

Zebra: Exploring users' engagement in fieldwork

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ABSTRACT

Participatory Design is a design approach that provides a popular set of techniques for designing interactive systems in collaboration with end-users. Technology probes are one of such techniques, developed recently to encourage users' engagement with design ideas while capturing interaction. In this paper, we describe a technology probe called Zebra, which aimed at exploring the design of an observation tool for fieldwork with busy professionals. We deployed Zebra in the coffee room of our lab and observed researchers' reactions to the proposed concepts it embodied, both as researchers and as participants. We found that participants engaged with the probe in ways ranging from playful performances, through to abandoning the social space. Based on analysis of the collected qualitative and quantitative data, we present our reflections on the Zebra probe, how it eased the burden of engagement in the design process, and helped us better understand the potential of the observation tool for participatory design with busy professionals.

Categories and Subject Descriptors

H.5.2 [User Interfaces]: User Centered Design, Evaluation/Methodology

Keywords

Technology Probes, Participatory Design, Engagement

1. INTRODUCTION

Designing interactive systems that are adapted to people and their environments is one of the challenges of User Centered Design (UCD) and Participatory Design (PD). In order to support these approaches, Human Computer Interaction (HCI) researchers seek new techniques and methods to support the design process. While UCD considers users as the core of the design process, Participatory Design goes further in making users active participants in the design process, alongside designers and engineers. The Participatory Design approach thus leads to a stronger engagement of users in design activities, which in turn adds responsibilities and workload to the participating users. Facilitating the engagement of users in the design process is one of the key issues Participatory Design practitioners face. Field observation is a method used in PD that involves observing users

in their environments to better understand their inter-relationships and the role of context in their activities. Other methods involve users in design exercises and reflective discussions and actively include participants in the design process. This work is motivated by the need for compromises between conducting field observations that place designers in the users' space, and engaging users in design/reflective activities that place them in the designers' space [17].

To respond to this need, we propose the use of a field observation tool which allows an automated capture of video data while providing users the ability to review, reflect and annotate the captured data. This tool is intended to support the PD practice by actively engaging users in fieldwork observations. Designing such a tool presents many technical and methodological challenges, such as reliability in an unknown physical environment [2], the validity and usefulness of the collected data, and the reaction of users. To better explore these issues, we have designed the Zebra probe, a technology probe [12] aimed at exploring the design of this tool.

To ensure the success of this tool, we involved HCI researchers in our lab in a PD process using the Zebra probe as a core artifact. Because of the researchers' busy schedules, we tailored a study to engage them in the design process while limiting the impact of the study on their workload. We developed and deployed the Zebra probe as a naïve implementation of the video observation tool, designed to engage researchers longitudinally whilst minimizing intrusion into their daily routines.

This paper describes the early stages of the design of this tool in collaboration with HCI researchers. Building upon this study, we present different approaches that the tool's concept could encompass. We then discuss how the use of the technology probe methodology facilitated engaging busy researchers in a participatory design process.

2. RELATED LITERATURE

Attempts to engage users in design are frequently limited by the time and commitment available for any activity that is not directly part of their jobs. In a previous study [20], we conducted fieldwork in architectural firms to explore the physical nature of collaborative design. We were permitted to observe two different architectural offices for a period of two days each. Given this limited time, we decided to use a mix of 'quick and dirty' ethnography [11] and interviews to gather maximum data. The aim of the study was to gain initial insights about the design space and identify ideas and general concepts to be investigated further. During the observations, we were sensitive to the impact our work might have on their workflow. At the end of the study, we the captured video and written data led us to a better understanding of the design space. However, the time spent in the firms had

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seriously limited our ability to engage users in the design process. In planning further studies, we decided to investigate other techniques to make better use of limited time with users in their space. We need to find new ways to engage participants more actively in design without unacceptably impacting upon their usual activities.

Studies, such as Cederman-Haysom and Brereton's study of ubiquitous computing in a dentist surgery [8] highlighted the need for compromises when actively involving users in PD processes. In their study, they improvised, modified, and tailored their methods to suit the schedule of "busy professionals" and achieve a limited level of engagement. They describe how one of the participants was late in his schedule and had to shorten the time he could spare for the study, thus obliging researchers to improvise and change their activities.

