poll Questions

"Questions about politics were more interesting than demographics."

"Some questions made me think."

"Politics"

"I was already pretty sure about my own opinion."

“Some questions made me reflective in terms of my own opinion. I was ambivalent on one of them.”

“The question about whether Brisbane was your hometown was interesting. As someone who just recently moved here that was interesting to me, I voted no.”

“I loved that you can nominate your own questions. I wanted to do that but couldn’t think of one right that instance. But I’d love to do it later.”

“The questions were not controversial enough, some were almost too obvious to say yes to. E.g. asking the question about education funding on an uni campus.”

“The questions about this area were most interesting. We just moved here a year ago so it’s interesting to see what others think.”

“I was most interested in seeing people’s answers. So we kept on voting to see the results.”

“The questions about politics were the most interesting to answer, whereas the questions about demographics were most fun to see the results of.”

“With some questions the wording wasn’t entirely clear so we didn’t want to vote on those.”

“I wanted to put my own question on there but I couldn’t think of a good one right then.”


“The mix of more serious and political or broader questions as well as more local questions made it so much more engaging.”

“To me the question about same-sex marriage and politics were the best. Maybe you could ask about international students rights and equality policies.”

“I’m a resident, so when the thing started asking questions about uni, I wasn’t sure anymore whether I was supposed to participate.”

“I like the questions the most that related to myself or my situation.”

E. Ethical Clearance Application

| | | |
|--|---|---|
| University Human Research Ethics Committee APPLICATION FOR REVIEW OF NEGLIGIBLE / LOW RISK RESEARCH INVOLVING HUMAN PARTICIPANTS | |  January 2013 |
| NOTE | <ul style="list-style-type: none"> • All answers should be written <u>in simple and non-technical language</u> that can be <u>easily understood by the lay reader</u>. • You must provide an answer to each questions - N/A is not acceptable. | |
| SECTION A: RESEARCH PROPOSAL OVERVIEW | | |
| A1 Summary Information | | |
| A1.1 | Project title (200 character limit including spaces) | |
| | User Engagement with a Public Urban Screen | |
| A1.2 | Brief project summary in LAY LANGUAGE (i.e. plain English) | |
| | <p>This research project trials and evaluates different forms of urban screen interactions in public spaces and their impact on social interaction. Urban screens are becoming a common sight in many cities. They are increasingly being equipped with interaction capabilities enabling user control over the screen content that allow for more sophisticated screen applications. One of the unique features of urban screens is interaction in the public space. By interacting with them (unlike mobile phones or desktop computers), user interactions are exposed to other people (e.g. passers-by). This presents not only the potential of connecting people, e.g. through applications that can be used by multiple people at the same time, but also bears challenges. One of these challenges is to find ways for users to interact not only with the screen but also with each other in a way they are comfortable with.</p> <p>The QUT Urban Informatics Research Lab has installed, owns and operates an outdoor urban screen, including a built-in computer and loudspeakers, installed at the 391 bus stop at the QUT Creative Industries Precinct at Kelvin Grove, corner of Musk Avenue and Carraway Street. Several screen-based applications have been researched by the team to date, including studies by Dr Ronald Schroeter (ethics #060000033) and Dr Jan Seeburger (1000000695).</p> <p>This study involves creating and evaluating an interactive application for the urban screen at the 391 bus stop. The application is a polling tool that lets people voice their opinions. The screen presents one yes-no question at a time. The questions relate to current events and ask for the people's opinions about it (e.g. who will win a sports event? Do you enjoy the weather today? Did you have a good semester break? Will you go to the local market on Saturday?). Users are able to answer the questions by pressing physical buttons labelled "Yes" and "No". The screen also displays the results, allowing users to compare their own answer to other people's answers and to get an overall impression of the mind set in the Kelvin Grove Urban Village. This way, people who share experiences or opinions are connected to each other through the screen application.</p> <p>Following a qualitative methodology, we will use participant observations, questionnaires and interviews for data collection. Participant observations are used to count the number of users and document the way they interact with the urban screen application. The questionnaire will include standard user experience design questions. Semi-structured interviews will comprise open-ended questions to gather user opinions and insights on their overall experience using the screen in public. The researchers will be present on location for the whole duration of the study.</p> | |
| A1.3 | Provide an overview of your <u>research participants and their involvement</u> (max 250 words) | |
| | The purpose of this question is to gain a sense of who the participants will be, and what you expect them to do within the research | |

