Progressive Scenarios: A Rapid Method for Understanding User Interpretations of Technology

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ABSTRACT
For emerging group technologies that require evaluations on long-term use and social norms, assumptions, and implicit rules that develop around the technologies, standard usability testing may not be adequate. At the same time, field based research that allows for observing technology use over long-term is costly in terms of time. In this paper, we present a rapid method that we call *progressive scenarios*, which could help replicate the processes by which interpretations evolve over time in natural settings and how invisible assumptions and social norms dictate the technology use. Using a preliminary design concept of a publicly available ambient personal information and communication system, we demonstrate how the method helped to elicit design implications.

ACM Categories & Subject Descriptors
H.5.2 User Interfaces: Evaluation/methodology; H.5.2 User Interfaces: Theory and methods

General Terms
Design

Keywords
Scenario-based design, multiple interpretations, user-centered design, ambiguity

1. INTRODUCTION
Standard usability methods can be limiting when designing and evaluating new forms of group technologies that require understandings about people's interpretations, assumptions, and practices over time. Accordingly, more and more field-based combinations of interviews and observations are used to provide rich data, but they are costly in terms of time. Meanwhile, rapid methods (e.g., paper prototyping) often fall short in understanding how interpretations might evolve as users encounter different aspects of a technology over time and as users interact with other users to make sense of the technology.

We propose a method called *progressive scenarios* (PS) that can address shortcomings in existing methods. We argue that PS helps designers to understand the processes by which users encounter different aspects of technology in natural settings over time, especially usage which is influenced by social norms and assumptions. Below, we discuss the background from which the method emerged, as well as describe PS and how it elicited design implications. We end with the scope and limitations of this method.

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2. BACKGROUND
As Sengers and Gaver [1] pointed out, exploring users' interpretations is essential to understanding interaction and how a system needs to be designed. However, studying interpretations over the long-term is costly in terms of time and resources. One of the resource-efficient methods known to elicit participants' perceptions and attitudes towards design is group interviews [2]. However, the central technique requires situating participants into a specific problem – sequencing questions from general to specific – which limits the ability to see gradual and unexpected changes of interpretations that often happen in natural settings.

Scenario-based design and socio-technical walkthrough in participatory design [3] are also known to situate developers and users within a concrete context of use in a timely manner, thus the methods are often used for requirement analysis, design evaluations, and user reflections. Scenarios consist of task goals, activities, evaluation plans, actions and events [4], and socio-technical walkthrough uses diagrams to depict possible system concepts. However, the literature on both scenario-based design and socio-technical walkthrough acknowledge,that it is often difficult to predict task practices that evolve around emerging technologies, especially those that are affected by implicit social norms and rules around the technology. Accordingly, an existing set of rules for devising scenarios and diagrams may not be adequate for designing new forms of group technologies. However, we argue that deliberate obscuration of specific task goals, activities, and plans in scenarios can in fact play a useful role in designing emerging group technologies.

We therefore build on existing user experience research techniques using interviews, participatory design, and scenario-based design to devise *progressive scenarios*, which uses in a group interview setting a sequence of scenarios that do not necessarily specify goals or tasks. We argue that PS will be able to help designers to understand 1) users' evolving interpretations of the system in a timely manner, 2) the social norms, assumptions, and invisible rules around a particular technology use, 3) socially construed uses of the system (by observing how the

Figure 1. The image of the system shown to the participants.

participants in the groups influence each other), and 4) how certain design interventions could affect users' interpretations. Next, we describe the method in detail.

3. PROGRESSIVE SCENARIOS: THE PROCEDURE

In describing progressive scenarios (PS), we will use a test case of PS. For the test case, we used a design concept of a publicly available ambient personal information and communication system (Figures 1 and 2), similar to prior work on ambient displays [5, 6].

For PS, the design concept to be tested does not have to be complete in terms of the detailed steps in which users would interact with the system. Rather, *the overall idea about what the system does, what technical components are used, and where it is going to be deployed is sufficient* for PS. Once the design concept is ready, the basic idea is to *prepare a visual image of the system* that could help participants to imagine the settings in which they would initially encounter the system (Figure 1). Second, one should *create a sequence of scenarios that gradually reveals information about the system* in terms of how a user encounters the system, what is visible in the system, what the system is for, and different ways in which the system can be used.

Our scenarios were sequenced as follows (references to S1-S4 will be used throughout this section):

`You are walking down a hallway and you see a wall-mounted display with a camera and a microphone hanging by a professor's office (S1). The next day as you walk by the system, you see a different kind of image inside the display (S2). You are curious about what the camera does, so you ask the professor. You then learn that the system can video conference with the professor even when he is away (S3). One day you realize that the artworks in the display represent the availability information of the professor (S4).`

If necessary, more animated or still images can be prepared to help the participants to understand the scenarios better, but we prepared four animated images for different ways in which availability information could be shown (Figure 2).

