Vote With Your Feet: Local Community Polling on Urban Screens

Fabius Steinberger
Urban Informatics Research Lab
Queensland University of Technology
130 Victoria Park Rd, Kelvin Grove
QLD 4059, Australia
fabius.steinberger@qut.edu.au

Marcus Foth
Urban Informatics Research Lab
Queensland University of Technology
130 Victoria Park Rd, Kelvin Grove
QLD 4059, Australia
m.foth@qut.edu.au

Florian Alt
Media Informatics Group
University of Munich
Amalienstrasse 17
80333 Munich, Germany
florian.alt@ifi.lmu.de

ABSTRACT

Falling prices have led to an ongoing spread of public displays in urban areas. Still, they mostly show passive content such as commercials and digital signage. At the same time, technological advances have enabled the creation of interactive displays potentially increasing their attractiveness for the audience, e.g. through providing a platform for civic discourse. This poses considerable challenges, since displays need to communicate the opportunity to engage, motivate the audience to do so, and be easy to use. In this paper we present *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 is novel in that it focuses on a *situated* civic discourse and provides a *tangible* user interface, tackling the mentioned challenges. 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. Our field study showed that *Vote With Your Feet* is perceived as inviting and that it can spark discussions among co-located people.

Keywords

Polling, voting, ubiquitous computing, tangible media, urban computing, urban informatics, civic engagement, public displays

Categories and Subject Descriptors

H.5.2 [**User Interfaces**]: Input devices and strategies

1. INTRODUCTION

The ongoing proliferation of public displays in urban areas raises new opportunities. Today, urban screens mostly display passive content such as commercials or digital signage, providing only slight benefits for users. At the same time, networked displays augmented with sensing technology provide new opportunities for creating engaging experiences and content.

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Figure 1: The urban screen used for *Vote With Your Feet*. We deployed the system at a bus stop in Brisbane, Australia.

A major obstacle in reaching this vision stems from the fact that providing fresh and interesting content is costly from a display owner's perspective. Prior work identified user-generated content – e.g. consisting of classified ads, tweets or polls – as a valuable source for public displays [1, 11, 18]. However, this creates an inherent need to make users aware of the opportunity to participate, motivate them to do so, and keep the barrier for participation low.

In this work, we tackle the mentioned challenges by introducing *Vote With Your Feet*, a hyperlocal public polling tool for urban screens that allows users to express their opinions on issues such as current affairs and local matters (Figure 1). While polling for public displays has been investigated before, our approach is novel in that it (a) focuses on sparking a *situated* civic discourse, potentially making it more rewarding for people to contribute, and (b) provides a *tangible user interface*, which not only draws people's attention but also lowers the barrier for user participation.

The research aims explored are as follows: (i) How can tangible buttons on the ground help attract attention and lower barriers for user participation? (ii) What are implications of polling in public and its impact on discomfort and answering honestly? (iii) How can users contribute content and how can information about the local community be reflected? (iv) Which are the most popular poll topics and what social interactions are caused by *Vote With Your Feet*?

This paper is structured as follows: First, we present related endeavours in a literature review and point out in what ways our approach builds upon them or differs. We then explain the concept of *Vote With Your Feet* in detail. After delving into the setup of our field study, we discuss the obtained results with respect to the research aims. Finally, we conclude with design implications and potential avenues for future research.

2. RELATED WORK

Various aspects have been studied in the context of public displays. This literature review focuses on urban screens stimulating civic discourse, polling, and user engagement with public displays.

2.1 Civic Discourse

A number of studies aimed at sparking discussions, both on-screen and offline. Discussions In Space [27] engaged citizens with interactive urban screens by initiating and displaying debates. Unlike *Vote With Your Feet*, it relied on mobile phone input thus posing a significant barrier for user participation. Also from YourScreen [28] and TexTales [3] we learned that novel ways to lower participation barriers and to attract attention are important.

Opinionizer [5], Wordster [15], and FunSquare [16] shed light on how to trigger social offline interaction among co-located people. *Vote With Your Feet* extends on this and further connects users over time by displaying their sentiment also after their engagement.