| | |
|--------------------|---|
| | <p>Participant observations:</p> <p>Potential study participants are passers-by at the 391 bus stop at Musk Ave / Carraway St, e.g. QUT students or staff, and residents and visitors of the Kelvin Grove Urban Village. Participant observations are used in order to observe and count the number of people interacting with the screen. Anyone entering the vicinity of the public screen is in one way or another actively or passively participating in this study, e.g. by ignoring or using the public screen. However, nobody is forced to actively use the screen. The point of the observations is to find out what kind of technology makes people want to use it, and to count and compare use versus non-use.</p> <p>Interviews and questionnaires:</p> <p>Interview and questionnaire participants will be adults who volunteer to participate in this study. They will be selected on-site based on the findings of the initial participant observations. This procedure has been previously approved by QUT ethics in application #0600000033. Gender or other demographic attributes are irrelevant for this study. Participants will be asked as they are being approached whether they have adequate time (5 min) to take part in the study, read the consent form and make an informed decision. Participants are also invited to take the consent form with them and contact the researcher at a later stage. Participants will complete a brief questionnaire or interview. Participants may answer both the questionnaire and interview if they explicitly wish to do so, however, it is not planned in order to prevent research fatigue.</p> <p>The main instruments used in the questionnaire will be the Player Experience of Need Satisfaction (PENS) and Game Experience Questionnaire (GEQ). These instruments have been approved for use by QUT in ethics applications #09000000936 and #1100000657. They consist of statements; respondents rate their level of agreement to each item using a 7-point Likert scale (1 = Do Not Agree, 7 = Strongly Agree). The set of statements includes:</p> <ul style="list-style-type: none"> - I feel close to other persons. - I felt pressure. - I lost track of time. - It felt like a rich experience. <p>The questions in the interviews go in the same directions. However, they will be of a more open-ended nature, providing space for more in depth answers such as stories and explanations.</p> |
| <p>A1.4</p> | <p>Provide a summary of the merits of this proposed research (in LAY LANGUAGE) including the aims / hypotheses / research questions (refer to Section 1 of the National Statement, NS1.1, when preparing your response).</p> <ul style="list-style-type: none"> • Include potential contributions to the body of knowledge and methodological rigor (max 250 words). Briefly provide evidence that the proposed research is based on knowledge of the relevant literature, and provide a list of key references. You may also attach a research plan / methodology which <u>does not substitute for the summary above</u> - this attachment should be no longer than 6 pages. NOTE: Unless proposed research has merit (and the researchers who are to carry out the research have integrity) the involvement of human participants in the research cannot be ethically justified. |

