Chapter 7
Exploring Civic Engagement on Public Displays

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1 Introduction

Research and deployment of public interactive displays is moving from laboratory environments into urban spaces and public areas (Müller et al. 2010). Public displays augment the activities in the space around them by facilitating different use cases, such as public statements (Ananny and Strohecker 2009; Dalsgaard and Halskov 2010), play and performance (O'Hara et al. 2008; Hosio et al. 2012), or information foraging (Kukka et al. 2012). It is even envisioned that such public display installations will fuel the next big wave of social change (Kuikkaniemi et al. 2011).

In our research we seek to augment urban space with public displays to promote civic engagement by addressing local and temporally and spatially relevant issues. Civic engagement lacks a unified definition in literature, but in general it is perceived as an instrument for local governance and a foundation to empower people, often by informing citizens and utilizing feedback channels towards authorities (Mohammadi et al. 2011).

Over a 2-year period, we incrementally evaluated applications that disseminate information about a long-term renovation project in Oulu, Finland. We used these applications to disseminate information about the construction work being done and by enabling users to provide in situ comments and feedback to the local Technical Centre (later TC). The TC is responsible for the execution of the renovation project, and while information provisioning has been of principal interest to them, our focus has also been on studying the characteristics of different situated feedback mechanisms in authentic city settings.

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To study different feedback mechanisms, we utilize a grid of large touch screen displays deployed in pivotal locations in Oulu nearby the renovation project, where citizens and tourists alike can utilize them in a 24/7 fashion. Unlike in most prior work that relies on bespoke displays, ours feature several applications for different purposes making them multipurpose displays (Ojala et al. 2012). Many public displays are envisioned to be multipurpose in the future, just like smartphones today, and therefore, it is crucial to acknowledge the implications that utilizing such displays have on applications. Applications on multipurpose displays do not attract nearly as much use as ones deployed prominently on bespoke displays (Kostakos et al. 2013; Hosio et al. 2013). However, their advantages are crystal clear: they can be customized to offer "something for everyone."

Feedback prototypes have been developed for public displays situated in special events (Brignull and Rogers 2003; Hosio et al. 2012), university campuses (Day et al. 2007), online (De Cindio et al. 2009), and more recently especially for mobile environments (Korn and Bødker 2012; Goncalves et al. 2013a, b, c). However, we are not aware of any previous studies that explore the larger issue of civic engagement using public displays in large-scale field trials in authentic settings and without active researcher intervention and participant recruitment.

In this chapter we summarize and reflect on our experiences of using public displays as a public situated feedback channel. The key contributions of this chapter are:

- We characterize how applications for civic engagement were used and appropriated in field trials in authentic settings.
- We quantify the effectiveness of various feedback mechanisms used with public displays.
- We propose factors to consider when deploying future civic engagement or feedback applications on interactive public displays.

2 Related Work

Previous research shows that civic engagement is beneficial for individuals, institutions, and communities as well as for the broader society (Clary and Snyder 2002; Montero 2004). While citizens are encouraged to adopt more active roles, civic engagement can only be fostered on the basis of reciprocal trust between people and responsible institutions (Uslaner and Brown 2005). Civic engagement can be viewed from the perspective of benefits to be gained and costs to be borne. These benefits include not only material advantages but also psychological satisfaction for participants (Hirschmann 1982).

In our work, we seek to foster civic engagement and offer gratification by partnering with the responsible institution of the renovation project, thus empowering citizens to have their voices heard. Further, we provide a novel feedback modality—in situ interactive displays—and explore the benefits for individuals (citizens) and the corresponding institution (the TC).

2.1 Public Displays and Feedback

Public display research has focused heavily on interaction, attention, and design, but relatively little attention is given to civic engagement. Civic engagement calls for understanding of functional feedback mechanisms. Previously, public displays have been proposed especially as a viable *opportunistic feedback* medium because they allow passersby to understand situated and contextually relevant information, leading to genuinely insightful feedback (Battino et al. 2011). Supporting this, Ananny and Strohecker (2009) argued that public opinions are highly situated, and De Cindio et al. (2009) observed that people leave feedback often during so-called peak or protest moments, when the circumstances for public discourse or disapproval are right. These results together raise the question whether situated feedback mediums could be leveraged to reach people during these key moments for discourse.

We expect these moments to occur when citizens confront a public display in Oulu and are given the possibility to leave instant feedback about a locally remarkable and topical issue that invades their territory: the renovation project that affects traffic in the whole downtown area. Public displays also foster sociality and group use by nature (Kuikkaniemi et al. 2011; Peltonen et al. 2008), and getting feedback from groups of users is often easier than from individuals (Hosio et al. 2012). Further, the well-known *honeypot effect* (Brignull and Rogers 2003) can be leveraged to our advantage in spreading awareness about the feedback channel among nearby potential users.

