From School Food to Skate Parks in a few Clicks: Using Public Displays to Bootstrap Civic Engagement of the Young

Simo Hosio, Vassilis Kostakos, Hannu Kukka,
Marko Jurmu, Jukka Riekki, Timo Ojala
Department of Computer Science and Engineering, University of Oulu, Finland
firstname.lastname@ee.oulu.fi

Abstract. We present Ubinion, a service that utilizes large public interactive displays to enable young people to give personalized feedback on municipal issues to local youth workers. It also facilitates discussion and sharing the feedback online using modern social networking services. We present the motivation and rationale behind Ubinion and analyze the results from three large-scale user trials conducted in authentic settings. The evaluation shows that young users are positive about adopting Ubinion, and that they quickly appropriated its use to provide feedback outside the intended scope of the system, but still reflecting their concerns. We argue that Ubinion's design as a fun and informal tool is appropriate for its purpose, and discuss the versatility of public interactive displays as a municipal feedback medium and as content sources for online communities in general.

Keywords: Social computing, urban computing, public spaces, public displays, social networking, civic engagement, information interfaces.

1 Introduction

In this paper we investigate the role of a proliferating pervasive technology, interactive public displays, to allow for collective, semi-anonymous initiation and enhancing of an online community. We utilize these displays in collecting feedback and opinions on topical issues from young users, specifically from pre-teens (<13 y/o), teens (13-17 y/o), and young adults (>17 y/o) and for relaying this feedback online for discussion and access. We regard public interactive displays, deployed in pivotal city locations, as a potential tool for reaching out to the urban youth otherwise often unreachable by social workers. Our focus is on the youth that do not actively participate in municipal youth activities or, indeed, are not even aware of such activities. As many young people are interested in latest gadgetry and games, we see potential in approaching them with playful interfaces and applications that are social and fun to use on high-end, interactive displays.

We have developed a prototype service called Ubinion that runs on interactive displays. The aim of the prototype is to foster engagement of the young in topical municipal issues, and to empower the youth to have their voice heard through such new pervasive technology. The prototype allows the Youth Affairs Department (later: YAD) of Oulu to initiate a topic of discussion, and for the young to respond by giving feedback or comments through interactive public displays. These responses take the form of photographs, with annotated thought bubbles (Figure 1) or protest signs, and end up in Ubinion's online presence in a popular online social networking service (later: SNS), thus aiming to create an online community, initially populated by the

semi-anonymous young and their submitted content. To follow-up the feedback, users and youth workers can view and take part in the discussion online. As SNSs are an integral part of teenagers' lives these days, we believe they are efficient tools for fostering discussion about topical municipal issues of interest to the young. Further, as the Oulu officials already have an online presence in SNSs, Ubinion enables increasing interaction between the young and city officials.

In this paper we make three key contributions:

- We develop a novel public service for fostering communication between young citizens and youth officials in a fun and entertaining way.
- We demonstrate how public interactive displays can be used in a many-to-one fashion to facilitate creation of a content-rich community presence in a social networking service.
- We identify how young users appropriate this new communication channel via extensive field trials conducted in authentic settings.

Our contributions are essential for cities or organizations wishing to engage the young in conversation about topical interests using such pervasive technologies. In addition to demonstrating how public displays can be used hand-in-hand with SNSs (here: Facebook and Twitter) to create a content-rich community presence, we also identify the ways in which young users are willing to appropriate this technology to voice their own concerns.

Fig. 1. Sample feedback submitted via Ubinion prototype. Left: "Faster decisions, please." Right: "You are using the City's money wrong, e.g. a new parking lot. No funding cuts to schools!!!"

2 Related work

Previous research has shown that citizen participation is positive for individuals, institutions [1], as well as for the broader society [2]. While citizens are being increasingly encouraged to take on more active roles [3], citizen participation can only be fostered on the basis of reciprocal trust between people and institutions [4-7]. It has been argued that citizen participation can be viewed from the perspective of benefits to be gained and costs to be borne. Benefits include not only material

advantages but also psychological and social ones: satisfaction [8], sense of belonging, and social status rewards [9].

Building on these previous findings, we identified two key requirements for Ubinion. First, the process of giving feedback should be fun and engaging, thus offering satisfaction to those providing feedback. Second, we decided to use SNSs as an intermediary transparent mechanism for building trust between the youth and the institution that is dealing with this feedback (in our case the local youth workers), as well as for intrinsic social status rewards.

2.1 Public Displays

While little previous work has considered using public displays for civic engagement, research on applications utilizing public displays has been steadily gaining momentum, focusing on issues such as user interface design, navigation, awareness, and artistic creativity. Our system draws features from several types of services on public displays: Ubinion is primarily a social application that encourages young people to collectively create something meaningful, yet personalized, on public displays.

Müller et al. [10] reported findings from two prototypes on public displays, *News Displays* and *Reminder Displays*, deployed in a university setting and providing users topical news and situated, contextual reminders. They provided a straightforward mechanism for submitting new information chunks and highlighted the importance of updated content available for viewers, reported also in [11]. Further, they emphasized the recognition of content sources, individuals who have continuous needs for publishing content, for providing fresh content to a system. In our work, we demonstrate how to provide new content by turning casual bystanders into content sources through playfulness, participation, and sociality.

A large networked display installation in the wild, *e-Campus* [12], explored various means of injecting content into their system. They focused in supporting large user population and gathering lessons for future deployments of similar purpose. These include content-related issues, such as the well-known phrase “Content is king”, referring to the importance of high-quality content, and the expenses associated with acquiring good content. Further, they highlight maintenance tasks, such as being able to see what the users of applications see. We take advice from these lessons in our work by designing our system to encourage its users to generate socially meaningful, relevant content for themselves and for their peers in SNSs, thus guaranteeing near-perfect uptime and content monitoring capabilities.