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| | <p>This project's general aim is to provide a better understanding of urban screen interactions in public spaces. It presents timely research as public displays evolve from being passive information or advertisement displays to becoming increasingly interactive and omnipresent.</p> <p>More specifically, one of the emerging research questions this study aims to address is how to foster social interaction through urban screen technology. Furthermore, this project investigates the impact of public display technology on the user experience, seeking answers to questions such as:</p> <ul style="list-style-type: none"> • Did you feel comfortable using this technique in the public? • Did you feel connected to nearby people, e.g. strangers or friends? • What's your subjective opinion on the overall experience? <p>Rogers and Brignull [2] have identified social embarrassment as a key factor in determining whether people will interact with a public display in front of an audience. They draw an analogy with a street performer in a public space, who invites a participant from the audience to 'help out' with their show. Such a person can often be wary of volunteering, not knowing what exactly will be required of them. Müller et al. [3] talk about the presentation of self (everybody plays a role, and a major goal is to maintain coherence of their role) and about public display as a stage.</p> <p>Alt et al. [1] frame the social impact of public displays (do they foster social interaction, communities around displays?) as a key research question. Previous research has found that while remote interaction (e.g. via mobile phones or websites) reduces social embarrassment, it also reduces social interaction. Moreover, previous research suggests that participants need to be able to learn how to interact with the system intuitively, rather than be told or have to follow a set of instructions. Such low commitment activities render the interaction quick to learn, do and enjoy.</p> <p>It is imperative for this study to be carried out "in the wild," a real-world public space (as the study site, the bus stop at the Kelvin Grove Urban Village, presents), because previous research identified a discrepancy between laboratory and real-world studies in the context of public display interaction [4].</p> <p>References:</p> <p>[1] Alt, F., Schneegaß, S., Schmidt, A., Müller, J. and Memarovic, N. 2012. How to evaluate public displays. PerDis '12: Proceedings of the 2012 International Symposium on Pervasive Displays. (2012), 17.</p> <p>[2] Brignull, H. and Rogers, Y. 2003. Enticing people to interact with large public displays in public spaces. Proceedings of INTERACT. 3, (2003), 17-24.</p> <p>[3] Müller, J., Alt, F., Michelis, D. and Schmidt, A. 2010. Requirements and design space for interactive public displays. Proceedings of the international conference on Multimedia. (2010), 1285-1294.</p> <p>[4] Ojala, T., Kostakos, V., Kukka, H., Heikkinen, T., Lindén, T., Jurmu, M., Hosio, S., Kruger, F. and Zanni, D. 2012. Multipurpose interactive public displays in the wild: Three years later. Computer. 45, 5 (2012), 42-49.</p> |
| A1.5 | <p>Why should this be considered a negligible OR low risk application?</p> <p>Refer to Chapter 2.1 of the National Statement when preparing your response and note that:</p> <ul style="list-style-type: none"> • 'Negligible risk research' describes research in which there is no foreseeable risk of harm or discomfort; and any foreseeable risk is no more than inconvenience (e.g. filling in a form, participating in a street survey, or giving up time to participate in research). • 'Low risk research' describes research in which the only foreseeable risk is one of discomfort (e.g. minor side-effects of medication, the discomforts related to measuring blood pressure, and anxiety induced by an interview). • Research in which the risk for participants is more serious than discomfort (e.g. where a person's reactions include pain or becoming distressed) the research <u>cannot be considered low risk</u>. |
| | <p>This research project can be considered as low risk as the only foreseeable risk is one of discomfort during interviews. The people involved in the research are engaging in the kinds of activities that they regular perform for work or personal interest (i.e. waiting at the bus stop, looking at screens, playing videogames), and thus the risk involved is not greater than the level of risk they choose to bear in their everyday lives.</p> |
| A2 | <p>Potential Risks and Benefits (refer to Chapter 2.1 of the National Statement when preparing your response)</p> |

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| A2.1 | <p>Describe ALL the identified potential risks and who may be affected by these risks e.g. researchers, participants, participant community and / or the wider community.</p> <p>When gauging the level of risk ensure you take into account:</p> <ul style="list-style-type: none"> • the kinds of harm, discomfort or inconvenience that may occur; • the likelihood of these occurring; and • the severity of any harm that may occur. <p>The choices, experience, perceptions, values and vulnerabilities of different populations of participants will be relevant.</p> |
| | <p>1. Participant observations: Participants may experience discomfort in terms of using an unfamiliar screen application and loss of time.</p> <p>2. Interviews and questionnaires: Participants may experience inconvenience in terms of spending time answering questions (no harm). Participants may experience discomfort in terms of:</p> <ul style="list-style-type: none"> - Answering questions about their experiences and personal preferences regarding the screen application (no harm). - Anxiety during interviews (no harm). - Misbehaviour of other participants (no harm). - Anxiety while interacting with an application in the public space (no harm). |
| A2.2 | <p>How are the risks to be minimised? And how will they be managed if they were to occur during the study or arise after the completion of the study?</p> <p>NOTE: The greater the risk to participants in any research for which ethical approval is given, the more certain it must be both that the risks will be managed as well as possible, and that the participants clearly understand the risks they are taking on.</p> |
| | <p>The above mentioned risks will be managed by:</p> <p>1. Participant observations: Even though anyone entering the vicinity of the public screen is in one way or another actively or passively participating in this study (e.g. by ignoring or using the public screen), nobody is forced to actively use the screen. The point of the observations is to find out what kind of technology makes people want to use it, and to count and compare use versus non-use. So if a person does not feel comfortable using the screen application, he or she is not going to use it in the first place. This is something we found out in previous studies.</p> <p>2. Interviews and questionnaires:</p> <p>The interview and questionnaire participants will be informed about the research project in detail before their further engagement.</p> <p>Participants may answer both the questionnaire and interview if they explicitly wish to do so, however, it is not planned in order to prevent fatigue. Participation is voluntary and may be stopped at any time, e.g. in case the participant has to catch a bus or in case of discomfort or anxiety.</p> <p>Participants will be given contact details of the researcher and the QUT Research Ethics coordinator so that they can seek advice in the unlikely event they are concerned about any aspect of the study. In case of any fatigue or discomfort participants can take a break or withdraw from the study at any time.</p> |
| A2.3 | <p>What are the potential benefits of the research and who would benefit from these?</p> <ul style="list-style-type: none"> • Benefits of research may include, e.g. gains in knowledge, insight and understanding, improved social welfare and individual wellbeing, and gains in skill or expertise for individual researchers, teams or institutions. • Some research may offer direct benefits to the research participants, their families, or particular group/s with whom they identify. Where this is the case, participants may be ready to assume a higher risk than otherwise. |
| | <p>The main benefit of this study includes better understanding the design of engaging screen interactions in public space.</p> |
| A2.4 | <p>How do the benefits justify the risks?</p> <ul style="list-style-type: none"> • Research is ethically acceptable only when its potential benefits justify any risks involved in the research. |
| | <p>Participants will be asked to engage in activities that are fundamentally similar or identical to those that they carry out in their day-to-day lives (waiting for the bus, seeing a display, deciding whether to ignore the display or to further engage with it). Therefore, any risk associated with participation will be similar or equal to those of their daily life. The various benefits to the participants, research field and wider community outweigh the minimal / lack of risks.</p> |
| A3 Other General Information | |