Archetypal feedback applications on public displays utilize typing in some form as their main input modality. Brignull and Rogers (2003) reported on *Opinionizer*, a system that combined a projected screen with a laptop to type feedback and converse about the everyday contexts it was deployed in. They noted the honeypot effect and emphasized social pressure and awkwardness that users often feel when interacting publicly. Ananny and Strohecker (2009) leveraged public screens and SMS to create public opinion forums. Their *TexTales* installations highlighted how urban spaces can become sites for collective expression and nurture informal, often amusing discussions among its habitants. More recently Goncalves et al. (2013a, b, c) explored the use of altruistic crowdsourcing as a mechanism to collect more serious contributions from similar urban spaces.

A playful feedback application, connected to social networking services and utilizing a virtual keyboard and a web camera for feedback, was introduced in Hosio et al. (2012). Studies with *Ubinion* also highlighted situated public displays being well-suited for acquiring contextually relevant feedback. Similar projects (Day et al. 2007; Munson et al. 2011) developed feedback systems for campus settings, utilizing online interfaces, dedicated mobile clients, and Twitter as input channels. In these studies, Twitter was suggested as a good tool to provide content for public displays, and SMS was envisioned handier for feedback than dedicated mobile applications. A similar project to ours was deployed in Brisbane, where the *Discussions in Space* prototype was deployed on public screens to elicit feedback via Twitter and SMS, further validating their use as viable input mechanisms (Schroeter 2012).

We set to explore the question of whether situated interactive displays can be leveraged for obtaining feedback on subjects that are highly local and of interest to authorities, i.e., for civic engagement. The key difference between our work and most of the related work is that we do not deploy new screens or infrastructure for our studies, but aim for authentic experience with no novelty effects. We utilize multipurpose public displays that have been deployed already for years prior to our study and test both previously utilized feedback mechanisms together with novel ones during the course of our studies.

2.2 Deploying in Urban Spaces

Civic engagement should be possible for all social groups (Mohammadi et al. 2011). Therefore, deploying our system "in the wild" for everyone to use was a fundamental requirement. The urban space itself is a rich yet challenging environment for deploying pervasive infrastructure and applications (Müller et al. 2010). Several considerations, including the intertwined social practices of the area, robustness of the technology, abuse, vandalism, balance between the different stakeholders, and even weather conditions may cause constraints when deploying in the wild (Dalsgaard and Halskov 2010; Korn and Bødker 2012). However, to gain an understanding of how technology is received and appropriated by the general public, deployment in authentic environments, or *living laboratories*, is highly beneficial (Rogers et al. 2007; Sharp and Rehman 2005).

We seek to evaluate situated feedback mechanisms for civic engagement in an environment and with an audience that cannot be fully controlled. In reporting our trials, we follow the advice by Brown et al. (2011) to move beyond reporting artificial success: rather than proposing a solution that fulfills all the needs of all involved stakeholders, we report what happened with the chosen solutions in the complicated setting.

3 Studies

We conducted two field studies and a supervised deployment in between to evaluate civic engagement applications on public displays, in collaboration with the local TC. The TC was closely involved since including domain experts is favorable in application-led research (Sharp and Rehman 2005). The developed applications allow citizens to learn about the renovation project and to provide feedback about it.

3.1 Environment

To frame our studies, we first clarify the scale of the renovation project in question. It included building new pavement and underground heating systems for two of the busiest pedestrian streets in downtown Oulu, heavily affecting pedestrian flows and

Fig. 7.1 One of the walking streets being renovated

everyday business in all the surrounding areas. Figure 7.1 illustrates the scale of the construction. The downtown area is rather small, and most of the pedestrians are forced to use these main streets. Due to weather conditions the work was completed during summer months (typically the busiest months in downtown), which further contributed to the disruptive nature of the renovation project.

The displays used in our studies are 57″ full-HD touch screen displays with Internet connectivity, fitted in weather-proof casings. Many of the displays had been located in the vicinity of the renovation project area already for several years and as such have gone beyond novelty to become an accepted and domesticated part of the city infrastructure. This is important, as inserting novel technology in public often leads to strong novelty effects and bias in the actual usage. We used 12 displays, 5 of which were located on the renovated streets (e.g., Fig. 7.2). The rest of the displays were situated nearby in other pivotal locations, such as a public library or a popular swimming hall. A complete and detailed description of the infrastructure and the displays has been described earlier in Ojala et al. (2012).

It is important to note that the displays were not dedicated to the feedback application alone, but multiple (20–25) applications were offered to the users at all times. The other applications offered directory services, news and weather, image and video galleries, and games. Particularly games have been identified as the most popular group of applications that people use. Interestingly, this follows the generic trend in mobile applications stores, where games traditionally dominate the top-downloaded lists.