The *AutoSpeakerID* and *Ticket2Talk* [13] prototypes augmented an academic conference with information about its participants, enhancing their awareness about each other. *Instant Places* [14] allows users to draw content from Flickr or post simple messages using their Bluetooth device name as the commanding interface. These, like many other deployments, draw pre-generated content from existing sources. In contrast, our focus is on on-the-spot creation of content by our users, supplemented with the ability for follow-up interaction and discussion via popular SNSs.

2.2 Encouraging Use

A key challenge we faced with our system is to encourage social use: build the system so that groups of people can use it simultaneously. This requirement is grounded on the fact that while getting feedback from an individual young person is challenging due to social barriers such as shyness, getting feedback and ideas from a group is seen as far easier. By working together, groups are able to overcome common problems, thanks to team efforts [15]. Therefore a key requirement we identified was to base the functionality on a live camera stream that is able to capture a group of people at the same time.

Previous research [16], [11] has shown that the 'mirror' metaphor is an efficient way of enticing users to approach a display, and become active participants, thus combating display blindness [17], a common problem related to public displays in the wild. The interactive displays deployed in Oulu already include an application that allows users to take a snapshot using integrated cameras, augment the image with a textual message, and send it to friends through e-mail or share it on Facebook. The application has attracted considerable use throughout its deployment [11], and we have observed groups of up to 20 teenagers posing in front of the displays at the same time for long periods of time, taking snapshot after snapshot, trying to capture the perfect moment. As this interaction method has proven effective in capturing attention and enticing people to use a public display in groups, we utilized a similar method in the Ubinion prototype.

3 Ubinion

Ubinion was designed to allow users to interact collaboratively and playfully using large interactive displays in urban space to create content and, at the same time, leave feedback about municipal issues to the local YAD. In addition, it enables follow-up discussion, commenting, and sharing generated content online using SNSs. The system is aimed at the local youth, and the YAD has been involved in all stages of design and evaluation of Ubinion.

Our design process involved a design session with representatives of the YAD to gain a better understanding of their operations and needs. The session took place at the university campus and lasted for two hours. Four local youth workers took part in the session, which was documented with notes, and a questionnaire was delivered to the participants after the session to collect further data. In this case, the youth workers are domain experts in the field, and involving them from the very beginning is a crucial aspect in building a successful prototype [18].

In addition, focus group sessions and informal semi-structured interviews were conducted with young people, to capture their understanding of civic involvement and their perceptions of YAD and its operations. Their use of SNSs was also explored. These sessions were organized in cafeterias favored by the young in downtown Oulu, where we discussed with groups of teenagers and interviewed them on a one-to-one basis as well. In addition, we deployed online questionnaires answered by the youth.

3.1 Existing Practices, Design Requirements, and Guidelines

Our research indicated that YAD currently uses paper-based feedback forms, distributed and collected after specific events for the young. They also use a generic on-line feedback form, and they utilize an online nationwide initiative service. The main tool for reaching young people is still face-to-face conversations in selected schools and youth centers. Interestingly, social media, which our data and interviews showed to be a very integral part of communication practices of today's young, is not efficiently used to reach the young. Despite the seemingly multiple ways of collecting feedback, the youth workers expressed difficulties in reaching as many young people as they would want to, while the youth appeared somewhat uninterested and especially uninformed in YAD's approach and ways of reaching out.

Another finding was that existing feedback and information channels were inadequate in many aspects, and novel solutions were required to keep up with the contemporary communication practices of young people. While the need for an upgrade of existing practices was clearly recognized, YAD officials did not have a clear idea or the required skills on how to exploit new technologies.

In addition, we collected feedback about the possibility of a public display service, since they have previously been successfully used to collect topical opinions and votes e.g. in a campus-setting for students [19]. We inquired about the kinds of benefits that YAD and the youth would see in using such public interactive displays for engaging with the young. The feedback we received was that such a system should aim to reach the young who do not participate actively in official events. The opinion of both the YAD and the youth was that using the latest technology to increase the visibility of informational content is necessary to systematically reach out to the young. In general, the possibility to engage in municipal issues directly from public displays was seen as a fascinating avenue to explore. Moreover, the young felt uncomfortable to visit the premises of YAD in person, as they claimed it added "pressure" to giving feedback. As one of the interviewed youths put it: "*With some other solutions, we can take our time giving the opinions, and don't have to fear that we have to [commit] in realizing the idea.*" Thus, the young felt they would benefit from a more anonymous and flexible mechanism of participation.

Finally, our findings showed that YAD considered television, movies, radio broadcasting, and traditional roadside advertising as far too expensive, while social media was seen as a potentially functional communication tool regardless of the target group and the type of activity planned ("mainstream" / "underground"). E-mail and Twitter were not thought to reach the young very efficiently. Despite the recent digital takeover, face-to-face conversations and traditional meetings at youth houses and schools were mentioned as highly important activities. Thus, YAD considered the role of digital and social media as increasingly important and supportive, but definitely not dominant as of yet. On the other hand, our data from talking to youth suggest that they regularly engage in interactions via social media, and they claim to get to know about new events and ideas almost solely through Facebook. It appears that social networking services are channels used heavily by the youth. Our interviews also showed that Facebook is used among the young for discussions around a variety of topics, and not only for status updates and ephemeral sharing. Thus, Facebook could be suited for discussions around concerns of the young.