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| A3.1 | Where will the data be collected? (e.g. on site at QUT or other location) NOTE: If you would like to conduct your study at the premises of an external organisation/association please ensure you provide a copy of your intended approach letter which requests their support/permission for this, or provide evidence of this if already gained. | | | | | | | | |
| | <table border="1"> <tr> <td>QUT</td> <td><input checked="" type="checkbox"/></td> <td>Other - details:</td> <td>At the 391 bus stop on Kelvin Grove campus where the public screen was installed by the QUT Urban Informatics Research Lab.</td> </tr> </table> | QUT | <input checked="" type="checkbox"/> | Other - details: | At the 391 bus stop on Kelvin Grove campus where the public screen was installed by the QUT Urban Informatics Research Lab. | | | | |
| QUT | <input checked="" type="checkbox"/> | Other - details: | At the 391 bus stop on Kelvin Grove campus where the public screen was installed by the QUT Urban Informatics Research Lab. | | | | | | |
| A3.2 | Is the QUT Human Research Ethics Committee (UHREC) the primary or only ethics committee reviewing this proposal? If NO, provide details of any other institutional HREC involved and the role of each institution (including QUT) in the project. If the project involves more than one institution that also has a HREC, please provide details on the role of QUT UHREC; whether arrangements can be put in place for to minimise multiple review; arrangements for communication of the roles/responsibilities between the institutions HRECs, e.g. who will monitor etc. | | | | | | | | |
| | Yes | | | | | | | | |
| A3.3 | What are the estimated timeframes for the project? (dd/mm/yyyy) NOTE: Data collection cannot commence until you have received formal written UHREC approval. | | | | | | | | |
| | <table border="1"> <tr> <td>Start of project</td> <td>06/08/2013</td> <td>Start of data collection</td> <td>01/11/2013</td> </tr> <tr> <td>End of project</td> <td>05/08/2018</td> <td>End of data collection</td> <td>31/10/2018</td> </tr> </table> | Start of project | 06/08/2013 | Start of data collection | 01/11/2013 | End of project | 05/08/2018 | End of data collection | 31/10/2018 |
| Start of project | 06/08/2013 | Start of data collection | 01/11/2013 | | | | | | |
| End of project | 05/08/2018 | End of data collection | 31/10/2018 | | | | | | |

SECTION B: PARTICIPANT OVERVIEW (refer to [Chapter 2.2 of the National Statement](#) when preparing your response)

B1.1 Who will be approached to participate? Clearly outline each participant group.