The application we developed for the renovation project was accessible by one click from the public displays' "main directory," which opened when users were

Fig. 7.2 An interactive display at the end of a walking street in Oulu

either sensed in the vicinity of the displays or touched them. The application itself was not dedicated to feedback, but it also provided information about the progress of the renovation project. The feedback functionality was accessible through an icon depicting the renovation project and "give feedback" as the textual call to action. The instructions in the feedback interface for all studies we describe in this chapter were: "Leave anonymous feedback to the city officials about the renovation project. Please note that your feedback will be delivered directly and unmodified."

3.2 Study 1

The design of the first feedback mechanism was based on a single requirement from the TC: to offer a text-based channel for leaving free feedback on the renovation project. Several public display prototypes have successfully leveraged a large on-screen virtual keyboard for typing (Hosio et al. 2012, 2013), and thus, we chose to use the same mechanism in this context. The submitted messages were directly emailed to the TC representatives, who decided to receive the feedback without moderation. This interface can be seen in the top left of Fig. 7.3.

The application ran on our display grid for 3 months during the summer of 2011. During this study, the application was launched 1,406 times, and 35 feedback messages were dispatched to the TC. Two researchers categorized the feedback messages into "relevant" and "not relevant" messages, depending on whether they offer feedback of the renovation project or consist of something else. Eight of the items were found "relevant" (Cohen's kappa: 1.00).

Fig. 7.3 Feedback interfaces. *Top left*: Study 1, *top right*: Study 3a, *bottom left*: Study 3b, *bottom right*: Study 3c

This being the case, it was apparent that the deployment resulted in a relatively high percentage of *noise* (77.1 %). We define noise in this chapter as *messages that have nothing to do with the renovation project*, i.e., irrelevant messages. Examples of noise from Study 1 include such messages as "It's fun in Oulu," "LOLOLOL," or random nicknames. The underlying themes of noise will be discussed in depth later in this chapter.

In situ open-ended interviews with citizens during the final weeks of Study 1 revealed that the application was seen as one of the most useful and interesting applications deployed on the displays at the time, thanks especially to its high relevance to local topical issues. Again, it should be noted that the other applications were not only games, but also more "serious" applications, such as news, local directory services, arts, and multimedia were available. This was a promising finding as itself: the feedback channel was a new kind of service to citizens and was received positively.

Fig. 7.4 Study 2 setup in a university lobby

Finally, a post-study interview with the TC revealed that they were very satisfied with the deployment in general: for them it was an original and novel channel that was perceived beneficial by citizens. We agreed to build a follow-up prototype together for a later phase of the renovation project (in this chapter: Study 3).

3.3 Study 2

We organized a controlled follow-up study to better understand the reason for the large amount of noise generated in Study 1. A controlled environment was selected to observe and interview users who give feedback using public displays. Such a separate study was needed, as users of the first study were fully anonymous and we could not contact them. Study 2 was conducted in a university lobby equipped with a display identical to the previous study. We replicated the feedback window of Study 1 and added an image explaining the study structure. We also decided to change the topic of feedback to *general issues in education in the university* to maintain high relevance between the context and the topic. The setup of Study 2 can be seen in Fig. 7.4.

We recruited 18 passersby (12 male, 6 female) aged 20–37 ($M = 27.3$, SD = 4.7) to participate in this study. To familiarize participants with leaving feedback using the interactive display in public, they were asked to leave four comments. The first three comments were defined by us, because we wanted the users to become familiar with the input mechanism first. The final one they had to come up with on their own. We conducted an open-ended interview about leaving feedback through a public display with each participant.

The results revealed that public displays were strongly preferred for "spur of the moment" and contextual feedback. Related research also finds it easier to obtain high-quality feedback with closely situated mechanisms (Ananny and Strohecker 2009; De Cindio et al. 2009). Some participants commented "If I just finished a horrible lecture, I'd definitely use it [the public display] to give feedback… Maybe when I got home, I probably would not care about it anymore. I would like to just spit it out right away," and "Yes, I would use public display easily spontaneously, right after a lousy meal or a bad lecture…." People were giving positive statements about the possibility to type immediately with the on-screen mechanism.

The virtual keyboard, however, was also criticized. It became apparent that typing longer messages was seen as inappropriate or even physically painful on public displays. Comments like "Public display is very cumbersome when typing longer texts" or "My arm was just killing me after a little while using the public display to write the comments" reflected this. On-site observations also confirmed this, as participants often felt uncomfortable when typing using the virtual keyboard.

Finally, several participants noted feeling uncomfortable to give in-depth, emotional, or negative feedback alone on public displays and that it would be perhaps more suitable to think about feedback in groups when using public display.

