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# Interactive Opinion Polls on Public Displays – Studying Privacy Requirements in the Wild

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## Abstract

Interactive opinion polls are a promising novel use case for public urban displays. However, voicing one's opinion at such a public installation poses special privacy requirements. In this paper, we introduce our ongoing work on investigating the roles of the interaction technique and the poll question in this novel context. We present a field study comparing three different voting techniques (public touch interface, personal smartphone by scanning a QR code, from remote through a short Web address) and three types of poll questions (general, personal, local). Overall, the results show that actively casting an opinion on a timely topic is highly appreciated by passers-by. The public voting opportunity through a touch screen is clearly preferred. Offering mobile or remote voting does not significantly increase the overall participation rate. The type of poll question has an impact on the number of participants but does not influence the preferred interaction modality.

## Author Keywords

Public display; public poll; mobile interaction; privacy

## ACM Classification Keywords

H.5.2 [Information interfaces and presentation (e.g., HCI)]: User Interfaces.

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## Introduction

Nowadays, public screens have become ubiquitous in modern city landscapes and enable a plethora of interactive urban applications for passers-by. One promising use case which is recently gaining increasing interest in academia are citizen participation tools such as public opinion polls exploiting urban screens as bidirectional communication channel for identifying and discussing matters of urban governance.

While previous respective research in the field of public displays focussed on studying social phenomena around such installations, on investigating how to raise awareness for provided interactive applications or on exploring novel interaction techniques, knowledge about the privacy requirements and concerns for opinion polls on public displays is scarce. In this paper, we introduce our ongoing work on privacy aspects in the context of interactive public polls and present the results of a preliminary field study which compared the acceptance of a public voting technique and personal smartphone-mediated one and further investigated the impact of different categories of poll questions on the preferred interaction style and the participation rate.

## Related Work and Research Questions

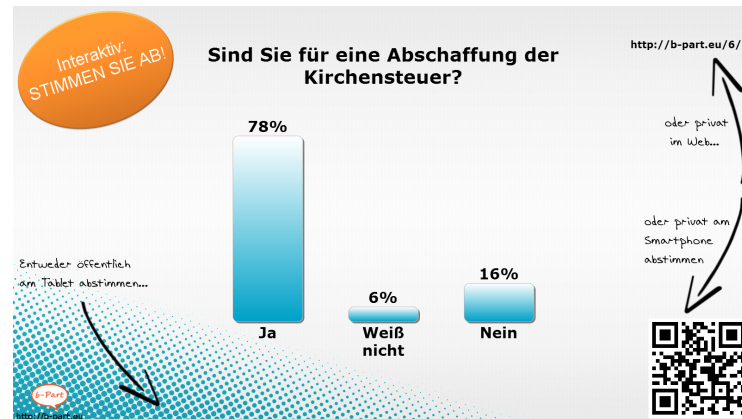
One of the earliest prototypes utilizing a large public display for citizen feedback is *Opinionizer* by Brignull and Rogers [3], an interactive shared display where passers-by could add their views using a keyboard. Two field studies showed that social embarrassment is the major deterrent preventing people from participating. Further, an easy change from being an onlooker to a participant and back again should be enabled. More recently, interactive public displays have been rediscovered as enabler for civic engagement. For example, *TexTales* [1] is an opinion

forum on large public projection screen and enabled commenting of displayed photos through submitting text messages which led to active offline discussions among the participants. *Agora 2.0* [7] is another example for an interactive public display where passers-by could vote for city-related suggestions through a connected mouse. Related is the idea of Behrens [2] who investigated tangible (dis)like buttons to express opinions at related real-world locations.

Paek et al. were among the first who investigated mobile devices as remote controls for shared displays and identified polling as one promising use case promoting discussion and consensus building [5]. A first respective real-world example is *MobiLenin* by Scheible and Ojala [6]. Their system enabled guests of a restaurant to vote for video tracks to be played on a large display and included a lottery mechanism to win a voucher. Most related to the work presented in this paper is *Viewpoint* [8], a custom device providing a simple voting interface with two buttons to answer yes/no questions and a small display showing the current result. The prototype further featured voting by sending text messages, yet, this feature was not used by single participant during the trial. Overall, *Viewpoint* was very successful in engaging participants and received positive feedback.