Digital community boards such as Digifieds [1], Streetinfographics [6] and Nnub [23] provide a way for users to shape the content of the public display. *Vote With Your Feet* differs in that it only requires a minimum amount of effort to participate. However, it builds upon them as it also requires textual input for suggesting new questions.

2.2 Polling

There have been various studies on polling systems, ranging from indoor deployments (e.g. in meetings [21]) to public spaces (e.g. in bars [20]). Some aimed specifically at public displays, such as MyPosition [31], which features an interactive poll visualisation. It uses Kinect to sense user input. Unlike the tangible buttons of *Vote With Your Feet*, this approach comes at the expense of an obvious interaction affordance. It also permanently displays the current results, which is likely to influence people's voting behaviour. Bringing a physical component to the user interaction, Swipe I Like [4] and PosterVote[1] lower the barrier of entry by making use of readily available hardware. While they inspired us to position the tangible buttons of *Vote With Your Feet* peripherally, they do not publicly display the obtained votes for everybody to read.

Recent projects include Smart Citizen Sentiment Board[2], United Colours of Dissent[3], Viewpoint [30] and Free2Choose[4], which all are participatory installations that visualise people's sentiment in real-time. Unlike *Vote With Your Feet* though, they are designed for temporal installation and require explicit instructions.

Overall, this research space has gained a lot of traction. However, there are still unresolved issues such as engaging users in truly public places or enabling effortless user participation. Foth et al. argue that we also need new contributions to interaction design theory that open and map the post-cinematic user experience space afforded by new generations of screens [8].

2.3 Engagement with Public Displays

Attracting people's attention and motivating users to interact have been identified as key challenges for interactive displays [17]. Existing approaches to tackle these include enticing people through other people (honeypot effect [5]) or through spatial characteristics. *Vote With Your Feet* was designed with the audience funnel [17] in mind and was evaluated in this regard. Huang provides recommendations regarding screen positioning [12] which, however, are sometimes difficult to obey for given constraints, as in our case.

[1]http://di.ncl.ac.uk/postervote/
[2]http://moritzbehrens.com/2013/scsd_sp/
[3]http://info.ucod.org/
[4]http://www.annefrank.org/en/Museum/Exhibitions/Free2choose/

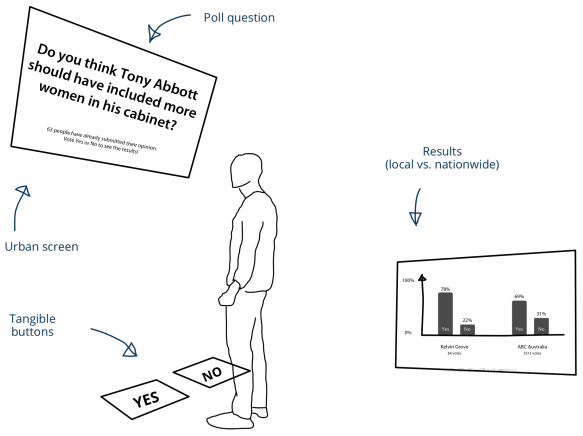

Figure 2: Concept sketch of *Vote With Your Feet*.

Finally, attention can be raised through the screen and its content. Considering behavioural urgency, change blindness [17], bayesian surprise [13] and graphic design [14] are a number of proposed aspects. From previous experiences with applications for our urban screen [27, 28], we knew it was close to impossible to attract attention through the screen itself given its positioning. Consequently, we addressed this issue using tangible buttons. At the same time this raised questions with regard to the benefits (lowering participation barriers) and drawbacks (discomfort, awkwardness).

3. SYSTEM DESIGN

Inspired by the Design Space Explorer Framework for Media Façades [7], this section describes *Vote With Your Feet* covering the following aspects: purpose, content, interaction and participation, location, situation, and screen. The development of *Vote With Your Feet* was structured in a way that would repeatedly involve users in the evaluation of the latest features and changes. In particular, several pre-studies at the designated screen location and a short-term deployment at OzCHI '13 shaped and improved the design.

