

# Office Social: Presentation Interactivity for Nearby Devices

Debaleena Chattopadhyay<sup>1,2</sup>, Kenton O'Hara<sup>1</sup>, Sean Rintel<sup>1</sup>, and Roman Rädle<sup>1</sup>

debchatt@iupui.edu | {keohar, srintel}@microsoft.com | raedle@acm.org

<sup>1</sup>Microsoft Research, Cambridge, United Kingdom

<sup>2</sup>Indiana University, Indianapolis, USA

## ABSTRACT

Slide presentations have long been stuck in a one-to-many paradigm, limiting audience engagement. Based on the concept of smartphone-based remote control of slide navigation, we present *Office Social*—a PowerPoint plugin and companion smartphone app that allows audience members qualified access to slides for personal review and, when the presenter enables it, public control over slide navigation. We studied the longitudinal use of Office Social across four meetings of a workgroup. We found that shared access and regulated control facilitated various forms of public and personal audience engagement. We discuss how enabling ad-hoc aggregation of co-proximate devices reduces ‘interaction costs’ and leads to both opportunities and challenges for presentation situations.

## Author Keywords

Presentation interactivity; Audience engagement; Collocated collaboration; Social devices

## ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## INTRODUCTION

Delivering slide presentations for communicating content to a group of collocated people is commonplace, ranging from large academic classrooms to small project meetings. While there are many important forms of audience participation (e.g., questions, deliberation, feedback, or critique), current presentation applications are designed for a single presenter to have exclusive control over slide review, navigation, and interactivity (e.g., PowerPoint, Prezi, or Keynote). Swapping public control to an attendee is possible but awkward. Without substantial preparation, taking the public floor is highly socially conspicuous and entails a high ‘interaction cost’ [15]; which rises with every added speaker—even more so if back and forth is required. Interaction cost is the cost associated with bringing about the outcome of a particular interaction (e.g., time, physical

or mental effort). User interactions requiring considerable effort do not maximize the utility from a cost-benefit perspective [15]. Non-public participation with presentation content also requires time and effort (e.g., obtaining attendees’ email addresses and sharing slides beforehand).

We propose re-imagining the relationship among existing technologies to support a fluid interchange between the presenter and attendee status in presentations. To that end, we envisioned meeting participants bringing their own devices and forming an ad-hoc co-proximate aggregation. In realizing our vision, we focused on wireless presentation interactivity of PowerPoint slides via smartphones. In this note, we first discuss our proposed design solution, Office Social, and how it addresses the limitations of conventional distributed access by collocated participants. We then present findings from an observation of the longitudinal use of the system across four meetings of a workgroup—where use cases were allowed to evolve naturally. The system facilitated hand-over to co-presenters, fostered spatial mobility within presenter–attendee status and allowed attendees to co-reference slides. Our findings highlight how enabling lightweight relationships among an existing ecosystem of co-proximate devices can increase their cumulative value. We conclude with a set of core research implications to inform the future research on social devices.

## RELATED WORK

Prior research explored multi-user interactivity with slideware using both specialized and off-the-shelf systems.

Remote Commander ran on a PalmPilot, connected to a computer with a serial cable [11]. Participants could navigate PowerPoint slides back-and-forth linearly in its ‘presentation mode’ and annotate slides in its ‘pen mode’. All co-present individuals had equal control permissions, and the slide preview on handhelds replicated the shared-display view. Similar, but a more portable approach is Palette [12]. Palette printed iconic index cards for each slide in a deck, and a presenter or attendee could use them with a portable barcode reader to control the slideshow.

More specialized solutions include NoteLook, a dedicated meeting room, where attendees could use tablets to view presentation material in video channels and create annotations [2]. Or the Obje architecture [3] that supports creating browser-style applications to connect a PowerPoint file to a projector and then asynchronously deliver the user interface code (PowerPoint controls) to client applications (e.g. on PDAs). Although these systems use existing

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devices, they require dedicated infrastructure and setup overhead—thereby increasing the interaction cost [15].

Off-the-shelf solutions for multi-user interaction explored multiple mice [10], laser pointers [13], handhelds [17], mobile phones [1, 8], and the web. In Classroom Response Systems, students use handhelds to answer multiple-choice quizzes, with the anonymous responses then visualized on a shared display to assist the instructor in review and discussion [17]. Similarly, in primary education, researchers explored multiple mouse interactivity with PowerPoint slides for polling or painting [10]. Web-based authoring tools, like Google Slides, or PowerPoint online, support concurrent collaborative editing and viewing, but no presentation interactivity—only one presenter can interact with the slideshow on the shared display.