Through careful choice and tailoring of techniques, PD practitioners seek to lower the engagement required from users and/or increase users' willingness to participate. Different techniques for engaging users in the design process have been developed over the years. Muller et al. [17] provide an overview of such PD techniques, organized according to the "Position of Activity in the Development Cycle or Iteration", and "Who Participates with Whom in What", which relates to the compromise between users reaching the designers' world or the designers reaching the users' world. Examples of PD activities in the early process stages include ethnography [11], which involves designers in the users' world for a long period of time, and many design games [18], which allow designers and users to share knowledge and experiences. Activities placed later in the design process include prototyping [4]. Overall, gaining users' participation is a difficult task. Design games and other playful activities can help motivate participants and give them better incentives for engaging in the design process [5, 18]. Seeing a clear benefit to their involvement in the process also increases users' motivation. This is usually the case in designs for the workplace where a system to be replaced is critiqued [3] or where people have an innate curiosity about new technologies or design. Typically, multiple techniques must be used together to achieve adequate engagement alongside data collection, thus increasing the user's required commitment. Brandt et al.'s mobile queues system for triggering online diary entry [6] provides a way to help participants distribute the burden of participating in PD over different times.

Technology probes are recent PD techniques developed for the field of HCI. One of the strengths of that technique is that it encourages triangulation [15] by providing data from different points of view: design, sociology, psychology, engineering, and so forth. Over the past few years, several projects have used the technology probe methodology to involve users in the design process. The interLiving project [2] created TP to conduct participatory design with multi-generational, multi-households families. Langdale et al. [13] have studied domestic communications, and used a technology probe to elicit users' responses to design ideas. Markopoulos et al. [16] have provoked inspirational responses to the introduction of mirrors and video recording devices in public spaces. These responses were then collated to inspire design ideas and suggest further investigation of particular aspects such as social aspects of mirrors and public versus private spaces in using video and mirrors. Earlier studies at Xerox PARC have also explored the design of Media Spaces in

public spaces such as coffee rooms of research labs [9], exploring issues of privacy and acceptance.

3. THE ZEBRA PROBE

The aim of this study was to design an observation tool, which empowered users to review and react to data. To help us design such a tool, we decided to use a technology probe (TP) [2], which is defined as "a robust, simple device that stimulates and captures interaction between a system and its users". TPs were created for the interLiving project [2] as a method to explore a design space by:

- raising users' interest and curiosity and stimulate their imagination and creativity, thus supporting the design process,
- capturing users' interaction with the system along with its physical, narrative and interaction context, thus addressing the human studies need for real, ecologically valid, contextual data, and
- allowing the setup, test and evaluation of a technology in "real" settings.

The Zebra probe was created to help us explore the design of this video observation tool. The tool aims to provide participants with the opportunity to review and comment on video observations while they are being made, without being too disruptive to their existing workflow. The use of a technology probe for exploring the tool's design space allows us to better understand the different aspects of the tool that would influence data capture, data review and analysis, and participants' experience (especially regarding empowerment and engagement).

3.1 Description

The Zebra probe includes an autonomous video capture device, thus allowing the researchers conducting the observational study to be absent or focused on other tasks in the field. It automatically captures images from a camera when motion is detected and organizes and presents the video clips back to participants for feedback. Direct feedback of the Zebra probe's state is fed to an external display (Figure 1). No sound is recorded in order to reduce privacy issues. While audio would definitely be useful for us as researchers, we felt that people would refuse to have their conversations automatically recorded. To further reinforce privacy, we fitted a button to the side of the feedback screen so participants could disable recording at any time. When triggered, the clip being currently recorded is deleted and the Zebra probe waits for five minutes before starting to record again. We also provide feedback on the screen to indicate when recording is disabled (Figure 1c).

Automated video capture allows the natural segmentation of video as it is being recorded. It reduces the amount of video collected by automatically discarding moments with no motion, thus facilitating subsequent video analysis. The drawback of using automated video recording is that the viewpoint of the camera is fixed and cannot be directed to record specific events or scenes as a cameraman would do. However, the advantage is that it can systematically record data without requiring anyone to operate the device and can therefore work independently while the researcher is away. The fixed viewpoint can be advantageous in another way: we can detect repetitions and patterns that recur within the scope of the camera's view and we can also generate quantitative data such as who occupies that space at which time. The Zebra Probe

can be deployed before and after fieldwork, allowing capture of data over longer periods of time, with only minor disruption for participants.