3.1 Purpose

Vote With Your Feet is a hyperlocal public polling tool for urban screens allowing users to express their opinions (see Figure 2). Similar to vox populi interviews on TV or polls on news websites, it is meant to reflect the mindset of the community on issues 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. As a tangible media installation that bridges physical and digital urban layers, the project experiments with a bottom-up approach in terms of stimulating the expression of opinions and sparking civic discourse.

3.2 Content

Vote With Your Feet consists of two main views. The first shows a Yes/No question, the second its results (Figure 3). The poll questions can be clustered into four categories. First, politics and current affairs, taken from a news website[5], such as 'Was Kevin Rudd right to resign from Parliament?'. Second, local events and cultural identity, provided by community experts and the author (e.g. 'Do you consider Brisbane your hometown?'). Third, user-submitted questions, as a way for users to suggest their own ideas and have an impact on the screen content. Lastly, questions related to *Vote With Your Feet* itself, such as 'Do you answer these questions honestly?'.

[5]http://www.abc.net.au/news/thedrum/polls/

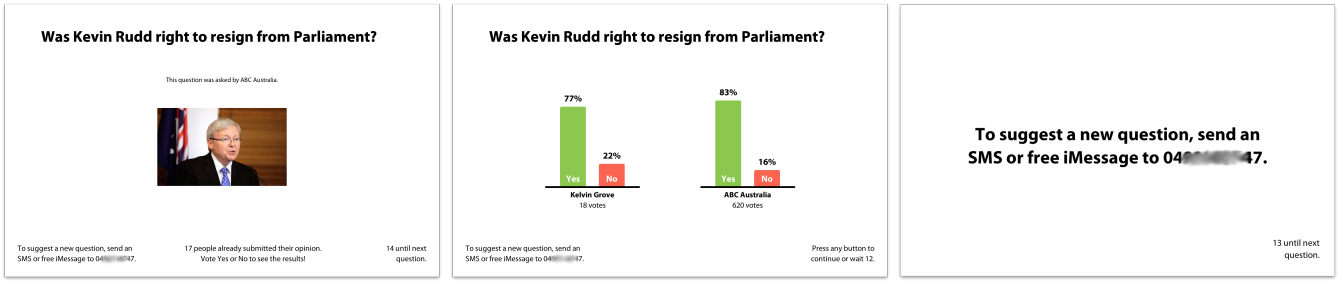

Figure 3: Screenshots of the *Vote With Your Feet* application: question (left), results (centre), suggest new question (right).

For categories 2-4, the users' results were displayed for the current day as well the overall application life cycle ('Today' vs. 'Overall'). In the first category, however, local and national results are displayed side by side ('Kelvin Grove' vs. 'Australia'). This lets users compare their own opinions to other users' opinions as well as compare the sentiment of their local community to the sentiment of a larger community. With these comparisons, we wanted to explore how *Vote With Your Feet* could reflect the mindset of its users and spark situated conversations.

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 of the Yes/No buttons (Figure 4). Previously tested input modalities at this particular screen include social media channels, text messages, gesture interaction using a Kinect, and QR codes [27, 28]. None of these performed strongly as they either failed to attract people's attention or presented too big of a barrier for user participation. The tangible buttons, however, seemed promising in a first expert study that was part of a civic engagement project [9]. Given they had not been thoroughly evaluated in the wild, we decided to re-use them for *Vote With Your Feet* and focus our study on this mode of interaction.