Broadly speaking, these systems have two limitations. First, a fluid interchange of presenter–attendee roles is not supported during group interactivity [6] (only rigid roles like student–teacher modes are sometimes available [10]). Second, the interaction cost for audience interactivity outmatches the benefits: installing dedicated systems or obtaining each attendee’s personal information (e.g., email address) is often an overpriced investment for allowing attendees to navigate slides on a shared display or review slides privately. Furthermore, social norms of presenter–attendee statuses differ across types of presentations; while the roles are quite structured in large keynote-style addresses, much overlap of roles occurs in small-to-medium informal presentations. We propose a system that reduces the interaction cost to switch fluidly between presenter–attendee statuses, without entirely abolishing either of them.

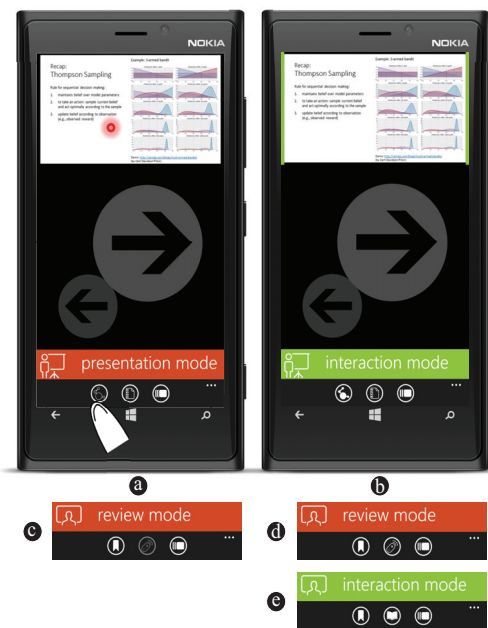
### OFFICE SOCIAL

Office Social builds on an earlier smartphone application called Office Remote that allows a presenter to use their smartphone to control remotely a PowerPoint presentation on their PC connected via Bluetooth [16]. Our aim with the Office Social app was to shift from the single person paradigm of Office Remote to a multi-user paradigm in which multiple audience members were afforded remote control of the presentation from their smartphones.

Office Social consists of a PowerPoint add-in that runs on a presenter’s PC and a Windows Phone app (Figure 1). The add-in opens up a server to accept incoming connection requests from the phone app via any wireless network; thus creating an *ad-hoc aggregation of co-proximate devices*—presenter’s PC, and the smartphones of the presenter and attendees. To enable the devices to connect, the presenter must first provide their PC’s IP address to attendees by temporarily posting it in the meeting room (e.g. via a QR code). At the beginning of the presentation, the presenter activates the add-in, after which both the presenter and attendees can use the smartphone app to interact with the slides. People then join the presentation via the smartphone app. They have the option of joining either as a *presenter* or as an *attendee* that affords them different permissions

over the system. If joining as a presenter, the user has full control over the presentation (*presentation mode*) allowing them (from their smartphone) to view the current slide, navigate between slides, preview next slide, read presenter notes, or use the phone as a pointer. The presenter also has control over the available control states of attendee smartphones—they can toggle a button to either enable attendee *review* only or to enable full attendee *interaction*.

As an attendee, two modes of interaction are available—*review* and *interaction*. By default, attendees begin in *review* only mode until the presenter explicitly enables the possibility for *interaction* mode. When enabled, attendees can toggle between *review* and *interaction* mode. In *review* mode, attendees can independently navigate a local copy of the presentation (without affecting the master presentation) and bookmark slides to revisit later. They may also switch to *interaction* mode on their smartphone. In this mode, the attendee smartphone has full remote control over the master presentation—being able to navigate through the master slides and controlling a pointer on them, but no access to presenter notes. Unlike prior systems where interactivity is active by default, with Office Social, attendees remain in *review mode* and switch to the *interaction mode* only when explicitly choosing to control shared content.