3.4 Study 3

Study 3 was a longitudinal field study, similar to Study 1, of a civic engagement application. It was deployed on the same grid of displays, as one of many applications (20–25). It provided information about the renovation project and offered feedback mechanisms for citizens. Study 3 lasted 3 months during summer 2012 and consisted of three 1-month iterations (Studies 3a, 3b, 3c). Again, the TC oversaw the general look and feel of the application, and we designed the feedback mechanisms. This time the feedback messages were not relayed real time to the TC, but our researchers moderated and dispatched them in weekly batches via email. However, the moderation was not disclosed to users of the application interface, in order to keep the wording in the interface similar to that of Study 1.

3.4.1 Study 3a

Participant suggestions from Study 2 like "…you should consider giving choices instead of making the user write" or "On the public display, just use anything except typing, please" led to reconsiderations when designing Study 3a. We replaced the virtual keyboard with four new mechanisms for feedback: SMS, twitter, and email for text-based feedback and a smiley-based poll-style mechanism directly on the screens. SMS and Twitter have been used successfully in conjunction with public displays for feedback before (Ananny and Strohecker 2009; Munson et al. 2011),

and several participants from Study 2 suggested using something quicker and more effortless than virtual keyboard on the public display.

For SMS and email we created a dedicated number and address for receiving feedback, and a specific hashtag was used to identify tweets as feedback intended for our system. The smileys were used to rank personal agreement on two statements defined by the TC. Statement 1: "The large renovation project in is topical and necessary for Oulu!" Statement 2: "City of Oulu officials are informing citizens sufficiently about the renovation project!" The smileys were captioned using standard 5-point Likert scale statements from "strongly disagree" to "strongly agree," from left to right. The users had to rate both statements and touch a "send button" to register their ratings. In the end of this study, we conducted 20 in situ open-ended interviews among pedestrians in downtown Oulu about the application in general. The interface of Study 3a is depicted top right in Fig. 7.3.

During this study, the application was launched 381 times, leading to *zero* feedback via email, SMS, or twitter, while 20 smiley submissions were made with an average rating of 3.8 (SD 1.5) and 3.4 (SD 1.6) for statements 1 and 2, respectively. Interviews with 20 citizens (7 male, 13 female, $M = 28.0$, $SD = 11.6$) revealed that smileys were always preferred to the text-based feedback mechanisms. Email was the favored medium of the offered text-based mechanisms by majority of the interviewed, but again, leaving feedback later, e.g., at home and out of context, was seen as very unlikely. Ironically, the majority of respondents expressed the need for a virtual keyboard, as they felt it would be the most straightforward way to submit feedback instantly.

In summary, we received smiley responses, but users were reluctant to devote effort for any of the three offered text-based feedback mediums, which all required the use of personal devices. Interviews highlighted, once more, the need for effortless, in situ feedback mechanisms.

3.4.2 Study 3b

In Study 3b we decided to investigate the reliability of smiley responses and to offer a psychological incentive for the text-based mechanisms, which did not yield any feedback so far. To establish whether the smiley responses yielded valid results, we added negatively phrased versions of the statements to the mix: "The large renovation project at the walking street is not topical or necessary for Oulu!" and "City of Oulu officials are not informing citizens sufficiently about the renovation project!" On each application launch, the shown statement was randomized, i.e., the statements were either negatively or positively phrased.

Also, a stream of the ten latest messages was added to the interface to foster discussion, a practice suggested for enhancing communication between community members on public displays. We hoped this would motivate feedback submission because letting users observe others' messages enhances sense of community, a strong motivator for participation in urban settings (Day et al. 2007; Goncalves

et al. 2013a, b, c). The displayed stream was moderated daily to remove offending and irrelevant comments. The feedback interface of this study is depicted in Fig. 7.3 (bottom left).

During this study, the application was launched 444 times, resulting in 6 text-based feedback messages, all via SMS, and 46 smiley responses (25 for positively and 21 for negatively phrased statements). Similar to Study 1, feedback messages were categorized into "relevant" and "not relevant" by two researchers, and all 6 were labeled relevant (Cohen's kappa 1.0). The average agreement ratings given using the smileys for the positively phrased statements 1 and 2 were 4.4 (SD 1.2) and 4.3 (SD 1.1), respectively. The negatively phrased statements 1 and 2 were rated 3.9 (SD 1.7) and 4.1 (SD 1.4), respectively.

Introduction of the message stream seemed to encourage users to leave textual feedback and use the smiley mechanism more. However, at the same time the smiley-based rating system proved unreliable, as both the positively and negatively phrased statements received high ratings.