Of the 13-year olds (the "official" minimum age required to open an account in Facebook), only one out of twenty was reported to not have an account, just to "be different" and for a "matter of principle". One slightly alarming finding during the interviews was that many of the local young start to use Facebook at the early age of eight. "*Either they create the accounts in secret by themselves, or their parents create the accounts for them*", summarized one of the focus groups we interviewed. This suggests that the age limits of Facebook are not being enforced.

Our key requirements formulated from analyzing previous work as well as through our interactions with YAD and the youth can be summarized as follows:

- **Exploit public displays**: The use of public displays is often highly social by nature [20], and inherently supporting sociality increases the adoption of an application on public interactive displays [11]. They also contribute to a "cutting-edge" image that is attractive to youth. Furthermore, the "honeypot" effect [21] can be exploited to encourage their use.
- **Design for playfulness**: Interactions and interfaces on public displays need to be simple and effortless to use [20]. A public application needs to efficiently attract and motivate its users to engage with it [21, 22]. Previous research has shown that the 'mirror' metaphor [16], [11] is an efficient way of enticing users to approach a display, and become active participants, thus combating display blindness [17]. Also, taking a group photo using an embedded webcam effectively invites multiple users to create content in a social and fun way [11], thus lowering the barrier of interacting with a public display [22]. Collaborative use also combats the feeling of social awkwardness associated with interactions on public displays [21].
- **Use social media**: Social media can be used as a public ground to establish common trust between the youth and YAD institutions [4-7]. In addition, social media services can help manage content creation, storing, and delivery, which are key challenges in pervasive systems [12].

3.2 The Ubinion Prototype

Ubinion allows users to take a snapshot with a web camera embedded in the public display, add comments to an augmented graphical element in the picture, and upload the picture with given comments to a photo album in Ubinion's Facebook page, while the text comments are also replicated to its Twitter feed. Thus, Ubinion integrates two powerful, yet inherently different, online social networking services.

Ubinion consists of three separate parts. The user interface on *public displays* serves as the first entry point to Ubinion; the *Twitter* feed, being simple and easy to browse, allows youth workers and system moderators to rapidly skim the submitted feedback, and to only pick valid ideas and comments; the *Facebook* page, where taken pictures with given comments are uploaded, allows for sharing, commenting and discussing the ideas. The latter enables "liking" suggestions and comments, acting as a ranking mechanism, and offers convenient community-driven moderation as well as admin capabilities for the youth officials to oversee what is happening with the application. Finally, it serves the need for a more relaxed and casual conversation often happening around the less serious comments and photos.

Ubinion's public display UI provides only a few buttons to facilitate rapid and fluid interaction. Users move between screens by touching buttons shaped as large glowing arrows, and the final comment input is performed using a virtual qwerty-style keyboard. The graphical elements, speech bubble and protest sign, can be moved via dragging on the screen. Ubinion aims to be "fun", as using such interfaces can be a liberating experience [23], and make users feel comfortable to leave feedback. Previous research has also shown that while users tend not to perceive playful applications as useful or important prior to using such displays, data collected from actual long term usage shows that the opposite is, in fact, the case [24]. Ubinion's user interface can be seen in Figure 2. Ubinion strives to engage users by embracing the creativity of users [22] by allowing the creation of personalized content. Further, by utilizing a webcam feed, Ubinion makes users real parts of the application and produced content, which has been proven to be an effective way of catching attention [16].

Fig 2. Ubinion's user interface on public displays. From left: initial instruction screen, example opinions and feedback, webcam image and choice between "speech bubble" or "protest sign" as the augmenting element, and a screen with virtual keyboard to enter text in the chosen graphical element and a submit button.

4 Field Trials

We ran three field trials to evaluate Ubinion in realistic contexts. Each trial was a focused study in a selected event. In two of the three field trials, Ubinion ran on 57" displays already located at the venues. To encourage users in exploring the social networking features of Ubinion, we also provided all-in-one 23" touchscreen PCs and made them available to users.

After consulting the YAD, we chose to ask the following question on Ubinion's first page, and urge the youth to provide feedback: *"What is wrong? Are you annoyed? How could we develop Oulu?"*.

4.1 Data Collection

We collected data by unobtrusively observing users, having at least two researchers present in each trial, and by an online questionnaire. Users had the choice of using

extra computers on site to answer the questionnaire after using the prototype, or answering it later online. The form was made public via an easy to remember address: www.ubinion.com. As an incentive to answering the questionnaire, we raffled movie tickets for a local cinema. With the questionnaire we sought to uncover issues related to the usability and user acceptance of Ubinion, and to explore the perception of value of this kind of feedback channel and the actual feedback they submit. The questionnaire featured demographic questions, an adapted version of a standard SUS (System Usability Scale) questionnaire [25] to assess the usability of Ubinion, and questions regarding respondents' expectations regarding their feedback and experience regarding interactions with the YAD.

During the three deployments, we received 262 Ubinion entries, and 195 completed questionnaires (88 male). Of the questionnaire respondents, 70 were pre-teens (<13 y/o), 31 teens (13-17 y/o), and 94 young adults (>17 y/o), with an average age of 15.9 (SD: 5.3). Of the respondents, 152 currently lived in Oulu (67 male, average age 15.5, SD: 4.5).

4.2 Field Trials

The *first* field trial was conducted during a holiday event featuring mostly sporty activities like skateboarding, bouncy castles, and BMX cycling. The event lasted for two days, and was aimed at a pre-teen and teen audience. In order to engage as many visitors as possible, we placed Ubinion next to the main entrance to the exhibition space, a practice suggested in [10]. As the event mainly attracts a younger demographic, our goal with this trial was to attract a mainly pre-teen audience. Among the 88 questionnaire respondents from this trial, there were 69 pre-teens, 13 teens and 6 young adults. (MEAN age: 12.7 years, SD: 5.8 years).