**Figure 1. Office Social interface: when a presenter is in presentation (a) or interaction mode (b), attendees remain in review mode (c, d); while the presenter is in interaction mode, attendees can switch between review (d) and interaction (e).**

These different modes acknowledge a key characteristic of collaborative work in which participants, in a meeting, transition variously between *loose* and *tightly* coupled collaborative exchanges [4, 14]. In looser couplings, the participant may be present in the same room and only passively engaged with the presentation—listening and perhaps reviewing materials in private. As collaborative

couplings become tighter, participants present in the room become more actively involved in interleaved collaborative exchanges—interacting with public and shared information resources and actively contributing to the talk. Over the course of a meeting, participants move to and from loose and tighter forms of collaborative work. Significantly here, moving to tighter coupling can stem from moments of reflective looser coupling, in which one independently reviews and prepares materials and contributions that would later form more tightly coupled exchanges.

## STUDY

In studying Office Social, we wanted to observe the emerging practices and shifting dynamics of collaborative participation relating to the characteristics of this ad-hoc aggregation of collocated device control. To that end, we deployed the system to a real workgroup and studied its use in real meetings for a period of four weeks—where participants collaborated using PowerPoint slides. Because, in these uncontrolled circumstances, quantitative metrics would fail to capture the richness of behavior related to the use of the system, we used observation, interviews, and usage logs—augmented with video recording.

The workgroup in this study was a large research group (~20 members) in a corporate laboratory. We deployed the system on nine of the group members' smartphones. During the study period, there were four meetings, with an average of 17 participants per meeting. Meetings were about one hour long and consisted of one or two presentations. The group was briefed on the system prior to the first meeting. We video-recorded meetings during the group's weekly project reviews and gathered usage logs capturing all interaction with the application on their smartphones (e.g., slide navigation, bookmarking, or laser pointer use). We conducted one focus group after the first meeting and then across the four weeks, we interviewed four participants about their personal experiences. For two of these participants, who were heavy users, we used video-stimulated recall. In what follows, we discuss how our system—with ad-hoc aggregation, asynchronous review, and fluid switching of statuses—enabled the adaptation of social mores to the presentation ecosystem appropriately.

## FINDINGS

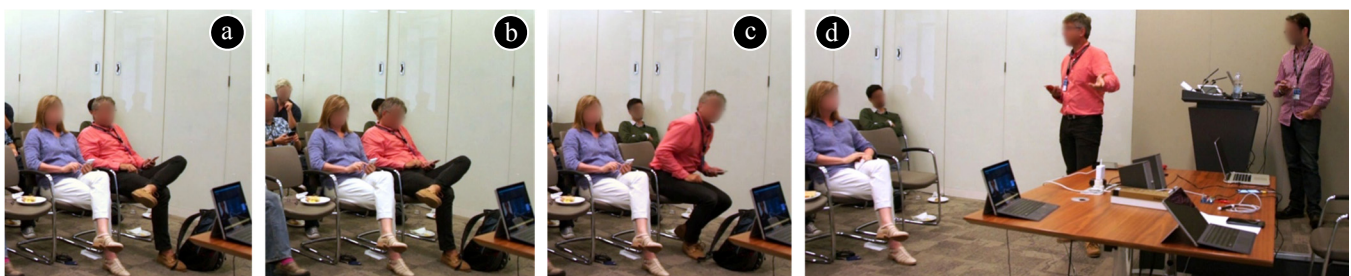
We observed attendees reviewing slides during, prior, or post presentation, and controlling the shared display during

group discussion. A presenter's preference to launching the interaction mode and providing democratic control to attendees varied widely—probably owing to the variety of presentation styles and contents. Three presenters waited until the end of their presentation, one launched it at the beginning, while one switched multiple times during the presentation to hand over control to co-presenters. We also observed the evolution of naturally-occurring orientations to the presentation ecosystem, which were facilitated by reducing the interaction cost of private review and control switch. We discuss these emerging behaviors as followed.

*Marshalling Resources.* When presenter hand-over was imminent in multi-presenter situations, incoming presenters used the review mode to rehearse, before taking over from the primary presenter (Figures 2a–d). When one attendee used the interaction mode to direct attention to a particular slide for discussion, other attendees effectively queued to take turn: they reviewed slides privately, waited to switch to the interaction mode, and then pulled up the relevant slide as they began to talk. One user referred to this as “*checking that my resources are marshalled to ask my question.*”

*Spatial Mobility during Control Hand-Over.* When multiple presenters use traditional presentation applications, the current presenter either leaves the podium, switches the seat, or passes on the remote control. Incoming presenters often also wait near the podium to take their turn. In each case, assuming the presenter role brings along a sense of spatial rigidity. With Office Social, in one instance a current presenter announced a hand-over by switching to the interaction mode without leaving his place. Each of the two incoming co-presenters then switched to interaction mode and began controlling slides as they walked from their seat to the front of the audience. They then positioned themselves near the primary presenter while they spoke and moved back to their respective seats as they were finished.