3.4.3 Study 3c

Concluding that the comment stream encouraged participation and that the smiley-based poll was not reliable in this context, we modified the feedback interface once more. In Study 3c we decommissioned the smiley mechanism and deployed the virtual keyboard mechanism from Study 1. This time, however, we complemented it with the messages stream, as we anticipated it would enhance both participation and quality if used in conjunction with the virtual keyboard. The feedback interface of this study is depicted in Fig. 7.3 (bottom right). Finally, at the end of this study, we interviewed the TC about the second long-term deployment of the application, i.e., the whole Study 3.

During 1 month of deployment, 40 feedback messages were created using the virtual keyboard. This speaks for the increase in feedback when the stream is displayed, as Study 1, which was three times longer than this study, attracted 35 messages using the virtual keyboard. Two researchers categorized the new messages into "relevant" and "not relevant," resulting in 13 relevant comments and 27 not relevant ones (Cohen's kappa 1.0). Thus, the percentage of noise was 67.5 %, which was a slight decrease from Study 1. An overview of all studies and key findings leading to design alterations can be seen in Fig. 7.5.

Difficulties in running our studies were mostly caused by hardware issues, highly dynamic deployment environment in Studies 1 and 3, and mismatching stakeholder interests, all issues that are common in such deployments (Dalsgaard and Halskov 2010).

Several displays suffered varying amounts of downtime due to overheating or malfunctioning touch screens or had to be temporarily removed because of ongoing renovation project arrangements or even vandalism (one LCD panel was shattered during Study 3b). Secondly, even though we agreed with the TC on implementing

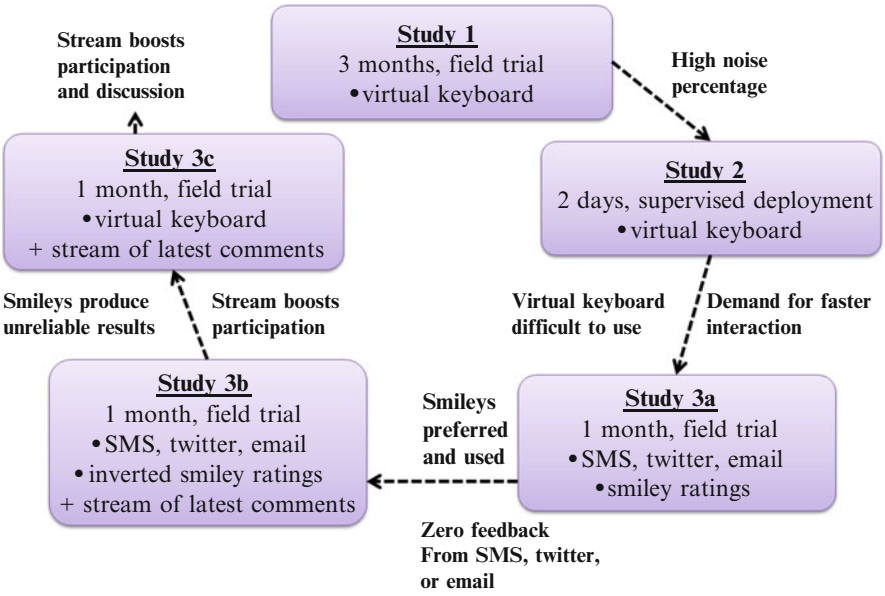

Fig. 7.5 Evolution of our studies and findings

the feedback applications, we had conflicting design opinions. We wanted to emphasize the feedback features, whereas the TC requested us to imitate the look and feel of their current online presence that focused more on presenting information.

We acknowledge that the execution environment has not been fully identical in the studies, perhaps skewing the data. Also the designs of the applications in Studies 1 and 3 were not identical. However, as agreed by Brown et al. (2011) and Huang et al. (2007), in field trials of systems such as ours, unforeseen social, organizational, and technical hurdles are common and often indeed unavoidable. We believe that the scale and length of our field trials counterbalance these effects to a great extent and that we have sufficient long-term results to initiate discussion about civic engagement on public displays.

4 Discussion

In this chapter we have presented a series of incremental studies aiming to investigate the following questions: (1) how does the public use and appropriate public displays for civic engagement and (2) how can the design of feedback mechanisms improve the collected feedback? Our studies were conducted over a long period of time, and with each study we aimed to better understand the findings of the previous study and improve the performance of the system. Civic engagement is hard to measure in the lab or during a quick one-off deployment, and for this reason we

Table 7.1 An overview of key statistics from studies 1 and 3

Study	1	3a	3b	3c	Total
Length in months	3	1	1	1	6
Application launches	1,406	381	444	433	2,664
Virtual keyboard	35	–	–	40	75
SMS/email/Twitter	–	0/0/0	6/0/0	–	6
Relevant textual	23 %	–	100 %	33 %	33 %
Smiley submissions	–	20	46	–	66

relied on longitudinal field trials that tend to become messy. However, through our iteration process and incremental changes to our system, we were able to isolate and evaluate various aspects of the interface and mechanisms we trialed.

