Displaying Mobile Feedback during a Presentation

Jaime Teevan, Daniel J. Liebling, Ann Paradiso,
Carlos Garcia Jurado Suarez, Curtis von Veh, Darren Gehring
Microsoft Research, Redmond, WA USA
{teevan, danl, annpar, cgarcia, curtisvv, darrenge}@microsoft.com

ABSTRACT
Smartphone use in presentations is often seen as distracting to the audience and speaker. However, phones can encourage people participate more fully in what is going on around them and build stronger ties with their companions. In this paper, we describe a smartphone interface designed to help audience members engage fully in a presentation by providing real-time mobile feedback. This feedback is then aggregated and reflected back to the group via a projected visualization, with notifications provided to the presenter and the audience on interesting feedback events. We deployed this system in a large enterprise meeting, and collected information about the attendees' experiences with it via surveys and interaction logs. Participants report that providing mobile feedback was convenient, helped them pay close attention to the presentation, and enabled them to feel connected with other audience members.

Author Keywords
Mobile, meetings, feedback, presentations.

ACM Classification Keywords
H.5.2 [Information Interfaces and Presentation (e.g., HCI)]: Miscellaneous.

INTRODUCTION
People attending a presentation typically provide feedback to the presenter throughout the course of the presentation. They nod and smile, look perplexed, raise their hands, and check their email. However, much of this feedback in unintentional, and it can be challenging for the presenter to fully synthesize and understand audience sentiment, particularly when presenting to large groups. It is even harder for audience members to know the reactions of the people around them as they focus on the presentation.

There have been a number of tools built to allow people to provide feedback to presenters, particularly in a classroom setting [1, 3, 9, 10]. For example, Chamillard [3] explored using a clicker-based system to engage students in the flow of a lecture. However, most of this work has focused on providing audience feedback solely to the presenter, which the presenter can then use for assessment and pedagogical purposes. In this paper we explore how feedback can be

provided directly to the audience to further engage them with each other and the presentation.

The most common existing technological way for audience members to engage with each other during a presentation is via a textual backchannel. For example, audience members can associate short snippets of text on Twitter with a shared hashtag to communicate with other people in the room. Yardi [10] describes a backchannel employed by university students in a classroom setting. Sometimes backchannel content will be projected during a talk for all to see. However, backchannel communication can be distracting for participants [10], and typically excludes the presenter, at times with significant social cost [2, 10]. Lighter-weight methods for providing [7] and visualizing [4] feedback have been shown to be more inclusive and engaging.

Crowd Feedback is a mobile phone based system designed to make presentation feedback explicit in a way that engages attendees without distracting them, and provides real-time benefit to the presenter without excluding them. During a presentation, audience members use their mobile phones to "like" or "dislike" what has just been presented. This feedback is then aggregated and displayed on a sidebar projected beside the presentation slides. When interesting feedback events occur, a badge appears on the sidebar and the presenter's mobile phone vibrates. In addition to being fun for the audience, badges let the presenter know that it is worth checking in with how the audience is responding.

We deployed the Crowd Feedback system in a large enterprise meeting, and collected information about the attendees' experiences with it via a survey and interaction logs. After a description of the deployment, we describe how the system was used. We find people who provided feedback felt engaged with the presentation and other audience members, while experiencing minimal distraction. We discuss the unexpected ways feedback was used during the meeting, and suggest ways feedback might be used after a presentation to help attendees recall presentation content.

THE CROWD FEEDBACK SYSTEM
The Crowd Feedback system has three components: a mobile client for providing feedback, a shared visualization of the feedback, and badges designed to include the speaker in the feedback. Each is described in greater detail below.

Crowd Feedback Mobile Client
The Crowd Feedback mobile client is shown in Figure 1. Audience members can provide positive feedback using a green *thumbs up* button, and negative feedback using a red

Figure 1. The Crowd Feedback mobile client.

Figure 2. The presentation sidebar

Figure 3. Crowd Feedback being used by 179 people in an enterprise All Hands meeting.
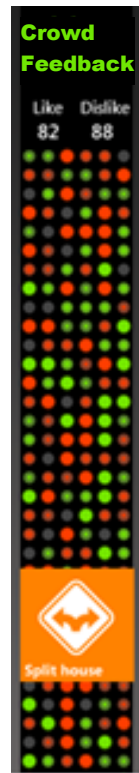
thumbs down button. We targeted mobile phones rather than building a special purpose clicker device [3, 9] or a laptop or tablet-based system [1, 7]. Our approach is similar to classroom-based feedback systems that have used mobile phones for electronic voting [5] and note-taking [8]. Studies have shown that phones are an attractive alternative to other devices because of their prevalence, functionality, and size.

To encourage adoption of the Crowd Feedback client, it is implemented as a webpage optimized for smartphones, rather than as an application that must be installed. To join a meeting, participants merely type, click, or follow a tag to a URL with the active meeting ID. As a result, audience members can also choose to provide feedback via any device with a Web browser, including laptops and tablets.