Provide details of the potential participant pool. If you are accessing secondary data please provide full details, including whether permission has been sought. If you are accessing Queensland Health data, you should determine (<http://www.health.qld.gov.au/ohmr/>) if it is necessary for you to submit a QH application (under the Public Health Act).

Participants will be students, staff and residents of the Kelvin Grove Urban Village area. Gender and age are irrelevant. Potential users of the screen application will mostly consist of people waiting for the 391 bus as well as passers-by (e.g. on the way to work, lunch or class).

B1.2 How many participants do you need for your study and approximately how many will you need to approach?

We intend to interview about 10–20 participants to be evaluated. For this we expect to approach 20–40 people asking for their time and consent to be interviewed.

B1.3 How will potential participants be identified and approached?

NOTE: If you would like to recruit participants via an external organisation/association please ensure you provide a copy of your intended approach letter which requests their support/permission, or provide evidence of this if already gained.

Potential study participants are passers-by at the 391 bus stop at Musk Ave / Carraway St, e.g. QUT students or staff, and residents and visitors of the Kelvin Grove Urban Village. Participants will be selected for interviews on-site based on the findings of the initial participant observations. This procedure has been previously approved by QUT ethics in application #060000033.

B1.4 How will the participants provide their consent to participate?

Outline the consent process you will use, what type of consent will be requested (i.e. specific, extended or unspecified – see [NS2.2.14](#)), what material will be provided to participants, how long participants will have to consider their decision to participate and what discussion will occur with participants.

NOTE:

- A person's decision to participate in research must be voluntary and informed i.e. not forced, coerced or obtained by improper inducements AND based on sufficient information and adequate understanding of both the proposed research and the implications of participation in it (the purpose, methods, demands, risks and potential benefits of the research).
- The process of communicating information to participants and seeking their consent should not be merely a matter of satisfying a formal requirement. The aim is mutual understanding between researchers and participants. This aim requires an opportunity for participants to ask questions and to discuss the information and their decision with others if they wish.

For the interviews and questionnaires, participants will read an information sheet outlining the nature of the study and the risks associated with it, and will provide consent by signing the provided consent form and continuing with their involvement in the study. Participants are also invited to take the consent form with them and contact the researcher at a later stage.

Participant observations are used in order to observe and count the number of people interacting with the screen. Anyone entering the vicinity of the public screen is in one way or another actively or passively participating in this study, e.g. by ignoring or using the public screen. However, nobody is forced to actively use the screen. The point of the observations is to find out what kind of technology makes people want to use it, and to count and compare use versus non-use.