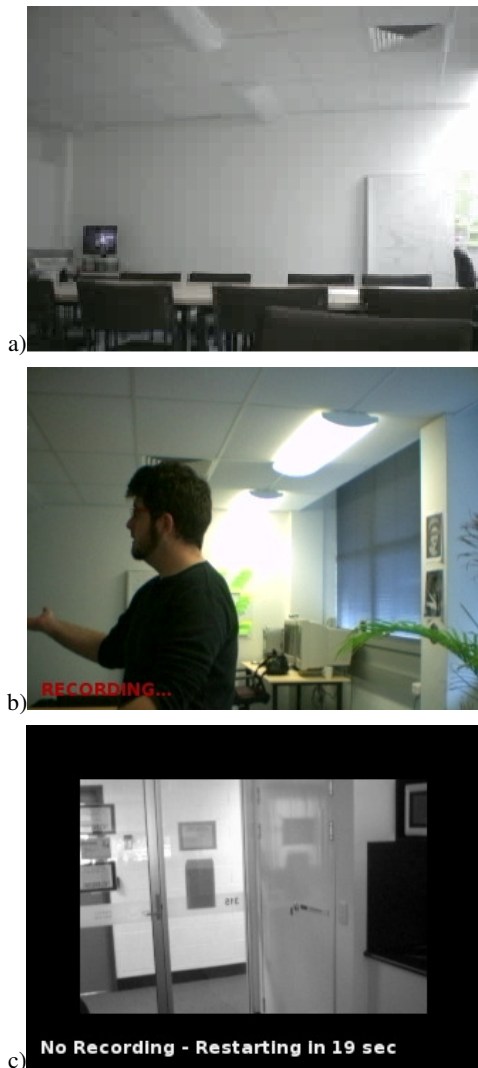


Figure 1. Feedback display: non-recording (a), recording (b), and disabled (c)

The Zebra probe uses a web interface to organize and present the video clips, enabling both users and researchers add meta-data describing the clips (Figure 2). It also provides users with a way to review filter and sort the data (Figure 2b). Feedback can include comments to the researchers (not disclosed to other participants), discussions in a forum (shared with the rest of the participants) and linking “tags” to video clips to sort and retrieve them. These features provide two advantages: first, participants are given the opportunity to add subjectivity, nuances, and missing context to the raw data; second, the comments, discussions and tags are a first step towards categorizing and analyzing the data, by which researchers benefit from the users’ vocabulary and opinions to build their own coding and analysis.

In order to better understand the qualities and issues associated with the introduction of the Zebra Probe in an environment and its role in a design project, we conducted a study in our lab. We

aimed to refine our design concepts, capture users reactions, and detect potential issues and improvements to serve as a basis for the observational tool’s design. Our interest is twofold: understand how such a tool can assist us during PD fieldwork; and understand how technology probes can assist us in designing the tool. We expect this study to give us first insights into participants’ responses to the introduction of such tool. We also expect participating researchers to build upon their experience of the Zebra probe to engage in the design of the tool itself, as researchers conducting similar fieldwork in their own work.

The tool in this context was studied as a method for observing the informal interaction in shared spaces between collocated coworkers. This study was to inform and inspire design solutions to support informal interaction in distributed environments. Points of interests included patterns of use of the space, collaboration taking place in the space, key artifacts and habits, and design opportunities.