Having studied the aforementioned literature, we identified several open questions concerning the privacy requirements of such public opinion polls and formulated the following research questions to be investigated:

1. Is a state-of-the-art mobile interaction technique such as scanning a QR code accepted for privately casting a vote through the personal smartphone?



**Figure 1:** The screen design contained the poll question, a bar chart as well as an animated banner and short instructions on how to participate.



**Figure 2:** The prototype was deployed in the entrance area of a coffee house for 10 workdays.

2. Does the type of poll question (such as general or personal) influence the participants' choice of the participation technique?
3. How do participants perceive the opportunity to actively express their opinion at public locations in comparison to just seeing real-time opinion summaries?

### Study Prototype

To study these research questions under real-world conditions we developed a functional study prototype based on state-of-the-art Web technologies. The Web application (run in a modern browser in full-screen mode, see Figure 1) showed a poll question in the top center and the current poll result in form of a bar chart below. Further, it contained an animated banner in the top left corner asking passers-by to participate and three short instruction texts (with arrows pointing to the respective

input method) explained the three interaction techniques supported by the prototype:

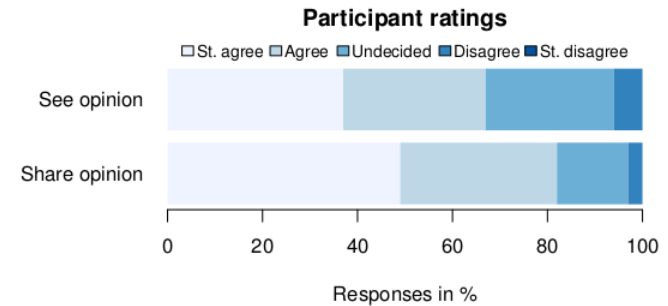
- *Public touch-based voting.* A tablet computer mounted in front of the large display through a custom-made fixation showed buttons for the three available choices. Passers-by could simply cast their vote (obviously visible to nearby bystanders) by directly touching the respective button (see Figure 2).
- *Private voting on the personal device.* To enable private voting we showed a QR code on the screen. An interested passer-by who captured the code with his smartphone was forwarded to a web page where he could cast his vote by clicking the corresponding button.

- *Voting from remote.* We further included a short URL for people who notice the public poll, yet prefer to cast their vote from remote, e.g. when being back at their working place and having looked up background information. Additionally this option is suitable for smartphone users, who do not have a QR code reader app installed. The type of end-device (desktop or mobile) was logged.

To investigate the impact of different questions types, we selected 12 timely poll questions from three different categories: locally relevant as the typical question category for participative applications (e.g. *Do you wish for more shops in this area?*), personal (e.g. *Are you content with your current working situation?*), and general ones (e.g. *Do you prefer car-free city centers?*). The question on the display was switched in intervals of 15 minutes and was alternately selected from one of the three categories.

## Methodology

We deployed the described prototype at a coffee shop (Figure 2) for 10 workdays. The shop is located in a business district and is visited by about 200 guests per day. In order to collect contextual data, a test assistant observed the interactions of visitors with the poll system and made notes using a prepared code sheet containing the type of interaction and the number of involved persons. In the second week, the test assistant handed out questionnaires. They contained general questions whether the participant liked the possibility to share his opinion on a current topic of interest through a public display and to see interim results, respectively, both on 5 point Likert scales. Further we wanted to know whether he had explicit privacy concerns when participating in such a poll on a public display.



**Figure 3:** Participant ratings concerning the statements 'I like to share my opinion/see the opinion of others on a current topic on a public screen'.

## Results

During the ten days we recorded 160 votes (participation rate about 8%) and received 30 completed questionnaires. The interviewees (12 females) were aged between 14 and 76 (mean=38.7, median=38).