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| B1.5 | <p>Will the project involve participants who are unable to give voluntary or informed consent? If YES, what special arrangements will be put in place to protect your participants' interests/welfare?</p> <p>These questions refer to research involving:</p> <ul style="list-style-type: none"> • Children and young people whose particular level of maturity has implications for whether their consent is necessary and/or sufficient to authorise participation (see Chapter 4.2 of the National Statement). • Persons with a cognitive impairment, and intellectual disability, or a mental illness (permanent or temporary) which impacts upon their ability to supply voluntary and informed consent (see Chapter 4.5 of the National Statement). • Persons who are highly dependent on medical care, e.g. unconscious or unable to communicate their wishes (see Chapter 4.4 of the National Statement). • Covert observation of behaviour, particularly if this relates to sensitive, contentious or illegal activity consent (see Chapter 2.3 and Chapter 4.6 of the National Statement). <p>NOTE: Where participants are unable to make their own decisions or have diminished capacity to do so, respect for them involves empowering them where possible and providing for their protection as necessary.</p> <p>This study does not involve engaging with people who are unable to give informed consent for the interviews and questionnaire components. However, there might be coincidental recruitment for the observations as we observe everyone who is in the vicinity of the screen.</p> |
| B1.6 | <p>Do you propose to screen or assess the suitability of the participants for the project? If YES, clearly state and explain the criteria (inclusion and exclusion, as applicable) for selecting potential participants.</p> <p>No</p> |
| B1.7 | <p>Will participants be offered reimbursements, payments or incentives? If YES, also provide the specific details (type and value), how and when it will be provided and whether its offer could compromise the voluntary nature of the consent obtained from participants. NOTE: Details of these should be provided on the Participant Information Sheet.</p> <ul style="list-style-type: none"> • It is generally appropriate to reimburse the costs to participants of taking part in research, including costs such as travel, accommodation and parking. Sometimes participants may also be paid for time involved. However, payment that is disproportionate to the time involved, or any other inducement that is likely to encourage participants to take risks, is ethically unacceptable (NS2.2.10) • Decisions about payment or reimbursement in kind, whether to participants or their community, should take into account the customs and practices of the community in which the research is to be conducted (NS2.2.11) <p>No</p> |
| B1.8 | <p>Do you, or others involved in facilitating or implementing the research, have a pre-existing relationship with the proposed participants? Could this result in the proposed participants feeling obliged or coerced into participation? Refer to Chapter 4.3 of the National Statement and the QUT Research Data Collection in Classrooms or Lecture Theatres guidance when considering/preparing your response. If YES, describe this relationship and how you will address the special ethical issues this raises (e.g. potential coercion in recruitment). Also outline what special arrangements will be put in place to protect the interests / welfare of potential participants. NOTE:</p> <ul style="list-style-type: none"> • Pre-existing relationships may compromise the voluntary nature of participants' decisions, as they typically involve unequal status, where one party has or has had a position of influence or authority over the other. • Examples may include relationships between employers or supervisors and their employees; teachers and their students; carers and people with chronic conditions or disabilities or people in residential care or supported accommodation; etc (see Chapter 4.3 of the National Statement for more examples). • While this influence does not necessarily invalidate the decision, it does mean that particular attention should be given to the process through which consent is negotiated. <p>No</p> |
| B1.9 | <p>Will you conduct a debriefing session at the end of the research or at the end of each participant's involvement? If YES, please provide the details of this session. NOTE: Such a session is required for research involving deception (see Chapter 2.3 of the National Statement), and may be appropriate if the research is likely to cause discomfort to participants.</p> <p>No</p> |
| B1.10 | <p>Consider providing feedback to participants as this is encouraged by the National Statement. Will feedback and/or the research results be reported to participants?</p> <ul style="list-style-type: none"> • If YES, explain how this will be done and in what form this reporting will occur. • If NO, explain why the participants are not to be provided with such a report. <p>Yes, the outcomes of the research will be published in research papers which will be publicly available via eprints.</p> |

SECTION C: DATA MANAGEMENT

C1 Future Use of Data

C1.1 Is it likely / possible that any of the data collected will be used by you, or others, for any research other than that outlined in this application? See [Chapter 2.2](#) and [Chapter 3.2](#) when preparing your response.
 If YES, describe below and ensure this is outlined in all your participant information sheets and consent forms.

- Participants should be fully informed of the possibility of any future use of data collected and their 'extended' or 'unspecified' consent gained. Failure to do this may restrict the future use of the data.
- Any restrictions on the use of participants' data should be recorded and the record kept with the collected data so that it is always accessible to researchers who want to access those data for research.

Yes, it might inform other researchers and publications at a future point in time and enable them to build upon our findings.

C2 Procedures & Protection

C2.1 What data collection procedures will be utilised?
 Place an 'X' in the relevant boxes below AND provide a copy (draft or finalised, labelled as such) of the relevant instrument, protocol or other written form used to guide (e.g. interview questions/guide) or collect data (e.g. survey) or include an explanation of the method by which the data will be collected. Clinical experimental measures / tools or creative works are considered "Other Instrument".

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| <input checked="" type="checkbox"/> | Questionnaires/Surveys | Archival records |
| <input checked="" type="checkbox"/> | Interviews | Focus groups |
| <input checked="" type="checkbox"/> | Other instrument – provide details: | Participant observations during screen application usage <small>(If there is insufficient space here, provide details in an additional separate document)</small> |

C2.2 Have the data collection procedures been previously approved by QUT or are they an academic standard instrument? If YES, provide brief details on prior approval or where instruments have been used previously, e.g. under a similar research context

Yes. The main instrument used in the questionnaire will be the Player Experience of Need Satisfaction (PENS) and Game Experience Questionnaire (GEQ). These instruments have been approved for use by QUT in ethics applications #09000000936 and #1100000657. Observing people at the screen has been previously approved by QUT ethics (#0600000033).