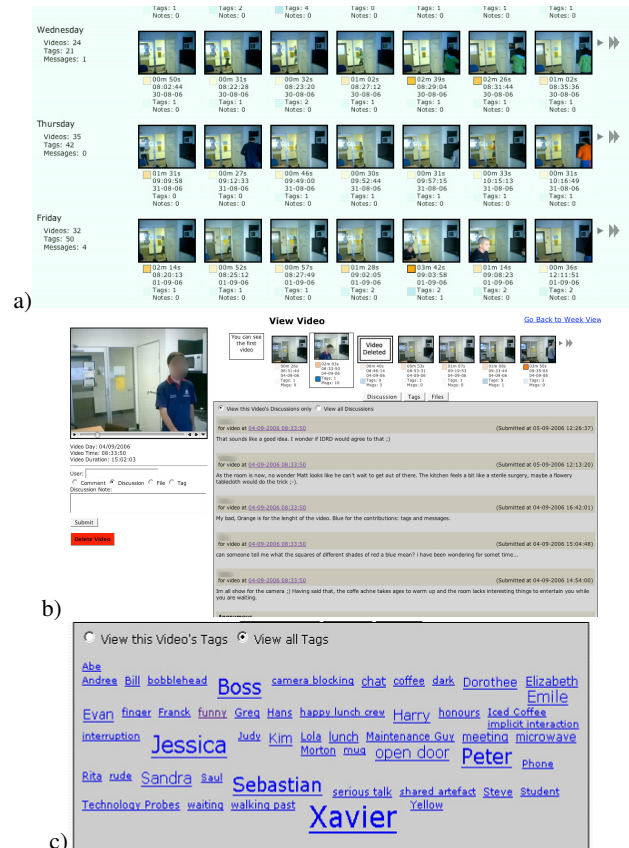


Figure 2. Web site overview with a) overview of the video clips of the week, b) details of a video with comment, discussion and tag tabs, c) the tag cloud from the study

3.2 Method

The Zebra probe study lasted for a period of about one month. It included four workshops spread across this period as well as five semi-structured interviews toward the end of the study. The study started with an introductory workshop, which explained to the researchers the nature of our work and the functioning of the device prior to its deployment. The Zebra probe was then deployed to study the informal collaboration taking place in the informal space of our lab, namely the kitchen/coffee room. The

feedback interface of the Zebra probe was also deployed on the lab's network. After a period of two weeks, a second workshop was organized that captured participants' feelings, concerns and feedback about the Zebra probe as observees under the scrutiny of the tool. The Zebra probe remained in the coffee room for a period of three weeks, during which time some changes were made to the feedback interface to resolve usability issues and respond to some participants' insights. During this period, the discussion feature was enabled. A final workshop was organized one week prior to the removal of the Zebra probe from the coffee room, to get additional feedback and insights. This workshop was followed by a set of short interviews with key participants to gather more detailed feedback and gain their researchers' view on the Zebra probe. During these interviews, we asked participants to imagine how they could transfer the device into their own research contexts and methods.

3.3 Participants

Participants were selected from the researchers in our HCI lab. Around 14 people were actively engaged in this study and attended workshops and interviews. About 20 other people were only peripherally engaged with the device and did not participate in extra design activities. Participants were recruited in our lab through email and informal chats. Their ages ranged from 23 to 45, with expertise in HCI ranging from Masters student to senior researcher. Participants were sampled to include experienced practitioners in the different disciplines of HCI; they included researchers in interaction design, engineering, computer supported cooperative work, human factors, participatory design, anthropology and HCI research students.

Engaging with researchers as participants allowed us to benefit from their expertise in their respective domains as well as get a first insight into users' reaction to the concept. We also acknowledge that working with researcher participants influence the qualitative data regarding their reactions toward the proposed concept in a favorable.

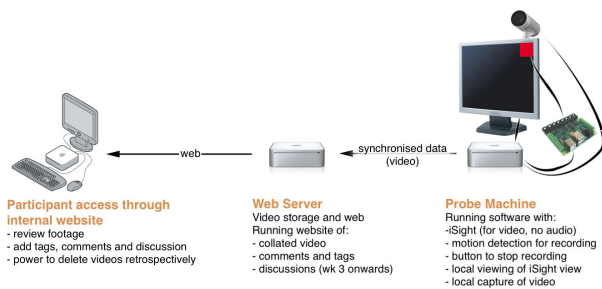


Figure 3. Overview of Zebra's configuration and points of user interaction

3.4 Apparatus

Figure 3 provides an overview of the Zebra probe's architecture. The capture side, labeled "Probe Machine" and the feedback side, labeled "Web Server" run on an Apple Mac Mini using the MacOS X 10.4 operating system. The Probe Machine is fitted with an Apple iSight camera to collect images. A custom-made program, developed using the núcleo toolkit [19] and the openCV library [1] provides motion detection and video clip recordings of the images captured by the camera. A standard 17" LCD screen serves to display the Probe Machine's feedback: what the camera is capturing and a feedback showing whether the system is recording

images (Figure 1b) or not (Figure 1a). A physical touch-sensitive button is connected to the computer and interfaced to the software using Phidgets [10]. It provides a privacy-enforcing feature that disables recording for a period of five minutes. Feedback that recording has been disabled and the remaining time before it restarts is provided on the screen (Figure 1c). The Mac Mini uses a Web Server using PHP and MySQL to organize the video clips chronologically on a webpage accessible to participants where they can review and comment on the clips (Figure 3). The website was available to participants throughout the study, with some additional functionalities changed or released during its course.