Clearly, there is room for improvement in the system we incrementally developed, but there are some delightfully encouraging results. First, the TC did not receive *any* feedback from citizens through the other channels they had in place (phone, website, email) but did receive dozens of comments through our system. Furthermore, our study highlighted fascinating aspects of human behavior, which we unpack in our discussion. Finally, given that our studies have been one of the first in using a novel technology (public displays) for a rather archaic practice (civic engagement), we believe that our findings can help practitioners and researchers incrementally improve the technology to suit the practice.

4.1 Participation and Impact

In total our feedback applications in Studies 1 and 3 were launched 2,664 times (825 during the time smileys were deployed in Studies 3a and 3b). This is 7.2 % of all application use on the same displays (36,874 launches), making our civic information and feedback prototype the *third most launched application*, right after a traditional "hangman" game and the official information bulletin board of the City of Oulu. To us this was a positive indication, as we did not expect high interest towards an application dealing with such a "serious" topic as civic engagement. These 2,664 launches resulted in 81 text-based feedbacks and 66 sets of smiley ratings. Thus, 3.0 % of all application launches led to users leaving textual feedback, and 8.0 % led to users using the smiley-based mechanism. We find remarkable similarities here to behavior in online discussion forums, where *lurking* has been identified as highly common practice. Up to 99 % of users do not participate in discussions in online forums, but rather follow and read information (Nonnecke and Preece 2001). The term *lurker* has an unreasonably bad connotation as well. After all, lurking is in many cases beneficial for the greater community, and a case can be even made for lurking to be normal behavior and participation abnormal: who would be reading if everybody focused on contributing (Nonnecke and Preece 2000)? Especially in civic engagement, information and awareness of participation possibilities is important, because only with these does a meaningful, two-way dialogue become eventually possible. A summary of key statistics from Studies 1 and 3 is presented in Table 7.1.

Another issue here is user motives and pre-qualification. Müller argues that public displays do not invite people for a single reason, but users come across them with no dedicated purpose (Müller et al. 2010). It has also been shown that when a display features multiple applications, many application launches are caused by pure curiosity or play rather than intention of using them (Hosio et al. 2013). These findings together lead us to believe that a portion of the application launches was not intentional, thus lowering the percentage of people who actually submitted comments, and that if the applications were deployed on bespoke displays, the amount of use would be even higher.

Several factors make civic engagement challenging. Downs (1956) has observed that citizens appear to be "rationally ignorant" of topical issues and local policies, because in their opinion the feedback they give will not make a difference or have impact anyway. We are optimistic about the participation and what can be achieved with new types of civic engagement channels that are a permanent fixture in the city fabric itself. While the total of 81 feedback messages we received may not sound like a lot if compared to the results of related feedback prototypes in literature, the TC reported it was the *only feedback they ever received from citizens* in the course of our studies. Based on interviews, the deployment itself was greatly appreciated by citizens, and partially because of that it has opened us further avenues to collaborate with the City of Oulu officials. Their conventional feedback mechanisms were not used for citizen feedback, and they were overall very satisfied with the performance of the new feedback channel.

Several of the feedback messages addressed the ongoing work, indicating that citizens did trust, at least to an extent, in the impact of their feedback and thus in the TC itself. Examples of such messages are "More employees are needed, this needs to be done faster," "We need to be competitive with other cities, this is good," "Looking good, also the new stage looks nice!," "Good but way too expensive show for the City," or "It's great to see the City developing!"

4.2 Feedback Analysis

Of all text-based feedback messages submitted in our field trials, 54 (66.7 %) were categorized as noise, i.e., not relevant to the renovation project. These messages indicate a strong appropriation of the application. Analyzing practices and contexts of use is a major concern in evaluating UbiComp technologies (Korn and Bødker 2012). An in-depth analysis of these messages reveals several underlying social phenomena that designers should be aware of, or even leverage, when crafting future feedback and civic engagement applications for public spaces.

4.2.1 Playing with Technology

Several messages consisted of random characters, such as "v811," "sfrd," or "zadffffgghhjjkkjhbbb." We argue this was caused by users *playing with the technology* and creating a mutual social event around the display rather than focusing on the application purpose itself. This is often observed with groups interacting with mobile devices in public (Kindberg et al. 2005), and to strengthen this, public displays inherently encourage social, performative use (Kuikkaniemi et al. 2011; Ojala et al. 2012; Peltonen et al. 2008). This is also supported by findings in Hosio et al. (2012), where a group of users socializing together around public displays was a major factor in obtaining high numbers of (arguably noisy) feedback.