With the initial design concept, images, and scenarios in place, it is important to *recruit small groups of users from the particular setting where the design is going to be deployed*. We used groups of two to three, because dyadic and triadic interviews are known for allowing richer reflection, lower cost in time and resources, and less contamination in stating opinions by the majority [7]. Each group consisted of individuals with similar social roles and work routines around group technology use, while the between-groups was heterogeneous. Our participant groups included graduate students from computer science (the EECS group), architecture (Arch), art and design (A&D), and information (MSI). We also had one group of staff (Staff). Each group consisted of two to three people, 15 in total.

Once the participants were recruited, we began each session by simulating how *the participants would encounter the system for the first time in a natural setting.* In our case, one of the two TV screens in the interview setting showed the image of the system hanging in a hallway as well as a close up image of the system (Figure 1), while the other showed the animated images of the artwork that would be visible on the display (Figure 2). The interviewer (the first author) then asked the following question to the participants:

`[After stating S1] what do you think the system is?`

As the participants discuss their interpretations of the system, *the interviewer probes further* to help the participants elaborate on their reasoning, assumptions, and interpretations with unstructured and open-ended questions that are based on the participants' responses. Once the participants seem to have come to an agreement about the interpretations or if the conversation gets stuck, *the interviewer moves forward from one scenario to another,* (e.g., S1 to S2), gradually revealing more information about the system as would happen in natural settings. In our case, we changed from b0 to b1 in Figure 2 while describing S2 to the participants. This way, the method attempts to simulate how the participants may change their interpretations as they get to know more about an unfamiliar system. In our case, we used S2 multiple times to see how knowing that different artwork can be used for the display may affect the participants' perceptions about the system's use. As the group discusses further, *gradually reveal more information about the system until all scenarios are presented* (e.g., until S4).

Next, we present findings from a test case that addresses the claim that PS can help uncover important design considerations.

4. FINDINGS FROM A TEST CASE OF PS

4.1. Users' progressive interpretations

PS allowed us to examine the process of changing interpretations in response to specific information provided about the system as the interviewer progressed through the sequence of scenarios. For example, the A&D group's initial interpretations included the system as an art installation, a security system, an "information thing," or a video kiosk. When the participants were given S2 (b1 in Figure 2), Kyle immediately revised his interpretation of what the system could do, now assuming that the system was interactive. John, on the other hand, felt that the system was a research project to possibly monitor people's behavior towards art displays on the wall:

`John: (snaps his fingers) I want to snap and wait in front of the camera to see what happens. […]`

Figure 2. Examples of the animated artwork on the display

Kyle: but also I wouldn't snap because I would be conscious of the camera and thinking they are recording me to see if I am going to do something like this, so I am just going to be cool, and walk right by it. Because I don't want to cave into their expectations

John: see I would have just stopped and laughed. Because this is kind of hilarious.

Switching the system's artwork, specifically the addition of animated features to the display, triggered the students to think that the system was interactive while articulating what was appropriate to do in public and in situations where one might possibly be monitored. It brought forward issues concerning participants' feelings of privacy, curiosity, and the system's unfamiliarity that were all closely intertwined in generating different possible expectations and interpretations towards the system, which in turn changed as the participants encountered different aspects of the system as is often the case in natural settings.

4.2. Unveiling the invisible

PS also unveiled invisible assumptions, social norms, and rules that played out in interpreting system use. In each group, given the broad context about the system, the participants initially had various interpretations of the system including artwork, a security system, a living arts display, a screen saver, and a reception system. These initial interpretations quickly translated into the participants' assumptions and taken-for-granted roles of certain technology such as a camera or a microphone. When the interviewer asked the group to elaborate on the interpretation that the system was a reception system, Beth's response revealed her assumptions about the roles of microphone and cameras in public systems and about the system hanging outside a professor's office:

Beth: Well because of the microphone and the camera. Or perhaps they are able to see you and you can converse with them.

Then Susan challenged Beth's assumption about systems with cameras. Based on her experience with video cameras, having a camera reminded Susan of security systems:

Susan: I wouldn't automatically make an assumption that it was a [reception system for the] person in the office. I may think that it was some kind of [a] security system or something because [in] places that are being video taped [it] is usually a security measure.

In this example, the participants were expressing their assumptions about what a system with a camera could do, and what having artwork as part of a system might mean. This allowed us to forecast how users would react to an unfamiliar system with a camera and how we should design accordingly.

4.3. Socially construed use of the system

PS also allowed us to observe how the groups' interpretations progressed over time as the participants shared their assumptions and expectations among themselves. For the Arch group, as Greg and Katrina discussed, their interpretation changed from the system functioning as an ice-breaker to a communication device and a medium for personal expression. For example, for Greg, seeing an alternate scenario as part of the display triggered him to think about the system potentially serving as an ice-breaker. Greg's bringing up a student visiting a professor's office provoked Katrina to think about the case in which the professor was not in the office, and how the system could be used accordingly as a communication device as well as a medium for personal expression:

Katrina: I think it would be kind of cool, giving [you] something to look at when you are waiting for him, or something to talk about to break the ice – "what's that thing outside your door?"