Made of timber on top and bottom and foam in between, the tangible buttons are robust pads of 40 cm x 40 cm x 10 cm in size. For sensing user interaction, the buttons were wired to a MaKey MaKey[6]. Stepping on a button closes an electric contact which triggers the MaKey MaKey to send user input data to the application, which was coded in Processing. In our pre-studies, 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. To improve the tangible stepping affordance, the labels of the buttons now say "Step on here to vote", resulting in the majority of people putting much more weight on the buttons. Additionally, both a visual animation and a sound effect were added to the software to indicate to the users that their input was recognised. To address another issue identified in the pre-studies, users are encouraged to press any of the two buttons to continue to the next question. This gives additional control to users who would interact at their own pace rather than wait for the given countdown timer to finish. This is in line with findings from prior work, i.e. control adds to the motivation for interaction with public displays [17].

New questions can be suggested via text message or iMessage. As shown in Figure 3, users are encouraged to do so by a dedicated screen message which appears at an interval of five questions. The reasoning behind this choice of technology was informed by literature [27] and with rapid prototyping in mind.

[6]http://www.makeymakey.com

Figure 4: Users participate by stepping on tangible buttons.

3.4 Location

Vote With Your Feet was deployed at a bus stop in Brisbane. The area combines education, residential, health, retail, recreational and business facilities within one precinct. As pictured in Figures 1 and 5 , the bus stop consists of two wooden benches to sit on, the urban screen, and a roof. Most importantly, this location presents an in-the-wild setting with a variety of different people.

3.5 Situation

People near the screen were either passers-by or waiting for the bus. The area serves 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 pass time while waiting for their bus. Seeburger et al. provide in-depth data about people's behaviour at this particular bus stop [28]. Most notably, people tend to look down rather than up towards the screen. This issue was addressed by placing the user interface on the ground to attract attention. Furthermore, it was necessary to keep in mind that most people's objective was to catch the bus, thus only allowing for a limited amount of interaction time.

3.6 Screen

The screen has been installed and is being maintained by the Urban Informatics Research Lab as a real world test site for the deployment and evaluation of novel urban screen applications. It is enclosed in a vandal resistant and waterproof case (as shown in Figure 1) and was installed in such a way that permanent access to power and internet is ensured. 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 visibility resulting from the high placement. However, these issues present real-world constraints that must be taken into account when designing public display applications. The preliminary user studies revealed issues regarding the GUI. As a result, text was made more easily readable and the choice of colours improved.

Figure 5: The surroundings of the urban screen.

4. FIELD STUDY

The objective of this field study was to deploy *Vote With Your Feet* in the wild and explore its potential with respect to the research aims identified in the introduction. We conducted an exploratory, qualitative design study, that is, the emphasis was on studying and collecting rich data about UX rather than a quantitative analysis.

4.1 Setup

The field study took place at a bus stop (Figure 5). As pointed out by Rogers, research in the wild is challenging but more rewarding than controlled lab studies [24]. A real-world setting ensures high ecological validity, but results may be difficult to generalise [2].

The study ran over the course of several days, consisting of five 120 minutes sessions in total. These sessions were spread throughout different times of the day, including lunch time, evening and Saturday morning during the famers market.

4.2 Data Collection

For this study, we received ethical clearance from the University Human Research Ethics Committee. Their policy required us to obtain explicit consent from all people interviewed for the study.

Throughout the entire deployment, all people in the vicinity of the screen were observed. Making sure not to influence people's behaviour, we avoided being exposed as researchers by hiding well behind the bus stop. People's behaviour was documented in field notes which also captured the context of users and spectators. This included whether people were waiting for their bus or just passing by, complemented by a description of the surrounding crowd and a differentiation between strangers and acquaintances.

To gain more insights into people's thoughts and actions, the data collection was rounded off by interviews. Both users and spectators were approached after they turned their attention away from *Vote With Your Feet*. 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. On a side note, we observed that people who decided to interact with *Vote With Your Feet*, were also more likely to agree to being interviewed. Hence, the interview data might mainly represent the points of view of those types of people who felt comfortable using a public display.

The interviews consisted of open-ended questions. 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 interviews focused on the most unusual themes, following an opportunistic sampling approach [22].

5. DISCUSSION OF RESULTS

The data analysis was inspired by grounded theory [29] , drawing bottom-up findings. This involved breaking up the interview data into single text snippets. Those were then clustered into several themes that also relate to the initial research questions. Findings were then triangulated with the field notes to establish connections and uncover potential causes of behavioural patterns.