Crowd Feedback Presentation Sidebar
The feedback provided by audience members is aggregated and represented in the Crowd Feedback Sidebar, shown in Figure 2. The sidebar is a stand-alone executable. When a PowerPoint presentation uses a specially designed template, the active sidebar can be positioned to float above the blank region on the template so that it appears immediately adjacent to the slide content, as shown in Figure 3.

Each audience member is represented as a colored dot in the sidebar. Individuals are identified via a cookie stored on their device, so that it is possible for them to temporarily close their Web browser and still be mapped to the same dot upon returning. As new people join the meeting, a new grey dot appears, and the dot then turns red or green as a

function of the feedback provided. The intensity of the dot shows how recently the feedback has been provided. New feedback is shown in Figure 2 as bright dots, while older feedback is shown as faded dots. To quickly summarize the feedback, a count at the top shows the number of people who have recently provided positive and negative feedback.

Crowd Feedback Badges
On interesting feedback events, a badge triggers. Feedback events that trigger badges include the presence of a large number of participants, a lot of positive, negative, or split feedback, and periods of inactivity. The inactivity badge was designed to remind audience members to provide feedback. When a badge triggers, an icon such as the one shown in Figure 2 appears at the bottom of the sidebar and floats slowly to the top. This animation ensures the badge is visible for an extended period of time, while not obscuring any one portion of the sidebar for very long.

It can be hard for a presenter to keep track of what is going on in the sidebar while talking. For this reason, when a badge triggers the presenter's mobile phone vibrates to provide awareness that an interesting feedback event has occurred. The badge speed is designed to provide the presenter with enough time to receive the buzz and look at the sidebar to learn which badge has triggered.

CROWD FEEDBACK IN USE
We deployed Crowd Feedback during a large presentation and studied how people used it. Here we describe the study methodology, people's reactions, and the feedback data.

Study Methodology
Crowd Feedback was deployed at an All Hands meeting at Microsoft, a large software company (see Figure 3). Several hundred people were invited to the meeting. Approximately 250 people were present for the presentation, and 179 used the Crowd Feedback Client to provide feedback. People attending the meeting received the link to the client in the meeting invitation and were asked to bring their mobile phones with them. The client URL and a QR code-like tag were also posted in the meeting room. The presenter provided a brief overview of the system at the beginning of the meeting. During the meeting, the feedback and badges were logged, and the presentation was video recorded.

Following the meeting, a survey about Crowd Feedback was sent to the meeting attendees. In addition to collecting basic demographic information, the survey consisted of two sections, one about viewing the sidebar and the other about providing feedback. Most questions were answered using a 5-point Likert scale. Fifty-one people completed the survey; 40 were male and almost all filled technical roles, which is consistent with attendee demographics.

Survey Responses
In this section, using the survey responses, we describe how mobile phones were the most popular and least distracting device used for providing feedback, show that providing feedback created engagement with the presentation and other audience members, and discuss some of the unexpected ways that feedback was used.

Mobile Phones Popular for Feedback and Less Distracting
Attendees were asked to answer the survey regardless of whether they had provided feedback during the meeting. However, a majority (84%) reported having used the Crowd Feedback client. Most of those who did not provide feedback said it was because they did not have a mobile device with them. Most (79%) of the people providing feedback used their mobile phones; 12% used laptops, and, in the case of remote participants, 7% used desktop computers. About half of the respondents agreed that they would have used the device in question during the presentation even if not providing feedback. This confirms our expectations that mobile phones are already commonly used by audience members in presentations.

Not requiring specialized hardware makes participation easy, but also makes it more likely people will be distracted by using the feedback device in other ways. The use of a laptop while attending a presentation, for example, has been shown to cause the user to miss useful information [6]. Respondents were evenly split as to whether the Crowd Feedback sidebar was distracting, but, consistent with previous work [7], found the process of providing feedback to be relatively less distracting. Having a multi-purpose device out to provide feedback did not appear to encourage people to disengage from the presentation. Only 23% of respondents agreed that they used the feedback device to do activities not related to providing feedback more than they might have otherwise, while 56% disagreed. Phone users were much less likely to agree with the statement (18%) than computer users (44%), perhaps because phones are small and do not support multi-tasking well.

Feedback Creates Engagement with Presentation, Audience
We now look at whether the Crowd Feedback system helped participants engage with the presentation and other audience members. A summary of these results can be seen in Table 1. Because respondents found the sidebar somewhat distracting, they generally did not believe that it helped them pay closer attention to the presentation. In contrast, however, providing feedback made respondents feel more engaged in the presentation.

		Agree	Neutral	Disagree
Sidebar	Helped me pay closer attention	18%	24%	59%
	Helped me know other's reactions	63%	20%	18%
	I felt closer to the audience	55%	33%	12%
	Was easy to see group feedback	67%	16%	18%
FB	Engaged me with presentation	60%	23%	16%
	Engaged me with the audience	72%	21%	7%

Table 1. Agreement with statements related to the sidebar and providing feedback (FB). Maximum value highlighted per row.

Additionally, both viewing and providing feedback helped audience members feel closer to each other. People viewing feedback reported that doing so helped them understand other's reactions, feel closer to other audience members, and easily see other's feedback. Even more strikingly, 72% of people providing feedback said doing so made them feel closer to other audience members. Overall, seeing feedback appears to have helped people understand the audience, while giving it also helped draw them in to the presentation.

