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# Using Elicitation Studies to Generate Collocated Interaction Methods

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**Abstract**

We report our experiences in using elicitation studies to gather from end-users intuitive and natural methods for collocated interactions.

**Author Keywords**

Elicitation study; guessability study; collocated interaction; multi-device user interfaces; wearable devices.

**ACM Classification Keywords**

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

**Introduction**

Elicitation studies allow collecting interaction methods directly from end-users, emphasizing the actions people would intuitively and naturally do to reach a given goal. However, in prior research, elicitation studies have primarily been conducted with individual users. Only a few earlier elicitation studies have involved groups of users [3]. Therefore, in this paper, we want to share our experiences in using the elicitation study methodology to gather methods for collocated interactions from groups of users.



**Figure 1.** Device surrogates used to simulate smartglasses (left) and smartwatches (right) in the study.



**Figure 2.** Participants suggesting and evaluating methods during the study.

## Elicitation Studies

To generate a set of user-defined input actions, Nielsen, et al. [6] and Wobbrock, et al. [9] suggest similar elicitation approaches: the participants are first presented with the end effect of an operation and are then asked to perform the action that caused it. Elicitation studies have been most commonly used to produce sets of touch screen gestures [for example, 8] but they have been adapted to other kinds of input actions as well, including hand gestures [7], kick gestures [1], and bend gestures [5]. Closest to our work, Chong and Gellersen report two elicitation studies that collected device binding methods from individual users [2] and groups of users [3]. While their studies covered a broad range of different device combinations, they did not address group binding methods for wearable devices.

## Our Study

In our work [4], we have used the elicitation study methodology to generate interaction methods for wearable devices for two common tasks in collocated interaction: group binding and cross-display object movement. Regarding devices, we have focused on the two most common wearable device categories today: smartglasses and smartwatches. Instead of real devices, we used simple mock-up devices that acted as surrogates of real devices. Figure 1 illustrates the device surrogates used in the study. We simulated smartglasses with ordinary 3M safety spectacles. For simulating smartwatches, we built custom mock-ups by attaching a Casio watch band to a small block of polystyrene foam.

In each study session, there was a group of four participants (see Figure 2). For each device and task

combination, the moderator asked the participants to suggest methods how the task could be achieved with the given devices. The moderator encouraged the participants to suggest the first intuitive ideas that spontaneously occurred in their minds. When the first participant had described a method, the moderator asked all participants to stand up and try it out with the device mockups, first in pairs and then as a single group four persons. The moderator portrayed an external person not to be included in the interaction. After the participants had tried the method, the moderator asked them to fill in a paper form to evaluate the method in terms of practicality (that is, how easy, effortless, efficient, and error-free it was to use) and pleasantness (that is, how human, connective, inspiring, and inventive it was). After filling in the forms, the moderator asked the participants to provide brief immediate free-form verbal comments about the method. The moderator then asked the participants to suggest another method, which was similarly tested and evaluated. The moderator coordinated the session so that every participant had an opportunity to suggest methods. The same procedure was repeated for each task and device combination.

The study sessions were recorded with a video camera. All the proposed methods were documented and categorized by the researchers. All participant comments about the methods as well as interview responses were transcribed and thematically analyzed. A quantitative analysis of the evaluation responses was done separately. The results of the study are reported in a separate paper [4]. In this paper, we will reflect our experiences of using elicitation studies to gather collocated interaction methods from groups of end-users.

## **Experiences of Using Elicitation Studies with Groups**

Overall, the study method worked well in our study. It took a moment for the participants to learn and get used to the method, and some of the first ideation and evaluation rounds took a relatively long time. But typically the participants learned the method quickly and the consecutive rounds were much faster. The participants also commented that they enjoyed using the method, although a few participants complained that it was rather exhausting due to the large number of repetitions.

It was important to create a relaxed atmosphere to free the participants to think of innovative solutions. It was helpful, especially for the less technically experienced participants, that they knew some other participants in the same group. On the other hand, a few participants commented that it would have been easier for them to evaluate methods proposed by some unfamiliar persons rather than by their friends. While we were primarily interested in the first spontaneous ideas that occurred in the participants' minds, sometimes the session seemed to evolve towards a competition of who invents the nicest idea, especially for the more technically oriented participants. On the other hand, the pressure for everybody to suggest an idea that will be publicly evaluated might have pushed other users to resort to more conventional and familiar ideas rather than to suggest more novel and uncertain ideas. It was also quite common that when one participant proposed a new idea, several other participants suggested improved variants of the same method. This way the participants' suggestions influenced the other participants, and as a group, the participants seemed to deviate to a certain subspace of the overall design

space and repeatedly produce ideas from that subspace. Further, it might have been worthwhile to contact the participants some time after the study session for further ideas, as it is possible that they invented additional ideas after the pressure of the study session was relieved.

The method seemed to be quite demanding for the participants. For some participants with creative minds, inventing methods was easy, while others struggled to invent possible solutions. This was problematic as a single participant could stop the progress of the study session for a long time. It was also important that the participants had some level of technical experience of doing similar tasks with digital devices. Less technically experienced users often had difficulties to perceive the basic steps that would be needed to solve the task (for example, selecting an object to move, initiating the movement operation, and identifying the target). Instead, they easily focused on practical application scenarios for the devices rather than on more abstract user interface solutions for the tasks that were given to them. The participants seemed to have some challenges to imagine features (for example, virtual screens) that were far from the devices they had experience of using. On the other hand, the more technically oriented users were often thinking rather conventional solutions derived from existing desktop and mobile user interfaces they had a lot of experience with. They also easily focused on technical implementation details rather than on user interaction. The less technical participants often proposed more versatile, novel, and innovative ideas.

In general, trying the method in practice with the mockup devices was very valuable. It clarified the

details of how the method would work and revealed many practical challenges. The participants also gained first-hand experience of how using the method would feel from emotional and social points of view in different roles. When testing the methods in pairs, it was important that there was the other pair of participants and the moderator present as that forced the participants to think of the possibility that there might be other external persons in proximity. Several participants also said that they enjoyed the physical activity of trying the methods together rather than just discussing and commenting the methods.

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