C2.3 In what form will the human data be collected, stored and used/reported?
 Place an 'X' in the relevant boxes below – at least one box must be checked in each column; if relevant you can check more than one box in each column.
NOTE: The term 'de-identified data' sometimes refers to a record that cannot be linked to an individual (non-identifiable), and at other times refers to a record from which identifying information has been removed but for which the means exist to re-identify the individual (re-identifiable or potentially re-identifiable). Because of this ambiguity, the terms below should be used.

| Collected | Stored | Used/ Reported | |
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| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Individually Identifiable i.e. data from which the identity of a specific individual can be reasonably ascertained. Examples of identifiers may include the individual's name, image, date of birth or address. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Re-Identifiable or Potentially Re-Identifiable i.e. data from which identifiers have been removed and replaced by a code, but from which it remains possible to re-identify a specific individual, for example, by using the code or by linking different data sets. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Non-Identifiable i.e. data that have <u>never been labelled</u> with individual identifiers OR from which <u>identifiers have been permanently removed</u> , such that no specific individual can be identified. This includes coded but anonymous data which can be linked with other data so it can be known that they are about the same participant, while the identity of that specific individual remains unknown. |

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| C2.4 | Is this project funded? If YES, outline what rights the funder of the study will have to data obtained from the study, and in what format e.g. aggregate reports only, access to raw data or other. NOTE: Any access by the funder should be made clear to participants. | <input type="text" value="No"/> | | | | | | |
| C2.5 | How will confidentiality of the study records be protected during the study and in the publication of results? NOTE: If you intend to identify participants or organisations, this needs to be made clear on the Participant Information Sheet. | <input type="text" value="No personal identifiers will be collected during the study. All comments and responses will be treated confidentially and will be made anonymous when transcribed."/> | | | | | | |
| C2.6 | Is this a collaborative project? If YES, also provide brief detail on data-sharing arrangements e.g. open – all parties have access to each other’s data; partial – data held by collaborator completing particular component. | <input type="text" value="No"/> | | | | | | |
| C2.7 | Who will own the resulting research data and the created intellectual property? Place an ‘X’ in the relevant box/es below – at least one box must be checked; if relevant you can check more than one box. Please refer to the D/3.1 Intellectual property (IP) policy for further information. | <table border="1"> <tr> <td><input checked="" type="checkbox"/></td> <td>QUT (Note: QUT as an employer is the owner of IP created by staff members in the course of their employment)</td> </tr> <tr> <td><input type="checkbox"/></td> <td>The student/s (NOTE: students personally own the IP they generate if this has not been otherwise assigned)</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Other – details:</td> </tr> </table> <p>QUT requires an IP agreement to be in place if IP ownership is to deviate from that described in D/3.1 Intellectual property (IP) policy. Please contact the relevant section of the Division of Research & Commercialisation if you require any further assistance.</p> | <input checked="" type="checkbox"/> | QUT (Note: QUT as an employer is the owner of IP created by staff members in the course of their employment) | <input type="checkbox"/> | The student/s (NOTE: students personally own the IP they generate if this has not been otherwise assigned) | <input type="checkbox"/> | Other – details: |
| <input checked="" type="checkbox"/> | QUT (Note: QUT as an employer is the owner of IP created by staff members in the course of their employment) | | | | | | | |
| <input type="checkbox"/> | The student/s (NOTE: students personally own the IP they generate if this has not been otherwise assigned) | | | | | | | |
| <input type="checkbox"/> | Other – details: | | | | | | | |
| C3 Storage & Security | | | | | | | | |
| <p>Ensure you refer to the QUT Data Management Checklist BEFORE completing this section.</p> <ul style="list-style-type: none"> • Data should be stored in a locked filing cabinet at QUT and/or electronically on a QUT mainframe drive. • Data must not be stored solely at home. | | | | | | | | |
| C3.1 | <input checked="" type="checkbox"/> YES Confirm that your research data and other records will be stored for the required period i.e. as outlined in the Queensland State Archives University Sector Retention & Disposal Schedule | | | | | | | |
| C3.2 | HARD/PAPER COPIES... (e.g. signed consent forms, which are required to be kept for 15 years as per the Schedule) | | | | | | | |
| C3.2.1 | What is the location/s of storage? (i.e. QUT room and building location and/or offsite storage location) | <input type="text" value="QUT K Block, Offices 505 and 506"/> | | | | | | |
| C3.2.2 | How will access to the stored data be controlled? | <input type="text" value="Office is locked; data will be stored in locked cabinets inside this office."/> | | | | | | |
| C3.2.3 | Who will have access to the stored data? | <input type="text" value="The named researchers listed on the coversheet"/> | | | | | | |
| C3.3 ELECTRONIC DATA... | | | | | | | | |
| C3.3.1 | What is the location/s of storage and back-up? (i.e. a secure computer/server and/or offsite storage location) | <input type="text" value="Personal computer and QUT computer at K505/506."/> | | | | | | |
| C3.3.2 | How will access to the stored data be controlled? | <input type="text" value="Password"/> | | | | | | |
| C3.3.3 | Who will have access to the stored data? | <input type="text" value="The named researchers listed on the coversheet"/> | | | | | | |