The *second* field trial was organized during a full-day event at the University main campus for students from local senior high schools, aiming to promote and deliver information about different study possibilities available at the university. The event attracts over 4000 students, mostly young adults, each year. Ubinion was situated in one of the main hallways of the university. The selected space is an intersection of several busy walkways, and already houses one of the large interactive displays deployed in Oulu, making deployment easy as we did not have to transport a display from elsewhere. The motivation to have a field trial during this event was to capture a mostly young adult demographic. From this trial, we gathered 94 questionnaire responses from 1 pre-teen, 7 teens, and 86 young adults (MEAN age: 19 years, SD: 2.6 years).

The *third* field trial was organized at a local high school during a school day. We wanted to evaluate the effect of changing from a public fair setting to a more mundane environment where students were attending their normal everyday schedules and not participating in a special event, as was the case with the two previous trials. We also wanted to capture a teenage audience, as the two previous trials had focused mostly on pre-teens and young adults. This trial differed from the two previous ones, as we gathered results only during two lunch breaks and two normal breaks, lasting around two hours in total. Due to logistical difficulties, we had to deploy Ubinion on a 23" touch screen PC, placed in a lobby next to the school cafeteria to make it as

visible as possible. This trial resulted in 13 respondents, 0 pre-teens, 11 teens, and 2 young adults (MEAN age: 15.3 years, SD: 1.8 years).

Following the three field studies and our analysis of the results, an interview session with Oulu YAD took place. The interview was organized at the premises of the YAD and included three youth officials both from City and from YAD who commented and evaluated the data collected by Ubinion.

5 Results

We analyzed the 262 entries (opinions) created by users of Ubinion during the three field trials. Two researchers individually examined the submitted entries, and concluded that the feedback can be grouped in four categories: public services, sports, education, and other.

The "public services" category contains 33% of all submitted entries. A few trends can be seen in these entries, namely comments for and against current topics in the local media, such as a new and expensive parking lot that was be built in Oulu. In addition we received comments about public transport, which was seen far too expensive and insufficient for the needs of the young. Further, the situation where the trial was held had an impact on many of these comments. There were several comments about and concrete improvement suggestions for the youth event (first trial) and for the university event (second trial). Generally comments like "Cheaper bus tickets", "We don't want the new parking lot", and "This <event> is really nice" were given in this category.

The sports category contains 13% of the comments. The trend here was to request more sports facilities or events for a certain sport. The most popular requests were to build more skate parks or renovate old ones, obviously due to the nature of the youth event during the first trial. However, more traditional sports got mentions as well, such as swimming and gymnastics. Even though the majority of sports related comments were requesting for something more, some of the existing sports facilities in Oulu got positive feedback and comments from the young. "More BMX parks!", "Build roofing to the skate park in <location>", or "The artificial lawn at <location> is great!" are typical examples of entries in this category.

The education category was the least popular with 6% of all submitted comments. Clearly the most discussed topic here was school food, which was often regarded as being of low quality. However, more severe topics such as bullying among the young and classroom sizes were mentioned as well. Comments such as "School food sucks", "Big classroom sizes are depressing", and "It would be nice to have more sports classes in senior-high school" were given in this category.

The category "Other" contained 47% of comments. In this category we grouped general greetings, random strings, smileys, and other comments that were clearly input just to test the technology, to have an entry submitted, or just to have some fun toying with the prototype. Comments such as "omg lol XD", "yebou", or "save the walruses" are examples of comments in this category.

In total 139 (53%) of the 262 entries were given by groups, consisting of 2 to 12 persons in them, 119 by single persons, and 4 without anyone particularly appearing

in the photo. Further analysis revealed that group size did not significantly affect the topic of the given feedback. However, gender did: a Pearson's chi-square test showed that males (males and groups of only males) gave significantly more feedback relating to "sports" than females (females and groups of only females) ($x^2(3, N=245) = 11.07$, $p<.05$). Figure 3 illustrates the category breakdown per gender.

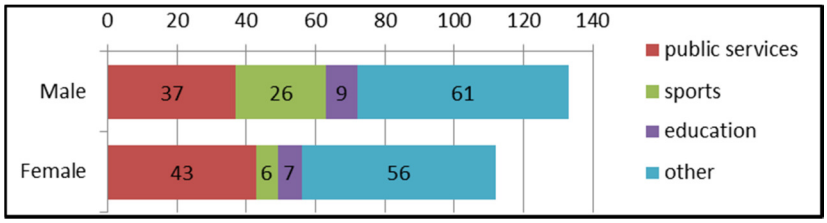

Fig 3. Feedback collected by Ubinion grouped by topic and gender.

5.1 Responses to the Questionnaire

Based on the 195 questionnaire responses, the respondents felt relatively comfortable using Ubinion (4.0 on a 5-point scale, SD=1.0), while they also reported that they perceived the system to be "fun" to use (4.1, SD=1.1). Pre-teens were generally more positive in their responses in this regard. In relation to the social use of the system, the participants mostly agreed that they preferred using the system in a group rather than alone (4.0, SD=1.2), with teens and young adults agreeing slightly more. Overall, respondents were positive about the system (3.9, SD=1.1).

The results also showed that the respondents were not entirely convinced that their feedback was of value to the city officials (3.4, SD=1.1). Especially young adults had doubts about this (3.1, SD=1.1). Analyzing this further, a Pearson's chi-square test was used to examine the relation between users' previous experience in participating in youth activities and believing that the feedback has value to the city officials. The relation was significant ($x^2(8, N=190) = 17.83$, $p<.05$), showing that participants with no prior experience in youth activities felt their feedback was less valuable.