3.5 Procedure

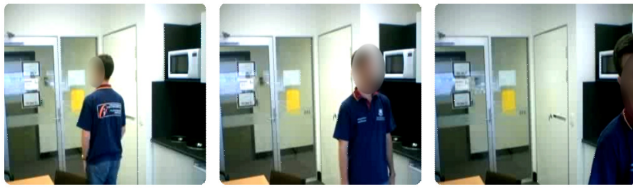
Zebra was deployed in the coffee room of our lab, where people engage in coffee chats, lunch get-togethers and, on occasion, meetings (for example, between Ph.D. students and their advisors). The camera was directed towards the door to capture people going in and out while also capturing activities around the table and beside the sink. The deployment lasted one month, during which minor changes were made to the Zebra probe, mostly with respect to camera position and the usability of the feedback website. The coffee room is particularly suitable because as a public space, it is shared amongst the whole group and visited regularly by most of the lab members. Moreover, people usually leave their work to go to the coffee room, leaving them potentially more available to examine and interact with the Zebra probe.

A pilot in a seldom-used room preceded the deployment, enabling some participants to preview the Zebra probe and test the system. We announced the deployment via email, three weeks before starting the study, to prepare participants and address potential initial concerns. We also sent email when the Zebra Probe was activated, including additional details about the study. Prior to the deployment, we gathered ethical review and informed consent from both lab managers and participants. Signs were also posted in the coffee room to inform passers-by and visitors about the experiment. Additional information sheets and informed consent forms were made available outside and within the coffee room.

In the initial workshop and emails, we asked participants to engage with Zebra when they wanted. We encouraged them to give feedback as they reviewed the posted data. The feedback interface was available at all times, using computers within the local network. We organized a second workshop two weeks into the study to engage participants in consultation over the project direction and gain feedback and participants' perceptions about the Zebra probe. This enabled us to reiterate the aims of the study and to discuss any concerns and questions the participants had about the study (on both a deployment and an interaction level). After the workshop, we enabled discussions on the feedback website and revised how participants interacted with the Zebra probe based on the workshop discussion. New features were implemented, including a tag cloud and the ability to search and view videos based on tags to enable faster tagging and discussion (Figure 2b). The final workshop held at the end of the study gave participants a preview of the results and included a discussion of the methodology with the participants as co-designers of the tool.

Participants' schedules strongly influenced participation in workshops and interviews. Typically, between 8 and 12 participants collaborated during workshop sessions and 8 key participants were interviewed towards the end of the study. Interviews lasted between 30 and 90 minutes.

4. RESULTS



P1: Nice throw over the shoulder :)
P2: I like the non-distracted waiting for coffee time. It lets my ideas percolate.
P2: (that last comment on ideas was me)
P3: can someone tell me what the squares of different shades of red or blue mean? i have been wondering for some time...
P4: I think you look bored, we should introduce distractions so that people can do stuff while waiting for the coffee machine to heat up or produce the magic juice.
P5: As the room is now, no wonder John looks like he can't wait to get out of there. The kitchen feels a bit like a sterile surgery, maybe a flowery tablecloth would do the trick ;-)

Figure 4. Example of video discussions and associated video's keyframes.

4.1 Probe data

Over the course of the study, participants entered 13 comments, 11 posts in discussions, and 27 tags. Tags were posted by participants only on the 27th and 39th days, dates of workshops. We, as investigators, posted 5 comments, 36 discussions, and 140 tags. A further 2 comments, 3 discussions and 477 tags were unidentified (Investigators' estimated being responsible for about 75% of the unidentified tagging). 51 unique tags were identified in total. The most used tags were the names of the lab members visiting the coffee room regularly that we entered to help us analyze the occupants of the coffee room and helped the participants review the videos concerning themselves. 351 unique videos were tagged, representing about 10% of the overall collection. Participants' tags included descriptions of the events such as "walking past", "coffee", and "waiting". Figure 4 gives an example of participants' posts on one of the videos.