Greg: If he wasn't there would I be able to talk to him about it? I guess I would assume that he's interested in surreal art.

In this way, we were able to observe interpretations that Greg and Katrina together constructed for the different ways in which the system could be utilized. Also, this in turn elicited social assumptions and expectations that would play out in interpreting the system under different circumstances (e.g., that the professor is interested in surreal art).

4.4. Design interventions affecting changes in interpretations

PS allowed us to uncover people's perceptions of privacy, trust, and what might be appropriate in using the system -- issues that are often tacit and taken-for-granted – and how these perceptions can be altered by simple design interventions. For example, the Staff group initially thought the system might be intrusive to their hallway activities. One participant, Joan, said she would not talk in front of the system, because there was a microphone. The interviewer then showed a new image of a professor, with whom they were familiar. Joan, in reaction, became willing to say hello as she passed by, providing design insights for how we might be able to alter people's trust and privacy:

Joan: […] if I knew that there was a microphone, and I knew that it was [Professor X]'s office, I might say "Hi [X]!" whatever as I was walking by, but then if I didn't know that there was a microphone, who knows what I might say. I might go, "Hmm, that's weird."

Thus, by simply introducing an alternative artwork, we were able to see how certain design interventions or features can alter participants' interpretations about intrusiveness and the use of the system.

4.5. Summary

Our initial idea was that the system was to be a video conferencing tool that could also show availability information. By deliberately hiding information about how the system works initially and gradually unfolding information about the system, we were able to replicate the processes by which users' assumptions, implicit rules, and interpretations would come into play when the system is deployed in natural settings. We were then able to use these

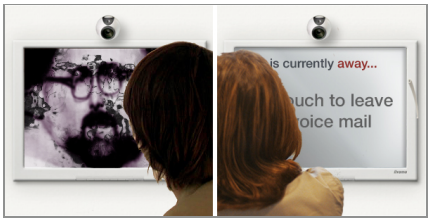

Figure 3. Redesign examples. Left is when the professor is available for office hours. Right is when the professor is busy and can only have brief conversations.

implicit assumptions about privacy, appropriateness, and rules from the findings to better design the ways in which availability information can be shown through artwork. We next turn to the redesign.

5. REDESIGN AFTER PROGRESSIVE SCENARIOS

When minimal information was given about the system in the beginning, the reactions contrasted among groups with different organizational roles. For example, the Staff group wanted concrete instructions that would efficiently help them learn how to use the system, because the hallway was a space for work and efficiency for staff. On the other hand, students perceived figuring out functionalities of an unfamiliar system as a playful activity, because students conceived the hallway as a place for inspiration and learning. As the scenario progressed towards the end, we were able to observe what features of the system could then change their initial interpretations (e.g., a familiar face as part of the display, changing a staff member's concern about privacy and efficiency).

There were two things from our test case that directly informed the redesign of the system: 1) The interplay between organizational roles and the participants' implicit rules about the technologies in the space, and 2) the findings about what design interventions could change these rules. In our redesign, the system will communicate with professors' calendars and give professors options to link certain artwork with certain types of schedules. For example, during office hours or open times that a professor allows for spontaneous meetings, the display can show abstract or animated artwork to allow for interactive playfulness so that the system invites students or staff who need office hours or informal conversations (Figure 3, left). If the professor is either away or can only briefly be interrupted, the system will show a text-based conferencing interface on the display where staff can leave voice mails, memos, or reminders, thus inviting users who need efficient interaction (e.g., reminder for a grant application) (Figure 3, right). Through *hailing*, an act of attracting certain groups of people to a space or idea through the different choices of text or images in advertisements [8], the design discussed here fosters non-intrusive ways of conveying information and expected use in a public space.

We also learned that interpretations involving trust and privacy could be altered according to what was displayed on the screen. That is, whether a person or an animated object was displayed, as well as who the person was, altered the way participants interpreted the system. This made us rethink the role of artwork beyond decoration, information display, or personal expressions – and that the artwork component of the system could in fact possibly engineer parts of the expected social norms surrounding the system's overall functionality.

6. SCOPE AND LIMITATIONS OF PROGRESSIVE SCENARIOS

The participants' assumptions that led to the design implications are limited to the particular time, space, and people participating in the PS case. The role of PS is, instead, to provide designers with a starting point for deploying new group technologies designed around existing social norms.

The biggest drawback to PS, however, pertains to the disparity between what people say they would do and what they might actually end up doing. Accordingly, we would not claim PS would provide generalizable results pertaining to any technology use.

Rather, we see PS being useful for designing and evaluating particular types of emerging group technologies that: 1) are to be deployed in a group setting (which need not be in the physical setting); 2) come with little or no explicit guidance about what the technology is for, what it means, or how it is to be used -- which often is the case for publicly available personal computing systems; 3) are not intended to attract focused, task-based interactions but are rather meant to be ambient, such as Mark Weiser's assertions on invisible computing as the core value in designing future computing; and lastly, 4) are not didactic in their presentations, but rather employ ambiguity and invite multiple interpretations, as proposed by Sengers and Gaver [1].

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