5.2 Facebook Activity

The Facebook component of Ubinion ran independently and throughout the three trials. We continued collecting data from the Facebook component 6 weeks after the third trial completed, thus bringing the total data-collection period to 5 months. During this time Ubinion's Facebook page received 53 likes and 16 comments. Wall posts, i.e. Ubinion entries, were viewed 991 times, and particularly the gallery section with all of the entries was accessed 122 times. Of the handful of comments made on Facebook, most merely attributed the young themselves or identified their friends in the photos. The most active age group visiting Ubinion on Facebook was 13-17 with 36% of all visits, followed by 27% by 25-34 y/o, and 23.4% by 18-14 y/o. This data was gathered directly from Facebook's page analytics.

5.3 Feedback from the YAD

During a feedback session, youth workers were asked to give insight on Ubinion and its use from the perspective of city officials. Overall, the feedback we received from the youth workers was positive. Facebook was perceived as an increasingly important part of their communication strategy, and a valuable tool in reaching the young. Furthermore, the administration interface provided by Facebook is easy and effortless to use for monitoring and participating in discussions. A shortcoming was the requirement for a person to 'like' the Facebook page prior to being able to participate in the discussion. Also, the youth workers had concerns about using Facebook as the only end point for the content, as they previously had problems with accounts being suddenly banned. However, the pros were seen to greatly overweigh the cons, and Facebook was concluded as a highly suitable solution for the YAD.

The Twitter feed was preferred over Ubinion's Facebook page for the simple task of following the text-based feedback stream. Twitter streams are less cluttered than a Facebook page, and thus it was deemed more suitable for this purpose.

The feedback submitted through Ubinion was seen as valuable but broad, since the youth workers concluded that the feedback was too cluttered in the scope of their purposes. Entries given through Ubinion often contained ideas or opinions on issues that are outside their jurisdiction and would require higher levels of the Oulu administration to address, such as building new sports halls or skate parks. However, it is to be noted that this feedback is valuable as it still reflects the wishes and concerns of the young, and should just be forwarded to different municipal stakeholders.

Overall, the youth officials reacted positively to the results. Based on this meeting, future enhancements were suggested, including an interface for changing the sample pictures and texts in Ubinion's public user interface. A further improvement would be to store the content also on private servers to counter the possibility of getting an account banned in Facebook and losing all the generated data.

6 Discussion

Our results and observations suggest that Ubinion was perceived positively by all age groups in the study, and slightly as more fun to use by pre-teens and teens. The used technology may be a factor in these results, as the youngest age groups are not as accustomed to gadgets and high-end technologies as older ones, making the use of Ubinion exciting and more fun for them. This can be leveraged in reaching the youngest demographics: by building applications with fluid, playful user interfaces and using novel technology, such as large interactive displays with cameras, it is possible to appeal to the young demographics.

However, youth workers were surprised by the fact that we found that less than one third of young adults felt that their feedback had any significant value. Prior participation in youth activities correlated directly with the perceived value of the feedback given, indicating that people more familiar with official youth activities also trust youth workers more. Utilizing applications that connect the young, youth

workers, and urban locations where the young can socially use the applications together might be a step towards a more flexible ecosystem, where the young are more aware and willing to engage openly in topical municipal issues. For example in our three trials we reached 130 respondents, 66.7% of all questionnaire respondents, who did not know of any other channels of giving feedback to their local youth affairs department. This as itself is already a contribution to local youth work, and was highly appreciated by the YAD.

Furthermore, we found that respondents preferred giving feedback collaboratively with friends. Utilizing Facebook for discussion and sharing the feedback was seen in a very positive light by especially pre-teens, and interestingly 100% of them were found to already use SNSs. It is worth noting, however, that the youths' positive comments in using Facebook as a discussion mechanism were not reflected in their actual behavior: Facebook, as we discuss later, was mostly used for browsing and voting, but not for discussion.

Finally, our interviews revealed interesting facts about the age of the youngest Facebook users, who were quoted to be as young as eight years old, supporting the findings in [26]. As Facebook officially restricts users below the age of 13, we can only note that this is indeed not the case in real life.

6.1 Effects of Social Settings

The social and physical situation where a trial was conducted affected users' behavior. During the first trial, we noticed Ubinion often being used as a playful gadget instead of a serious feedback medium towards youth workers. Users did not always pay attention to the core idea behind the service when they found out that they could take a photo and upload it to Facebook. This functionality alone worked as sufficient incentive to motivate action, and pre-teens often spent long times playing with Ubinion, taking photos and fooling around with friends in front of the embedded web camera. Some groups, especially of girls, took their photos several times before being satisfied with the result, while boys mostly enjoyed performing various tricks and poses in front of the camera but eventually being satisfied with a single snapshot. This is noteworthy, as the fair also offered a plethora of other activities that we initially thought to attract youngsters away from our prototype. Ubinion was clearly seen as one of the various attractions offered in the fair, thus being a natural addition and a good fit to this environment.

The atmosphere at the university setting in the second trial was more "adult", and users paid more attention to, and questioned the purpose of, the deployment. They spent more time thinking about their feedback, and did not engage in such joyous, playful interactions with the camera nearly as much as users in the first trial. Nevertheless, group-use of Ubinion was preferred here as well. We hypothesize that while pre-teens are still in a playful stage of development, i.e. not afraid to be seen playing in public, high school seniors are much more self-aware, and are not willing to risk looking 'silly' in front of their peers.