*Facilitating Micro-mobility and Ad-hoc F-formations.* F-formations are bodily orientations to engagement common in conversational contexts but are infrequent in presentation contexts [5, 7]. In the meetings, we observed instances of both L-shaped and side-by-side formations. In one instance, a presenter and attendee made a side-by-side formation around the attendee's phone while gathering feedback about the presentation content prior to the presentation (Figures 3a, 3b). In another scenario, three attendees made an



**Figure 2.** As an attendee transitions to a co-presenter, he reviews the slides (rehearsal), and then moves in front of the audience while presenting; other presenter stays at his place. Controlling slides using personal devices thus allowed for spatial mobility.



**Figure 3. Review of content facilitated small-group discussions in ad-hoc F-formations: side-by-side (a–b) and L-shaped (c–e).**

L-shaped formation to discuss content around the slides available on the phone (Figures 3c–e). In both cases, the formations, afforded by the micro-mobility of smartphones [9], were ad-hoc and short-lived, quickly emerging out and merging back into the ecosystem.

*What am I in for? Presentation Trailer.* Attendees reviewed slides for a range of purposes. Latecomers used the review mode to browse missed slides and get a sense of the ongoing presentation. One user said “*I knew I was late but realized I could catch up with the slides.*” Attendees also browsed slides to gauge how long the presentation might be, or what sort of topics would be covered; as a user mentioned “*trying to figure out ‘where is this going?’*”

*Getting Everyone on the Same Page: Distribution of Responsibilities.* In a traditional setting, when an attendee comments on some presentation content, the presenter and commenter—two engaged parties—are well-aware of the relevant content, but other attendees may feel lost. We observed an evolving behavior in the group: when a presenter-attendee discussion drifted away from the current slide on the shared display, and another slide became more relevant, another member switched to the *interaction mode* to bring up the most-relevant slide for the group’s co-reference [14]; thus taking responsibility for discussion coherence even if not actively engaged in the discussion.

### IMPLICATIONS FOR RESEARCH

Three core research implications emerged out of this study. First, there are potential challenges associated with affording such control to attendees, in particular to larger groups where our preferred mechanisms of social mediation become more difficult to enact. Understanding practices in these different settings and group scales will help identify design modifications necessary to accommodate the different social dynamics.

A second challenge is that democratizing control in presentations may spawn new tensions in engagement.

Changing a slide is currently treated as a relevant focusing move, but if this can be done by accident or without reference to the presenter’s designed narrative, slide change might lose some of its power to focus attention. Similarly, a democratization of content via preview and interaction with slides might challenge presenter narratives and group norms, resulting in ‘defensive’ designs. Would presenters choose only to allow attendees to browse already-presented slides and maintain surprise? Alternatively, how might presenters and groups, knowing that attendees might look ahead or even interact, change presentation styles, and evolve new norms that break out of collaboratively constraining single-presenter paradigm?

Finally, further opportunities for more inclusive collaboration dynamics could arise from extending engagement features beyond bookmarking. Bookmarking itself could be extended to send presenters feedback about the presentation content (e.g., likes, annotations, tweets). With the increasing trend in re-using slides, it would be interesting to explore if such audience interactivity can be used to crowdsource feedback and improve subsequent delivery of presentations.

### CONCLUSION

In this note, we presented Office Social, a lightweight system that allows audience members to review slides privately and, when the presenter enables it, publicly control the shared display. We explored how Office Social leverages the personal devices of both presenters and attendees into ad-hoc co-proximate relationships. The aim was to offer possibilities for more inclusive forms of collaboration that move away from presenter-led collaborative control. This allowed evolving presenter and attendee practices providing easy engagement with both the slides and collaborative context. Notably, our system supported easy hand-over to co-presenters, fostered spatial mobility within the social roles, facilitated F-formations, and allowed attendees to distribute interactivity responsibilities. Given the small scale of our study, future work on different presentation scenarios will be essential to validate, elaborate, and qualify these initial insights.

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