### Log file analysis

The analysis of the log file yielded a very clear result: we recorded only one voting through the QR code and one using the URL (on a mobile device). 99% of the votes were casted by directly touching the tablet. Concerning the type of polls, 43% of the votes were given for general questions, 33% for locally relevant ones, and 24% for personal questions.

### Questionnaire

Four of 30 interviewed persons stated they have privacy concerns. Two of them explicitly mentioned the possibility of a fingerprint sensor integrated in the touch screen. The most common explanation in the group without privacy concerns was that the poll is anonymous and no private information is entered.

48% and 33% of the participants stated to fully agree and to agree, respectively, with the statement 'I like to share my opinion on a current topic on a public screen'. 15% were undecided and 3% disagreed. The second statement, 'I like to see the opinion of others on a current topic on a public screen' was answered by 36% with strongly agree, 30% with agree and 6% with disagree. 27% were undecided. For both statements, no participant fully disagreed.

#### *Observations*

In addition to well-known phenomena such as the "honeypot effect" [3] (passers-by being attracted by people already interacting with the display) and the "landing effect" [4] (people pass the display, stop late and walk back), we observed several particular social effects which partly confirm experiences from recent related studies (e.g. [9]):

*Encouraging colleagues.* Several times only one member of a group (such as workmates) noticed the public poll when passing by and – accepting to unveil his choice – encouraged his colleagues to vote as well.

*Social deterrence.* We counted less interactions with the poll screen when the table close to the screen was occupied by visitors and noticed several people who were obviously interested in the poll but turned away from the screen.

*Discussions with by-standers.* Often discussions about the poll topic arose, not only between persons of one group but even among visitors who obviously did not know each other before.

*Waiting times.* In peak times a waiting queue developed in front of the counter. While standing in the queue,

several visitors used the public poll to bridge the waiting times. Due to this waiting situation, they were obviously more engaged in the interaction with the public screen.

## **Discussion**

In this section we refer back and relate the results to our original main research questions. The results of our field study showed that even for opinion polls in a public setting a direct interaction (in our case through a touch-sensitive tablet computer) is clearly favored over the opportunity to use the personal smartphone for privately submitting a vote. Offering the QR code as a state-of-the-art mobile interaction technique did not lead to significantly more participants. While we expected the overall result, the decidedness is surprising. We avoided a native voting app which would need to be downloaded and chose a modern mobile interaction technique (plus a short URL) over old-fashioned texting (cf. [8]) and thus assumed that several participants would use their smartphones for privately casting their vote, especially in the case of personal questions. However, we saw that people who did not want by-standers to observe their voting behavior did not choose to use their smartphone (or the remote voting opportunity), but decided not to participate at all. The type of question (local, personal, general) did not have any significant impact on this behavior.

The distribution of votes to the different poll categories is explicable: we expected that personal questions would receive fewest votes due to the public setting. We assume that general questions attracted most participants since the study environment is not only visited by employees of nearby companies but also by external guests and business partners who were less interested in locally relevant topics. The responses to our questionnaire showed that the majority of the participants liked the idea of using public

displays for polls in general. The slight trend that participants enjoyed more to actively express their opinion than to see the interim results is explained by participants' comments appreciating the opportunity to raise the voice and the feeling of being heard.

### Conclusions and Outlook

We presented a preliminary field study which serves as a starting point to investigate privacy aspects concerning interactive public opinion polls in more depth. Our results clearly show that mobile interaction opportunities, even an advanced one like in our study, are largely ignored as private voting techniques, when direct touch interaction at the public display is provided as an alternative input method. The type of poll question (general vs. personal) has an impact on the number of participants to be expected, however, not on the preference for the direct voting technique.

As a conclusion, current mobile voting features can be neglected when realizing a public poll application which also features a direct voting technique, since they are not capable of significantly increasing the number of participants. To reach a higher participation rate also for personal questions, an open challenge is the design of novel voting techniques which are comparable to a direct touch interface in terms of simplicity and speed but still do not reveal the participant's choice when used in public.

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