In the third setting, a local school, users acted in a slightly more distant and indifferent way towards the prototype installation. Engaging with Ubinion seemed to be socially more embarrassing in this context than in the previous two trials. In this

environment, teachers were supervising the breaks and all users were surrounded with close friends with whom they meet daily. We believe this might have caused potential users to completely avoid any chances of being seen as uncool in front of them by using such a technology probe, and secondly to just ignore the prototype in order to leave the "teacher's territory" and leave the premises to spend time outside. A limiting factor in interpreting this environment is the change in the used hardware setup: whereas the other trials featured 57" HD screens, here we only had 23" screens. Perhaps seeing themselves through a camera feed on a larger display would have mitigated some of the social awkwardness, similarly to the other two trials.

These findings highlight the importance of understanding the social context in the deployment of any ubiquitous computing application. We suggest environments where it is socially acceptable to engage playfully as most suited for these kinds of applications that aim to gather feedback through play and sociality. The overarching trend here is that with young people, contexts that are public in nature, such as fairs and exhibitions, are more suitable for these kinds of interactions than more private environments, such as a school.

By deploying novel interactive displays in places where the young already spend their free-time, and by making civic engagement on them fun at the same time, it is possible to reach young who are otherwise not reachable, and to significantly enhance the interaction possibilities between youth workers and the young. Further, as interactive touch screen-based public displays still are novel artifacts in public spaces, they arguably attract more attention than, say, having a similar prototype running on a laptop computer.

6.2 Playful Interaction

Civic engagement can often be seen as a "serious" task. Using playful interfaces that encourage having fun and socializing together with friends can help in lowering the barrier to participation in municipal issues. We were successful in gathering large amounts of feedback using playful elements. Especially among pre-teens, an important factor in the popularity of Ubinion was the aspiration to catch the "perfect pose", clearly a joyful effort towards which pre-teenagers were willing to sacrifice significant amounts of their time, regardless of other attractions close by. Verifying this, some photos taken in the first trial had up to 12 pre-teens posing to the camera. Succeeding in this, groups proceeded to give their feedback or comments. The user interface of Ubinion aims to be fun, as such interfaces can offer a liberating experience [23] and perhaps aid us by making users feel comfortable to leave natural feedback through Ubinion.

Having the deployment in the right spot and offering a possibility to create something in a fun and playful way helps reaching young who might be hard to reach otherwise. Getting any feedback from these people is seen as challenging by the youth workers, and our prototype was perceived as a valuable addition to their toolbox in engaging these less-active youngsters.

Furthermore, the live feed from an integrated camera proved to be a highly efficient way of fostering interest in the public display. We also noticed a very strong honeypot-effect when Ubinion's webcam view was visible. This agrees with

Schönböck's findings on making users parts of the display for embracing user engagement [16]. We often witnessed groups of people trying to play and position themselves in the background of pictures being taken by other people. This led to occasional rushes by many interested users to the display. However, once the rush was over, there would again be a more silent period of usage. This is a phenomenon exploitable on public displays. By using interfaces that are easy to learn by just watching someone go and use them, as suggested in [21], people can return any time and start using the application without feeling of embarrassment caused by the uncertainty on how to use it.

It is interesting to point out that while Ubinion was playful and engaged groups and individuals alike, we did not find any substantial difference in the kinds of comments individuals vs. groups gave. This suggests that while our system was successful in attracting users in groups, we did not find any evidence that the group dynamics altered the topics or quality of posts. On the contrary, we found that gender did have a significant effect, as we observed that male individuals or groups of males were significantly more likely to discuss sports.

6.3 Public displays for Online Communities

It has been suggested that public displays can aid the perception of unity of community knowledge and interests, and that the ability for everyone in the community to contribute to and access online content relating to the community's interests is important [27]. Further, pairing displays with new applications has strong implications on usability, service providing, and participatory democracy [28]. Utilizing interactive public displays with SNSs to foster communities allows not only for these, but also for easy content creation, moderation, and storing, characteristics that can be considered crucial for long-term maintenance of a system [12].

In our interviews, the young expressed a need for anonymity when giving feedback and suggestions to local youth workers, mainly in order to avoid any possible extra workload. Using Ubinion on public displays, they can voice out their concerns and ideas to youth workers semi-anonymously and are not face-to-face responsible for their feedback. They are rather given a possibility to participate personally and devote further to the topic by utilizing the Facebook community that they helped to build, thus enabling also non-anonymous participation.

We argue that public displays can be a good match in especially bootstrapping an online community. They offer a highly public medium that is constantly accessible by everyone and allow for in-situ creation of socially relevant content for their users, a powerful way to engage people to use an application [11]. Content quality and context relevancy in general can be problematic when deploying social applications, causing significant management overhead [12]. By utilizing multiple interactive public displays equipped with modern embedded cameras and touch screens, it is possible to acquire large amounts of high quality, context relevant, personal content to use as building blocks for applications, or indeed in this case, an online community of the young. These user-generated photos can subsequently be used to gain an understanding and support the recording of a "living history" of a community [29], adding value to this approach.

We argue that Ubinion is a step towards utilizing public displays for bootstrapping and supporting online communities. It leverages the appropriate affordances, playfulness, rapid content creation, and sociality, for its target demography, the young, to encourage contribution in creating a community. This community, Ubinion's online presence, is followed and moderated by the local youth authorities. It reflects the concerns and wishes of the young and can act as a mediator between local youth officers and the young.