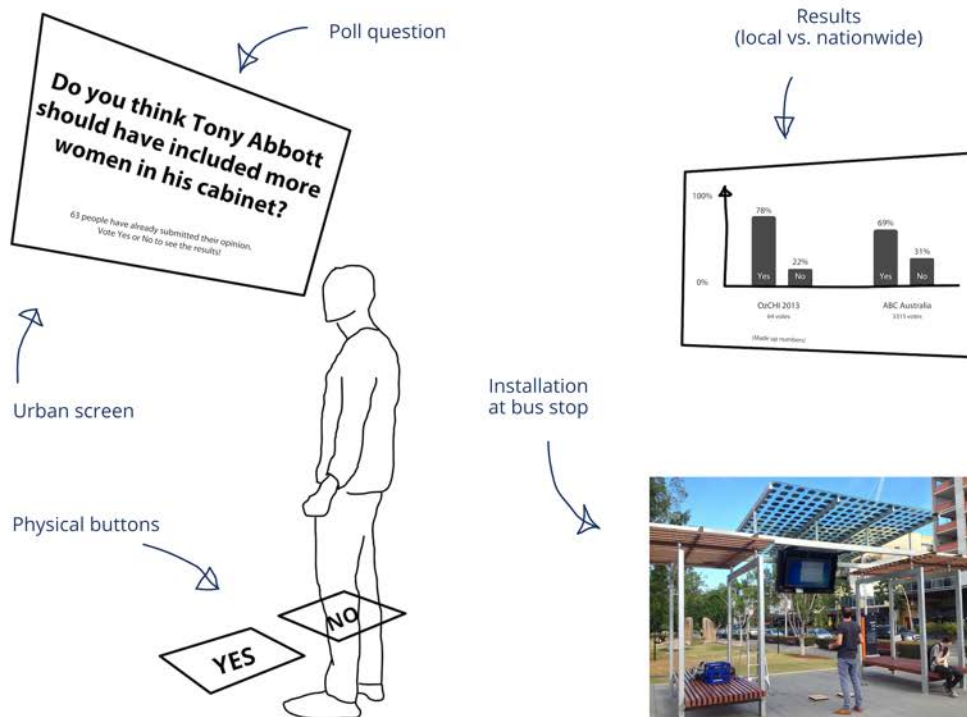
F. Poster (OzCHI '13)

OzCHI 2013
Adelaide

Vote With Your Feet

Hyperlocal Polling for Urban Screens

Fabius Steinberger
Urban Informatics, QUT



Research goals:

1. Explore privacy vs. practicality
2. Challenge one-way communication flows in the context of urban screens
3. Create a sense of belonging in the local community

Vote with Your Feet is a hyperlocal polling tool for urban screens that lets users express their opinion on current affairs. Similar to vox populi interviews on TV, it is meant to reflect the mindset of the community and its diversity. It shows one Yes/No question at a time and lets the user vote by stepping with their foot on one of two physical buttons. By not only displaying the local but also national results (taken from newspaper polls or TV news), it creates a sense of place and can spark offline conversations as well as making people think about their own opinion. As a tangible media installation that bridges physical and digital urban layers, the project empowers citizens and facilitates a bottom-up approach in terms of stimulating opinions and decision making (rather than broadcasting or automating). In a second iteration of the design, we want to encourage users to submit their own questions.