Feedback Sometimes Used in Unexpected Ways
Respondents generally felt comfortable providing feedback, although they were somewhat less comfortable providing negative feedback than positive; 21% agreed they felt uncomfortable giving negative feedback, compared with only 5% for positive. Respondents were asked to provide a free-text description of the sentiment behind their feedback. The most common words used to describe positive feedback were "agree", "good", and "yeah", and to describe negative feedback were "boo", "bad", and "disagree". The words "bored" or "boring" were also used, suggesting the negative feedback button may have been overloaded.

Half of those who provided feedback (21 respondents) reported having done so at some point for reasons other than to convey positive or negative feedback. The most common other reason cited was to find their dot on the sidebar. One person also reported conceptually using the feedback mark interesting locations, similar to the Hotspots approach explored by Kalnikaite et al. [7]. The most commonly requested additional type of feedback to provide related to presentation speed (e.g., "move on" or "too fast").

Feedback Collected
In addition to collecting people's subjective experiences with Crowd Feedback, we also logged the feedback people provided. Figure 4 shows these data as a function of time. Positive feedback is shown in green, and negative in red. Consistent with the fact that people were more comfortable providing positive feedback, a majority (71%) was positive.

The large spike at the beginning of the meeting (at about 10 minutes) and the end (at about 75 minutes) indicate times the presenter actively solicited feedback. In this way he incorporated the feedback system into his presentation in a manner for which it had not explicitly designed. In an interview with the speaker following the presentation, he suggested an explicit voting mechanism could be useful. For example, the speaker could click a button to clear the
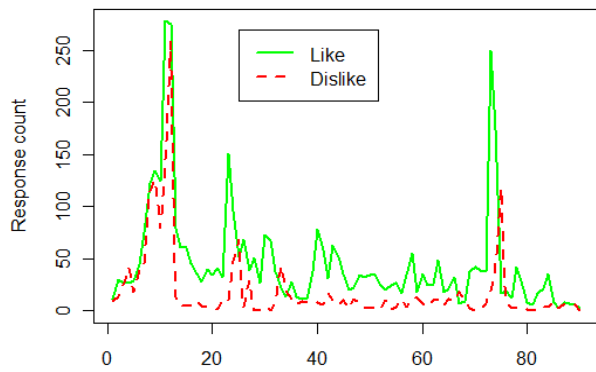
Figure 4. Log data as a function of minutes into the meeting.

existing feedback and enter a voting state where a badge triggers showing the color of the majority vote.

We were somewhat surprised to see that feedback was provided consistently throughout the entire 90 minute presentation, as we had expected people to forget about the system after initially playing with it. In our survey, most people (63%) reported forgetting to provide feedback at some point. Things that reminded them included directed questions by the speaker, new slides, and new topics.

Negative feedback appears to spike fewer times than positive feedback, and to lag positive feedback spikes when they occur. This lag may be because people are emboldened to provide negative feedback after a significant positive feedback event. One survey participant reported that feedback from others sometimes inspired that person to provide feedback. In this way the system may be providing a voice to the minority viewpoint [4]. People also appeared to be more emphatic when providing negative feedback. The mean time between two negative feedback clicks by the same person was only 29 seconds, while the mean time between two positive feedback clicks was 80 seconds.

Badges triggered primarily during the early part of the meeting. The inactivity badge, cued when total feedback activity is low, triggered 24 minutes in and precedes the third largest spike shown in Figure 4. Around 11 minutes in, positive and negative feedback peak within a very short time window, triggering the divisive badge. Reviewing the video shows that the speaker asked a question that divided the audience. When the badge appeared, it elicited laughter.

CONCLUSION AND FUTURE WORK
We have described the Crowd Feedback system, and shown that the ability to share data between ad-hoc, location-based groups of mobile phones can foster rich face-to-face social interactions centered around presentations. Our participants reported that phones were a popular and focused device for providing feedback, and that the process increased audience engagement with the presentation content and with other audience members. Feedback was sometimes used in unexpected ways, and we look forward to supporting richer types of feedback in the future, including polling by the presenter [5] and question asking by audience members [1].

The feedback data collected during a presentation has the potential to have significant value for attendees. Kalnikaite et al. [7] found that when people pressed a button to indicate they had heard something important in a meeting, they were able to use these annotations to recall the meeting several months later. Likewise, we expect the aggregate group feedback to be useful not only during a presentation, but also afterwards, for recall and summarization.

We are particularly interested in exploring how the unique capabilities of mobile phones can improve the feedback experience. Using the touch screen and accelerometer, the phone could recognize gestures and make it possible to provide feedback without attending to the device at all. For example, we observed some users pointed their phones at the sidebar when providing feedback, and this behavior could be used to intelligently target feedback. Likewise, a phone could identify hand raising or clapping, and use that information for feedback. In addition to supporting low-attention input, phones can provide low-attention haptic output via vibration. Just as the presenter's phone vibrates when a badge is triggered, so, too, could audience members', creating communal awareness of feedback events and re-engaging people in the feedback experience.

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