6.4 Feedback Mechanisms

In addition to feedback actionable by YAD, we observed that the youth decided to comment on issues that they worry about, but are not necessarily of interest to the YAD. Issues such as building new stadiums and parks, for instance, suggest that the youth appropriated this channel of communication as a way to voice their concerns in general, not just in relation to the YAD. Given the context of our trials, we argue that this behavior emerged quite organically, and suggests that Ubinion's public display component was successful in more broadly engaging the youth, who were ready to express their opinions using this medium. Here lies our main contribution: while the service might not evoke opinions to the questions it sets, it efficiently probes the mindset and opinion of the otherwise unreachable urban young.

Beyond the valuable concerns that were voiced via Ubinion, we found that 47% of all feedback consisted of general greetings and random texts typed just for fun or to play with technology. Perhaps unsurprisingly, we attribute this behavior to people's need for self-expression and exposure in their appropriation of communication technology [30]. This frequent behavior also transferred online, in the context of Ubinion's Facebook page. The results suggest that many participants did visit the page to see the photos and comments given there, and to "Like" particular messages. Visitors were quite happy to vote and contribute in this way, but were uneasy about explicitly adding comments.

We believe our study demonstrated a sharp difference between people's use of an online community medium (Facebook) where they are most likely to read and just click to "vote", as opposed to the public display component of Ubinion where users were much happier to interact and invest time and effort into creating content (regardless of being "serious" or "playful"). This is an encouraging finding, suggesting that bringing Ubinion out of the online world and into the community was a successful way to engage users more actively.

6.5 Limitations

We acknowledge that the conducted field trials have certain limitations. First, we cannot rule out the novelty effect in our trials, suggesting that the introduction of novel technology and software in itself contributed to the frequency of usage of Ubinion in the field trials. Also, the trial settings were explicitly chosen to reach a lot of young users from different demographic groups. Results derived from such popular one-off events are not directly comparable to those of a long-term installation in

mundane environments, which we understand is a necessity for a credible evaluation of scalability and generalization of such a system. However, as we deployed Ubinion in three different settings and collected rich data using various different unobtrusive methods, we believe that our results are a valid starting point for discussing the aspects of deploying such a system in public spaces.

A second limitation of our work is that the Facebook component of Ubinion saw very little meaningful postings from users. The few comments received via Facebook were of ephemeral nature [31] and aimed to publicize one's self and friends by identifying people in photographs and thereby sharing the photographs in one's own "stream" on Facebook. The lack of active contributing users is akin to lurking, a behavior that was not unexpected as it is commonly observed in online communities [32, 33]. We believe the relatively low number of comments was due to the high number of off-topic entries and the loss of anonymity and feeling of commitment that occur when posting non-anonymously online [33]. To encourage insightful and lengthier discussions, a public feedback system such as Ubinion needs to better motivate its users to contribute relevant and meaningful entries that entice conversation and perhaps persuade lurkers to contribute. Despite this, non-contributing members are still valuable to the community, and their participation can have far-reaching, positive consequences [33]. For example, in Ubinion's case the high amount of lurking contributes to raising general awareness about everyday issues of the young.

7 Conclusion

We presented Ubinion, a system that combines public interactive displays with online social networking services to enable the youth to voice their opinions and demonstrated how to use these technologies hand-in-hand to bootstrap a content-rich community presence in a modern SNS, Facebook. We argue that public interactive displays, as a public and social medium, can be leveraged in acquiring high quality, context relevant content, a common problem in pervasive systems. Through a series of public trials in authentic settings we show that our system can be effective in collecting feedback from the youth, a segment of the population perceived as challenging to reach by youth workers.

Our system utilized the "mirror-metaphor" and leveraged the honey-pot effect in order to raise interest and adopt a playful character. Our prototype was designed in collaboration with local youth workers and was perceived positively by our test users. Particularly the public display component of our system intended to voice initial concerns was successful, while the Facebook aspect meant to provide a mechanism for follow-up discussions did not gain traction. We found that the youth decided to use Ubinion to voice their broader concerns, not just concerns that relate to youth officials: effectively, it prompted the youth to voice concerns of an adult manner. Ubinion was proven effective to reach out for the young that would not otherwise engage in any activity with the Youth Affairs Department of Oulu.

Our work suggests that applications with fun, playful interfaces, deployed where it is socially acceptable to interact with them, can be used to collect feedback from

otherwise passive and disconnected users. We plan to deploy Ubinion on several interactive displays in Oulu and cooperate with local youth workers, who have already committed to take Ubinion as part of their communication processes with the young, to investigate how it performs over a longer period.

Acknowledgements

This work was supported by Microsoft Research through its PhD Scholarship Programme. The financial support of the Finnish Funding Agency for Technology and Innovation, the European Regional Development Fund, the City of Oulu, and the UBI (UrBan Interactions) consortium is gratefully acknowledged.