The following sections discuss six themes that emerged from the data analysis: attention, motivation, polling in public, social interaction, reflection of the local community, and popular poll questions. They can be partly attributed to the audience funnel [17]. We use the terms attention (what made you notice?) and motivation (what made you interact?) as described in this work.

5.1 Attention

We found the physical buttons to be a major factor for attracting attention. 23 out of 30 interviewees reported the buttons caught their eye. A few people were attracted by other users (honeypot effect) or the wires. Only one participant referred to the screen itself.

Considerably fewer people noticed *Vote With Your Feet* in the morning around 9-11am. While we do not have any supporting evidence, observations suggest this to be a result of the sun positioned behind the screen, casting also a shadow onto the buttons. Another explanation may be that in the morning, people tend to be in a rush to work and thus less likely stop and engage.

5.2 Motivation

Interviews revealed three major causes that made people actively use the application. First, an interest in the poll questions and the desire to submit one's own opinion ('I wanted to take part in the poll and contribute, so I submitted my answer.'). Second, as a way to pass time while waiting for the bus ('I'm waiting for the bus, so I've got time'). Third, *Vote With Your Feet* was perceived as easy to participate ('It looked so inviting with the big Yes and No.', 'You just know you're allowed to participate, a bus stop is such a public place and not intimidating like other locations.'). This shows that the tangible buttons lowered the barrier for user participation.

Being asked why they refrained from interacting with the application, spectators provided various reasons. Some referred to their desire for more controversial questions ('I saw the question and thought the answer was obvious, so I didn't bother voting.'). Contrarily, other participants did not submit a vote, because they were debating what to vote for. Two men said, 'we actually sat down to discuss the question. We haven't voted yet because we're still talking about it'. We consider this kind of outcome particularly valuable. It shows how interventions like ours can make people contemplate and spark discussions. Finally, there were also more practical reasons, e.g., one woman said, 'I didn't use it because I'm visiting a friend. So I was gonna get her first and then maybe try it together'.

The user engagement with *Vote With Your Feet* peaked in the evening. We relate this fact to people being more relaxed during that time of the day (e.g., walking their dogs; more residents than staff; cooler temperatures) and to the increased visibility of the screen when the sun sets. Notably, kids were quite eager to step on the buttons as well. Their main motivation was to hear the sound feedback or to see the visual feedback. Many were not heavy enough, so they started jumping or got their parents to lift them up.

5.3 Polling in Public

Polling usually is a private (e.g. voting on a website) and often anonymous activity (e.g. voting in elections) which is very unlike the nature of interacting with a public display. This seemed like a conflict that would ultimately result in a trade-off at the expense of the design concept. However, the vast majority of active users were not concerned at all about other people watching. As a matter of fact, some participants even reported that the exposed interaction and whole-body-commitment aspect was one of their favourite ones. As one woman said, 'it seemed like I committed to my 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 information exchange, similar to what has been explored before (e.g. [25]).

Shedding more light onto the matter of public polling, other participants pointed out it depended on the kind of question. Had it been much more personal questions, they would not have felt comfortable disclosing their answer in public. As one person 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 though. A few of those participants that were not surrounded by other people while interacting reported they enjoyed having the chance to try it out by themselves without being observed. For instance, one resident 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'.

The vast majority reported they answered honestly. One interview participant, however, revealed he voted for whatever he thought was the minority vote. Strikingly, this was an aspect the users were also curious about as signalled in the interviews. 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. This was appreciated, e.g., by a couple that said 'we asked ourselves if other people answered honestly. It was fun to see that exact question on the screen.' Obviously, hoaxing can also occur when replying to this particular question – or interviewees could also lie.

5.4 Social Interaction

Lots of social interaction happened around the screen, mostly between friends or colleagues and sometimes even between strangers.