4.2.2 Self-Representation and Expression

Self-representation and expression were observed in several feedback messages. These are common especially in photography (Van House 2007) and refer to an individual's needs for highlighting his/her activities, humor, or any unique identifiable angles around oneself, i.e., bringing oneself forward. In this case even the visually modest textual feedback channel was enough for users to submit their names or nicknames, affiliations, or mental and physical states. Comments like "I'm Sniff Dogg and I'm a wild guy!" and "My house is not affected by this, yeah" and comments with names or nicknames all represent the strong desire that people feel for expressing and advertising themselves in their appropriation of new communication technologies (Harper 2011).

4.2.3 Documenting Rule Breaking

The third observed phenomenon was *documentation of rule breaking*, a social need according to Schwarz (2011). Users submitted messages of breaking social rules and norms or ridiculing the authority that receives the messages, the TC—without intention to discuss the renovation project. Messages like "I really don't appreciate you…," "It stinks like s**t here, f**k you all!," and "I'm way too drunk to give you any constructive criticism, sorry a**holes" and random swear words all indicate acts of documenting the breaking of rules of social behavior and norms. A free-form, anonymous channel like ours is likely to receive abuse like this when deployed in the wild.

4.2.4 Storytelling and Discussions

Storytelling and discussions are series of submitted messages that complement or continue the previously submitted message. Curiously, these occurred even when the messages were not displayed to the users and were only emailed to the TC.

Storytelling happened both with relevant and nonrelevant (noise) comments. It is illustrated by the following comments that were submitted sequentially in Study 1 during 3 min: "I am a 12-year-old girl"; "I am a 12-year-old girl, from <Location>!"; and "I am a 12-year-old girl, from Tornio, but it was not me! It was Teemu." Self-expression and storytelling are both clearly distinguishable from the sequence. Considering that typing with virtual keyboard was judged cumbersome and frustrating in Study 2, such social play around a display has great potential to overcome those difficulties.

When the message stream was introduced in Studies 3b and 3c, people picked up previous comments and discussed them, often by agreeing and supplementing them. An example sequence from studies 3b and 3c consists of the following messages: "Wasting years because of this small renovation project is way too long," "Also, please add more working hours, it is taking too long," and "Yea, I also really agree on that." This suggests that adding the stream led to further engagement with other citizens.

4.3 Contrasting the Deployed Feedback Mechanisms

Our findings suggest the need for feedback channels at the right moment for discourse (De Cindio et al. 2009) to hold true in civic engagement on public displays as well and that public displays can present instant opportunities for feedback. Several interviews highlighted the need for fast, in situ interaction to give feedback. Further, users would most likely not go through the trouble of leaving feedback later on or search for mechanisms after the optimal moment for feedback has passed.

So while public displays are being recognized as promising medium for feedback (Battino et al. 2011; Hosio et al. 2012), the effectiveness of the actual feedback mechanisms becomes a key challenge. In our particular case it was important for the TC to offer text-based solutions for giving free-form feedback about the renovation project. Virtual keyboard, SMS, twitter, and email were all trialed for this purpose, and their differences turned out to be drastic.

Offering just a virtual keyboard for typing resulted in average *quantity* but high *noise* in Study 1 (27 of all 35 submissions, or 77.1 %), and in interviews of Study 2, virtual keyboard was regarded cumbersome or even physically painful in typing longer texts. However, in Study 3a when SMS, twitter, and email were deployed to facilitate easier typing and to lessen noise, the amount of textual feedback dropped to *zero*.

The stream of latest feedback messages introduced in Study 3b boosted participation slightly, but only with SMS. Twitter and email were not used. This further highlights the need for effortless, in situ interaction mechanisms, as twitter is scarcely used, and it is still far from everyone to have email capabilities in their mobile phones in Finland. Remarkable in the use of SMS, compared to the use of virtual keyboard, is the quality of feedback it produced. All the messages submitted through SMS were relevant to the renovation project. We attribute this to the costs of SMS. Only people who were serious and committed to voice out their feedback were ready to pay for it (at the time of these studies, a standard cost for SMS in

Finland was approximately 0.07EUR). On the contrary, in a recent study Schroeter (2012) found the fact that SMS is not free, a key factor in preventing people from leaving feedback.

Displaying the stream of latest comments turned out to be a major factor regarding feedback quantity. In the 3-month study 1 (i.e., without the stream), 35 feedback messages were left. Introducing the stream to the three times shorter Study 3c led to 40 submitted feedback messages, indicating people participating about three times more when the stream was shown. The stream also allowed for discussions around the renovation project to occur on public displays. Displaying previous feedback comments can be seen analogous to online message boards. Wright and Street (2007) discuss so-called have your say, style message boards, which can be conceived as democratic meeting places, virtual agoras. The underlying value of such boards comes from anonymous, fairly unstructured discussion that allows users to post what they want instead of what the officials want to hear. This shift in power has a liberating effect, as topics and concerns that people are interested in arise, but the officials are perhaps not aware of.