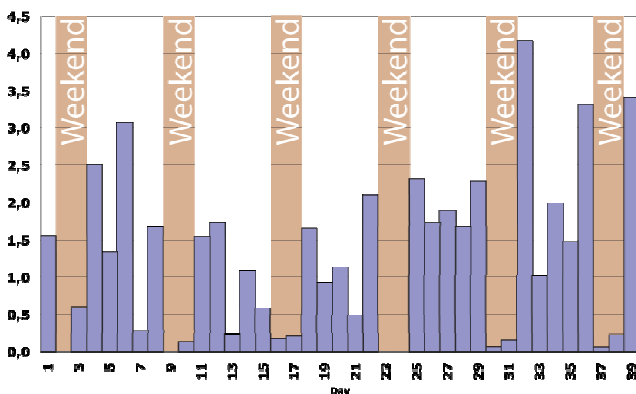


Figure 5. Volume of video captured each day

3677 video clips were recorded for a total length of 49 hours (almost 130 times less than a 24/7 recording). 2149 of the clips were hidden because they were irrelevant to the study, e.g., caused by a light flicker. This left 29 hours of video in 1528 clips (Figure 5). We estimate we reviewed around 95% of videos using the fast browsing function described later. Participants used tags more than other parts of the feedback interface. Workshops allowed

gathering feedback on the presented tool, considering our HCI researchers as participants in an observational study using the tool.

4.2 Reactions to the Zebra probe's introduction

Participants in this study were occasionally asked to react as researchers from the Zebra's perspective, but were primarily observed by it. They therefore provided interesting insights on reactions of participants to the introduction of a video recording device in a space. One user suggested that we should remove the screen with the always-on feedback as it was thought to be too intrusive, or "in your face". In talks with participants, we realized that one sub-group had decided not to use the coffee room anymore to avoid being recorded. Further investigation led to the understanding that the recording per se was not the main cause, but the fact that they were always reminded of the video capture made them too self-conscious about their actions. The review of the videos allowed us to observe their gradual desertion of the coffee room. However, after the second workshop where we addressed some of their questions on the finality of the study, this sub-group returned to the room, though never as extensively as before the study. This suggests that removing the always-on screen feedback would probably lower the impact of the tool on the environment, and prove to be less intrusive as a result.

Participants used the feedback side of the Zebra probe moderately. Most discussions concerned funny clips and some key aspects of a day, a particular meeting that had occurred in the coffee room or a lunch. After the second workshop, we modified the capture side feedback display to include a thumbnail of what was being recorded as well as the webpage of the feedback side, thus allowing participants to provide feedback on the site. However, overall the effort for sending feedback proved to be high and only a limited number of contributions were made.

4.3 Analyzing collected data

Towards the end of the study, discussions with participants led to suggestions and critiques of the data review and analysis. The current web-based implementation of the system inspired many responses. The tagging capability was suggested as a way to sort the videos into categories and support qualitative analysis. As participants themselves created the tags, they could provide categories and a vocabulary that can be re-used by the designers in discussions with users or to "code" the data. The analysis of the tags generated by the participants themselves could reveal interesting insights into their perception of their environment.

Participants also suggested that they would like to easily retrieve every video in which they appear to help them comment on their actions. As a result, study researchers started to review data from the server regularly during the day in order to tag them with the names of the people appearing on them. At the same time, we implemented the tag cloud feature (Figure 2c). Viewing the tag cloud allowed us to observe which users were using the coffee room more often as by doing so their name would be tagged more often and therefore appear larger in the cloud.

While reviewing videos, we observed that most participants glanced at the clips instead of playing them. They would hold the video marker and slide it to view an accelerated version of the video, efficient to recall memories and most interactions taking place. This fast browsing of videos was later suggested in the form

of selected key frames allowing participants and researchers to highlight important moments in a video for later discussion, but also to create a summary of the video.

For further data analysis, participants suggested implementing an interface to compare interaction over different days. Using tags as filters, we could compare lunch times, types of informal interactions, etc. to observe and analyze temporal patterns. Key moments of an interaction sequence could be displayed as stills to provide a contextual overview for those not wishing to review all the video footage.

4.4 Workshop and Interview outcomes

Using the interviews and the workshops, the study led participants to discuss different approaches to the observation tool tailored for different research and design audiences. We also made a distinction between researchers' perception of the tool as observational study participants and their critique and review of the concepts Zebra incorporates as experts in HCI. We highlighted these points of distinction between roles played by participants during workshops and interview sessions by focusing questions on either aspect subsequently.

In interviews and workshops, participating researchers provided comments on how the data could be used, other deployment contexts, and aims for potential extension of the tool's capabilities. The following alternatives summarize the researchers' re-interpretations of the tool according to their domain of expertise. The two most interesting alternatives are presented here: a participatory design alternative, and a human study alternative.