Often, acquaintances were involved in discussions, e.g. regarding the wording of the poll question or the issue at stake. For instance, the question 'Do you think individual states should be able to pass their own legislation on same-sex marriage?' had two men debate the spirit of the question, which could either refer to same-sex marriage or federal legislation. Furthermore, there were groups who first decided on their answer and then voted together. Some reported 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. They never tried to involve strangers though. However, there were instances of patiently waiting spectators who were invited by other users to try it out themselves. Lastly, a few 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 moving on.

As mentioned earlier, one of the major purposes of this study was to support and encourage people in shaping and exchanging their points of view. Evidence from the field study shows that *Vote With Your Feet* contributed to making this happen.

5.5 Reflection of the Local Community

By displaying hyperlocal poll results, *Vote With Your Feet* experiments with mirroring the sentiment of the local community. It is a first step of looking into ways for reflecting information about a community and its people [10]. To gain insights into what users valued about viewing the results, interviewees were asked about their impression. Their replies can be grouped into three categories.

First, users wanted to make sense of their local community and were curious about others' sentiments. One interviewee compared the local and national results: 'It was interesting to see that Kelvin Grove mirrored the Australia results'. A woman who was part of a group said, 'I work around here so I suspected I knew the answers to the questions about cultural identity. My friend 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.'

Second, many participants were interested in comparing their own opinion with the rest of the users. As one interviewee said, 'I was surprised to see that my opinion was aligned with the majority, I hadn't expect that.' In that sense, *Vote With Your Feet* helps users better understand their community as well as themselves.

Third and finally, a number of users also reported that they questioned their own opinion after reading the results. As one person described, '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.'

5.6 Popular Poll Questions

The majority of interview participants said the polls about politics and current affairs appealed most to them out of all topics. People who only fairly 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 said, 'We just moved here a year ago so it's interesting to see what others had to say about this area.'

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 appreciate this aspect, such as the couple 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: 'I'm a resident, so when the thing started asking questions about uni, I wasn't sure whether I was even supposed to participate.'

Only three questions came from interview participants 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 said, 'I loved that you can nominate your own questions. I wanted to do that but couldn't think of one right that instance.' The fact that only few people among a large group contribute their own content seems familiar to what is called the 90-9-1 rule [19]. It refers to the majority of users being passive on the Internet, a seemingly user-driven medium. However, to at least encourage the small minority of contributors, the submission of questions needs to be more enticing, effortless, or result in immediate impact.

6. CONCLUSION

We presented the design and implementation of *Vote With Your Feet*, a hyperlocal public polling tool for urban screens. Deploying it in an in-the-wild setting, we evaluated its unique characteristics in a field study over several days. In the following, we present recommendations and conclude with potential directions for future work.

Design implications. The field study reveals that the tangible buttons substantially drove the potential of attracting attention. We therefore recommend considering such peripherally placed UI elements, especially for displays outside the passers-by's regular field of view. Furthermore, this form of tangible interaction proved to be one of the key characteristics that made people perceive *Vote With Your Feet* as inviting and easy to participate. Providing a clear choice (Yes/No buttons) does a good job motivating users to interact. It seems to contribute to users skipping over the part where they contemplate whether they should interact at all.

It turned out that users value a low barrier of entry 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.

Displaying a mix of thought-provoking and location-based questions can lead to civic discourse and provide valuable insights into the local community. It also opens up paths for further experimenting with mirroring information about people and their sentiments.

Future work. Being the most requested feature, a Maybe button and a way to elaborate on one's opinion could be added. Some participants already did this, such as a woman who told everybody at the bus stop she voted neither Yes nor No and continued to explain why. A combination of Discussions In Space [26] and *Vote With Your Feet* could be a first step. This could combine the benefits of on-screen discussions and a low participation barrier.

Furthermore, *Vote With Your Feet* could be deployed in multiple locations. The different poll results could be put up for comparisons (e.g., different cities bus stops). This could even be extended to run competitions between sites or to benchmark their engagement.

Civic innovation is an exciting area for interaction designers. Collectively, we hope to foster more active citizens and citizenship.

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