Finally, interviews in Study 3 revealed citizens preferring the use of smiley ratings over other trialed mechanisms. As expected, the smiley-based poll-style feedback mechanism turned out to be popular also statistically. However, it was not reliable, as in Study 3b the positively and negatively phrased statements were both rated overall high, illustrating users' tendency to merely choose options on the right end of the scale. The effects of order in Likert-type scales have been studied widely (Chan 1991), and this behavior holds true especially in paper-based environment. Our studies are the first ones to point the same to apply for public displays as well. Another common reason for the potential invalidity of such poll-style mechanisms can be "non-attitudes." Converse (1970) suggests that people usually offer "top-of-the-head" answers when confronted by polls in public, just to avoid appearing as ignorant. In highly public settings like ours, this behavior might be strengthened.

5 Summary of Lessons Learned

Impact will not be immediate, so calibrate citizens' expectations and the scope of interaction. One-off deployments or novel installations are not viable solutions for long-term, ongoing civic participation. We chose to conduct the study in an authentic setting without explicit advertising in order to call for longitudinal action and support for sustained participation, both very much encouraged in community involvement (Clary and Snyder 2002). Our prototypes calibrated citizens' participation: while a multimillion multi-year project *cannot* be turned around given the opinions of few, day-to-day improvements *can* be made to ease the impact and side effects of such a big renovation project. Our prototypes explicitly focused on obtaining this type of daily feedback.

Expect moderate participation. Concerning the deployment environment, related literature often leads to expectations that getting hundreds of feedback items with public displays is effortless (Ananny and Strohecker 2009; Battino et al. 2011; Brignull and Rogers 2003; Hosio et al. 2012). However, a common factor in all these prototypes is a disruptive deployment, dedicated to the service alone and informal or even amusing feedback topics. We advise not to expect in naturalistic settings the same quantity and quality of feedback reported in literature in controlled or short-term studies. This holds true especially with civic engagement, which lacks mass appeal (Uslaner and Brown 2005) and towards which people are often ignorant (Downs 1956; Schroeter 2012). In addition, feedback is certainly not the only contributing factor in civic engagement—informing and creating awareness is one of the key elements as well and should not be neglected when analyzing "success" of civic engagement deployments.

Feedback designs do not work flawlessly as advertised in literature. Virtual keyboards and personal, mobile input mechanisms have been suggested earlier as successful feedback mechanisms in conjunction with public displays (Ananny and Strohecker 2009; Hosio et al. 2012; Schroeter 2012). While we found drastic differences between their performances in our work, none of them performed exceptionally well. In addition, and interestingly, the smiley-based mechanism, which was liked the most in our interviews, produced unreliable results.

Social and performative behaviors are major driving factors, confirming previous studies of interactive public displays (Kuikkaniemi et al. 2011; O'Hara et al. 2008; Ojala et al. 2012; Peltonen et al. 2008). Various social needs, such as self-expression or documenting rule breaking, present themselves in the use of new communication channels, and public displays do not seem to be an exception to this (Harper 2011; Kindberg et al. 2005; Schroeter 2012). The interviews in Study 2 also support findings of Brignull and Rogers about the awkwardness and social pressure that people feel when interacting alone with public displays (Brignull and Rogers 2003). Our participants expressed discomfort in submitting emotional or negative comments. These findings, while needing further validation, have important implications on eliciting civic discourse with public displays. If people are not willing to express their honest opinions on the spot, public displays should be used more to disseminate information and advertise the means of remote, more private participation. In this study, the TC regarded information dissemination and especially the PR value of the deployment as superior to the obtained feedback itself.

6 Conclusion

We present studies that investigate the feasibility of using public displays for civic engagement. We highlight and analyze psychological and sociological reasons behind their appropriation. We also find in situ interaction mechanisms as the most

desired ones on public displays. Our interviews indicate that offering the possibility for direct feedback was highly appreciated by both citizens and the TC.

We argue these kinds of deployments will have increasingly great role in increasing reciprocal trust between citizens and authorities, and we advocate the use of public displays in connecting these two entities as they are an opportunistic medium that is equally accessible to all locals. One of the most important facts supporting this is the ability of public displays to reach otherwise unreachable citizens (Hosio et al. 2012; Schroeter 2012). Thus, researchers should not be concerned only about the feedback quantity and quality or how different mechanisms perform immediately, but rather think long-term and set broader goals for civic engagement on public displays. In the spirit of our own advice, we certainly have several civic engagement services deployed on our displays at the time of writing this chapter.

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