4.4.1 Participatory Design Alternative

The low level of engagement with the feedback interface motivated us to investigate how the tool could be designed to encourage, motivate or provoke more engagement. Participants suggested two variations of the Zebra probe focused on enhancing the engagement of participants through maximizing exposure, stimulation and motivation. The first suggestion was to create an observation tool to engage people with it and confront them with the previously recorded videos. Instead of providing systematic recording and feedback, the device would randomly switch between two modes when motion is detected: playback of previously recorded video, upon which room occupants are then given the opportunity to comment; and recording (as described previously). This system could still provide the systematic recording ability of the Zebra probe, and would significantly increase the provocation of participants and their access to the recorded data. This technique effectively addresses the issue of exposure (how you get exposed to the collected data so that you can comment on it).

The second suggestion was to design a tool that maximizes exposure of participants to the collected material and lower the threshold necessary to take part in the data analysis. In this alternative, the feedback screen would be removed and replaced by printed keyframes from the videos that have been tagged by researchers and organized, then pinned on the wall of the coffee room. Participants would be free to write additional tags and comments on the prints and review particular videos by scanning a tag printed with the keyframe to identify. The corresponding video would then be played on the screen. Eventually, people rearrange the printed keyframes any way they feel appropriate.

The resulting organization would be recorded every evening for record keeping and other videos are arranged on the wall. This technique is strongly related to the video card game [7], a technique for analyzing video in collaboration with participants in a study which uses raw clips of video from the design setting to identify interaction themes.

4.4.2 Human studies alternative: Augmented diaries

Participants also suggested the use of the tool to conduct diary studies. Instead of pen and paper diaries, video would be automatically recorded by the device and serve as a prompt for the researchers to inquire about the details of a particular interaction. It could also be a powerful medium to help users recall a specific instant. However, diaries involve the user making the entries and choosing what to report instead of relying on systematic data collection, making them susceptible to omissions and other misreporting of events. During our interviews, an alternative was suggested in the form of a bookmark button, which would allow users to create diary entries in the recording. These entries would take the form of a marker to particular moments of the video. Researchers or participants would then review the clips for further discussions on particular scenes. Researchers would still have access to the full body of collected data, but could prompt users based on their own markers as well.

One suggested benefit would be the ability to run the study remotely, reviewing data and prompting users automatically. Bookmark entries would also be easier for the participants to make, and because the context of the marker would be recorded as a video, it would be rich in details to support remembering. This technique would also empower users, giving them the ability to highlight moments in their day that they consider important.

This alternative echoes previous work in the use of videos for research and fieldwork, such as Mackay's EVA [14] system, that allowed the use of meta-data to search, sort and explore video. However the proposed approach allows users to be actively involved in the collection of meta-data, making the process more oriented towards a PD approach. Brandt et al.'s work [6] also provides similar approaches where participants in a diary study use short messages or pictures while mobile to complete the entries online when they are at home and more available.

4.5 Informal interaction and social networks

An informal analysis of videos showed many aspects of the space that could trigger ideas for designs. It provided both inspiration and information on how to use the space to enhance remote collaboration. For example, people waiting for the coffee to brew often look for something to occupy themselves, such as reading old newspapers. Once Zebra was installed, we observed that sometimes occupants of the coffee room would go to considerable effort to create a funny video for the people watching it. This could inspire the creation of non-work related links between collaborators to occupy themselves and encourage interaction.

On preliminary analysis of the data, patterns of social networks began to emerge. For example, many participants would take a coffee at regular times of the day, and sometimes coordinate their coffee breaks while some other times meeting in the coffee room by accident. Often, participants willing to discuss while in his coffee break would leave the otherwise locked door of the room open to facilitate informal interaction (Figure 6).

The use of tags as markers of participants' involvement in video files enabled an overview, which not only aided the participants in annotating their own experiences, but also revealed a rich relationship of groupings of people to activities in context. This activity while revealing people's daily routines in the space also gave the participants insights into each other's activities, interactions and engagements. This situated social network was raised in the workshops as an insight into colleagues' activities and had helped people adapt their own activities in response to their colleagues' routines. Revealing this previously hidden data had given participants new insights and opportunities to interact with their colleagues.