References

1. Montero, M.: Introducción a la psicologia comunitaria. Buenos Aires: Paidos. (2004)
2. Clary, E. G., Snyder, M.: Community involvement: Opportunities and challenger in socializing adults to participate in society. In: Journal of Social Issue, 3, 581–592 (2002)
3. Bendapuni, N., Leone, R.P.: Psychological Implications of Customer Participation in Co-Production. In: The Journal of Marketing, vol. 67, no. 1, 14-28 (2003)
4. Alford, J. R.: We're all in this together: The decline of trust in Government, 1958–1996. In: Hibbing, J.R., Theiss-Morse, E. (eds.) What is it about Government that Americans dislike? 28-46 Cambridge University Press, Cambridge (2001)
5. Huseby, B.M.: Government performance and political support: A study of how evaluations of economic performance, social policy and environmental protection influence the popular assessments of the political system. Department for Sociology and Political Science, Trondheim (2000)
6. Orren, G.: Fall from grace: The public's loss of faith in government. In: Nye, J.S., Zelikow, P.D., King, D.C. (eds.), Why people don't trust Government, pp. 77–107, Harvard University Press, Cambridge (1997)
7. Uslaner, E.M., Brown, M.: Inequality, trust, and civic engagement. In: American Politics Research, 33, 868–894 (2005)
8. Hirschmann, A.O.: Shifting involvements: Private interest and public action. Princeton University Press, Princeton (1982)
9. Kelly, C., Breinlinger, S.: The social psychology of collective action: Identity, injustice and gender. Taylor & Francis, London (1996)
10. Müller, J., Paczkowski, O., Krüger, A.: Situated public news and reminder displays. In: European conference on Ambient intelligence (AmI'07), pp. 248-265 (2007)
11. Hosio, S., Kukka, H., Jurmu, M., Ojala, T., Riekki J.: Enhancing Interactive Public Displays with Social Networking Services. In: 9th International Conference on Mobile and Ubiquitous Multimedia, Article 23. (2010)
12. Storz, O., Friday, A., Davies, N., Finney, J., Sas, C. Sheridan, J.: Public Ubiquitous Computing Systems: Lessons from the e-Campus Display Deployments, In: IEEE Pervasive Computing, vol. 5, no. 3, 40-47 (2006)
13. McCarthy, J.F., McDonald, D.W., Soroczak, S., Nguyen, D.H. Rashid, A.M.: Augmenting the social space of an academic conference. In: CSCW '04, pp. 39-48 (2004)
14. Jose, R., Otero, N., Izadi, S., Harper, R.: Instant Places: Using Bluetooth for Situated Interaction in Public Displays In: IEEE Pervasive Computing, 7 (4), 52-57 (2008)

15. Ardito, C., Costabile, M.F., Lanzilotti, R.: Gameplay on a multitouch screen to foster learning about historical sites. In: AVI '10, pp. 75-78 (2010)
16. Schönböck, J., König, F., Kotsis, G., Gruber, D., Zaim, E. , Schmidt, A.: MirrorBoard – An Interactive Billboard. In: Mensch und Computer, 207-216 (2008)
17. Müller, J., Wilmsmann, D., Exeler, J., Buzeck, M., Schmidt, A., Jay, T., Krüger, A.: Display Blindness: The effect of Expectations on Attention towards Digital Signage. In: International Conference on Pervasive Computing, pp. 1-8 (2009)
18. Sharp, R., Rehman, K.: The 2005 UbiApp Workshop: What Makes Good Application-Led Research?. In: IEEE Pervasive Computing, vol.4, no. 3, 80- 82 (2005)
19. Day, N., Sas, C., Dix, A., Toma, M., Bevan, C., Clare, D.: Breaking the Campus Bubble: Informed, Engaged, Connected. In: BCS-HCI '07, pp. 133-136 (2007)
20. Peltonen, P., Kurvinen, E., Salovaara, A., Jacucci, G., Ilmonen, T., Evans, J., Oulasvirta, A., Saarikko, P.: It's Mine, Don't Touch!: Interactions at a Large Multi-Touch Display in a City Centre. In: CHI '08, pp. 1285-1294 (2008)
21. Brignull, H., Rogers, Y.: Enticing People to Interact with Large Public Displays in Public Spaces. In: INTERACT'03, pp. 17-24 (2003)
22. Agamanolis, S.: Designing displays for Human Connectedness. In: Workshop on Public, Community and Situated Displays at CSCW '02 (2002)
23. Shneiderman, B.: Designing for Fun: How Can We Design User Interfaces to Be More Fun? In: Interactions, Vol. 11, no. 5, 48–50 (2004)
24. Kukka, H., Kostakos, V., Ojala, T., Ylipulli, J., Suopajärvi, T., Jurmu, M., Hosio, S.: This Is Not Classified: Everyday Information Seeking and Encountering in Smart Urban Spaces. In: Personal and Ubiquitous Computing, online first (2012)
25. Bangor, A., Kortum, P., Miller, J.: An empirical evaluation of the system usability scale. In: International Journal of Human-Computer Interaction, vol. 24, no. 6, 574–594 (2008)
26. Boyd, D., Hargittai, E., Schultz, J., Palfrey, J.: Why parents help their children lie to Facebook about age: Unintended consequences of the 'Children's Online Privacy Protection Act' First Monday [Online], vol. 16, no. 11 (2011)
27. Redhead, F., Brereton, M.: A qualitative analysis of local community communications. In Proc. Australia conference on Computer-Human Interaction: Design: Activities, Artefacts and Environments In: OZCHI '06, pp. 361-364 (2006)
28. Schuler, D.: Community networks: building a new participatory medium. In: Commun. ACM, vol. 37, no. 1, 38-51, (1994)
29. Taylor, N., Cheverst, K., Fitton, D., Race, N.K.P., Rouncefield, M., Graham, C.: Probing communities: study of a village photo display. In: OZCHI '07, pp. 17-24, (2007)
30. Harper, R.: Texture: Human expression in the age of communication overload. MIT Press (2011)
31. Reynolds, B., Venkatanathan, J., Goncalves, J., Kostakos, V.: Sharing Ephemeral Information in Online Social Networks: Privacy Perceptions and Behaviours. In: INTERACT '11, pp. 204-215, (2011)
32. Wasko, M. M., Far, S.: Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. In: MIS Quarterly, vol. 29, no. 1, 35-57 (2005)
33. Nonnecke, B., Preece, J.: Lurker demographics: counting the silent. In: CHI '00, pp. 73-80 (2000)