Figure 6. Captured informal interaction in the coffee room: lunch between staff and students

5. DISCUSSION

5.1 Engaging users in fieldwork

"I have been on [the website]. [...] Usually to read the comments that other people make. They're quite funny sometimes." (Zebra study participant)

Despite our assumption that researchers would be more prone to accept and interact with the probe, the limited number of contributions through the feedback interface raises strong concerns about engaging users in fieldwork observations with such tools. In our study, we identified provocation as a strong motivator for participants. We encouraged discussion and use of the interface by making funny videos, which would introduce the system to participants and allow them to get familiar with the system. Through challenging or entertaining aspects of the Zebra probe, we were able to temporarily elicit participants' reaction to its deployment. These reactions served to fine tune the available interaction with the device and raise issues of navigation in the provided web interface. Provocation seems to be a particularly suitable motivator when engaging users in fieldwork and PD in general. However, the nature of provocation raises issues of data validity and usefulness. An example of suitable provocation for engaging user is given in the participatory design alternative described earlier. By feeding the video data back to the observees while they are available to interact with it, a system could prompt users to react on it and record reactions.

The low level of engagement of users with the feedback interface reveals that more could be done to ensure the capture of data, as suggested both in the participatory design and augmented diary alternatives given above. The mechanism of entering feedback should also be improved and tailored to ensure ease of use and input. Brandt et al. [6] provide one possible alternative for

facilitating users' implication in observations. The use of different medium and feedback types could also be investigated. The use of different input points (dedicated website, on-site audio or video commenting, ...) can support the participants when they wish to provide feedback on the available data. For example, a console could be provided just next to the capture device for the user to easily enter comments and tags, or possibly just mark this video as "of interest".

5.2 Engaging users in design exercises

The nature of the participatory design process around the study deployment enabled participants to engage in a manner that was less intrusive to daily activities and routines. The background deployment of Zebra in a commonly-used public environment let participants become familiar with the presence of the device, interface and main system features. The extended period of the study deployment let participants engage in their own time, choosing when and how they wished to be involved with collating and analyzing data.

The gradual deployment of the Zebra features over time helped renew interest in the tool, while gradually building participants' knowledge of the possible interactions and increasing the level of control they had over reflection of the captured moments. The formal sessions of researcher-participant engagement and feedback were short, considering the one-month deployment of Zebra. The three hours cumulated reflection on the device (during interviews or workshops), its usage and use outside of the deployed context, required a minimal investment from participants while efficiently maximizing the feedback and dialogue to ensure participants felt both informed and engaged in the process. By using this process, most of the shared understanding about the design was built over time through participants' exposure to the Zebra probe and opportunistic discussions as well as the formal workshops.

Our belief is that using a technology probe as at the beginning of a design process allowed participants to fully engage in it without requiring lengthy introduction. By experimenting with the probe, they are challenged in their way of thinking and are given the opportunity to begin an informed reflection about the design space in which we are designing.

Conversely when the focus of the technology probe is narrow, the researcher would benefit from ensuring that what it gathers is data directly analyzable. Clearly, a compromise needs to be found between the "inspiring" and the "informing" aspects of the technology probe prior to its deployment.

6. CONCLUSION

This paper has described a study that used a technology probe we called Zebra as the centerpiece of a participatory design for an observational tool for fieldwork. The study took place in a common space of an HCI research lab, whose researcher-participants were both participants in a study using the tool, and collaborators in the design of the tool. During the study, participants became active collators of contextual data on recorded video clips, ranging from adding single comments and tags to leading discussions. Researchers drew upon personal experiences with the Zebra probe and explored their familiarity from a research perspective to inform the design critique.

Engagement during workshops enabled a continuous flow of data to be collated on both the material captured in the study of

informal interaction and the discussion of the study and technology probe deployment. This was made possible without extra burden on participants through timed workshops and subtle encouragement to interact with the system (as well as personal motivation and investment).

The results of the study are presented as alternatives to the proposed naïve approach of the observation tool, grounded in both the interviews with the participants and their recorded experience as raw video and as tags and discussion through the web interface. Moreover, the study illustrated how a technology probe was used to ease the cost of engagement for busy participants in the design of the tool. It illustrated the potential of using the tool in fieldwork. It also highlighted the critical need to find ways of engaging users to provide feedback using motivations and provocations. Future work will allow the refinement of the tool to converge on a suitable design. Such work will certainly involve a prototype being used in a study with different users.

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