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Giulio Jacucci [a] & Minna Isomursu [a]
[a] University of Oulu, Finland

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Facilitated and performed 'happenings' as resources in ubiquitous computing design

Giulio Jacucci and Minna Isomursu

University of Oulu, Finland

{giulio.iacucci, minna.isomursu}@oulu.fi

Abstract

Use experience has been proposed as a primary goal and driving force in interactive system design, raising the issue of how evidence can be gathered to design for 'use experience'. According to particular views in anthropology, experience can be studied analyzing its expressions. We provide examples of this, from two projects: the configuration of open prototypes in a co-development project to create a mixed media environment to learn architecture design; and an evaluation technique for mobile and context aware services in a city centre that puts participants in the condition to express and record comments. In the discussion we propose resources for experience and its expression in 'design happenings': performance space, props, and interactional creativity.

Keywords: ethnographies, participation, performance, ubiquitous computing, use experience

1 Introduction

Moving computation from the virtuality of the screen to the physicality of the real world has brought into consideration the evaluation of designs that go beyond usability, including cognitive to phenomenological approaches. In particular, use experience has been proposed as a primary goal and driving force in interactive system design. Beside conceptual frameworks that explain use experience (e.g. Forlizzi and Ford 2000), questions remain of how evidence can be gathered to design for use experience. In particular the individual character of experience and the difficulty of explicating it with verbal means, indicate the need of devising 'design sessions' where people can participate providing insights into how they experience technology use in context. We provide examples from two projects proposing features of formative and evaluative design sessions that we found successful in providing insights into use experience. In the first case, co-developing a tangible computing environment for architecture students, we describe how scenarios of use were performed with students during their daily work using mock-ups. Moreover we show how trials were organised with open prototypes to allow for reinterpretation of technology by students. The second case describes an evaluation of mobile and context-aware services in a city centre. We describe how the evaluation was organised to collect insights from use experience.

1.1 On experience

The concept of experience has many roots and has been treated in different contexts, several

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of which are relevant to our discussion. We choose to refer to one of these roots namely the German thinker Wilhelm Dilthey (1833–1911) for whom the concept of an experience, *erlebnis*, is what has been 'lived through'. Dilthey wrote that "reality only exists for us in the facts of consciousness given by inner experience". The analysis provided by Dilthey has been found useful by anthropologists who sought to investigate how individuals experience their culture, and how events are received by consciousness (Bruner 1986). According to this view experience is not only "the diluted juice of reason" (Dilthey) but also feelings and expectations. While behaviour implies a routine that one goes through, an experience is personal as it refers to

> *an active self, to a human being who not only engages in but shapes an action. (Bruner 1986 5)*

Our discussion is about how we can investigate the experience of technology use. The difficulty is that we can experience only our own life, "what is received by our own consciousness" (Bruner 1986 5) and we can "never know completely another's experiences" because even if they are willing to share them, they censor and repress, or have not the means to articulate certain aspects of what has been experienced. So how can we overcome the limitations of individual experience? Following Dilthey's answer we "transcend the narrow sphere of experience by interpreting expressions" where expressions are representations, performances, objectifications, or texts. According to Bruner

> *Some experiences are inchoate, in that we simply do not understand what we are experiencing, either because the experiences are not storyable, or because we lack the performative or narrative resources ...There are inevitable gaps between reality, experience and expressions. (Bruner 1986)*

Applying these ideas to the design of interactive systems can translate into seeking ways to engage people (as prospective users) in situations where they can experience designs. Moreover people need appropriate resources to create expressions that provide insights into their experience of a situation.

However,

> *in this perspective an expression is never an isolated or static text. Instead, it always involves a processual activity, a verb form, an action rooted in a social situation with real persons in a particular culture ... (Bruner 1986 7)*

Expressions are therefore not isolated objects but something that happened, a contingent process to specific physical, social and cultural circumstances.

In the examples in this paper we show how use experience can be designed for by devising and facilitating 'happenings' where people can be engaged to experience designs. These happenings need to be organised providing the right resources for participants in order to create expressions that are providing useful insights on how technology is experienced in use situations.

1.2 Related work

Several works have been published describing novel techniques—as, for example, various types of group performance—to experience ideas during early design phases (for a review see Iacucci and Kuutti 2002, Iacucci, Iacucci and Kuutti 2002). However more mundane performative activities have been long present in interaction design most notably organised and analysed under approaches coming from cognitive psychology (see usability tests and task analysis). A radically different approach to performative situations has been documented in the participatory design movement, where these were seen as moments of user-designer dialogue and user contribution. According to Ehn and Sjögren (1991), descriptions can be reminders of past experiences, and representations can be used in the language games of design to "create a common language, to discuss the existing

reality, to investigate future visions...” In cooperative design open-ended representations allow users to simulate future work by creating hands-on exploration of emerging design: “artefacts including representations, develop over time based on use” (Kyng 1995). As examples of representations of work, Kyng mentions work situation descriptions and use scenarios. The former are reminders of situations and the latter are not detailed descriptions of artefacts and their use but try to “recreate a context for experienced workers to exercise the mock-up/prototype”.

Buchenau and Suri (2000) propose an approach to design called ‘experience prototyping’

> *to emphasise the experiential aspect of whatever representations are needed to successfully (re)live or convey an experience with a product, space or system.*

This and other approaches have applied as means of maintaining the integrity of experience: collecting stories (e.g. Mäkelä and Mattelmäki 2002), various kinds of probes, or performative sessions. Cultural probes, for example, were developed to collect user’s beliefs, desires, aesthetic preferences and cultural concerns (Gaver, Dunne and Pacenti 1999). The problem according to Sanders and Dandavate (1999) is how to access experience, as “each route reveals a different story”, beyond listening to what people say, and watching what people do. In particular, “special tools are needed to access the deeper levels of user expression”.

Various types of performance have been proposed to engage people and experience design ideas. Techniques ranged from exploring scenarios using mock-ups or Wizard-of-Oz techniques, to testing scenarios with prototypes. In a review (Iacucci, Iacucci and Kuutti 2002) we have identified three different roles of performances in design: they can support exploring and inventing ideas, communicating a scenario, and finally they can be useful in testing and experimenting with an object. For example, situated bodystorming techniques have also been recently applied to the design of mobile and ubiquitous computing (Iacucci and Kuutti 2002, Oulasvirta, Kurvinen and Kankainen 2003). Buur et al. report of various ways to use video as a design material together with users. One of the cases presented contains improvised video scenarios of use with a mock-up recorded by the users themselves. Particularly interesting is the work of Steve Mann in the design of wearable computing applications (Mann and Niedzviecki 2001, Garabet, Mann and Fung 2002). Through performance art in public spaces, wearable computing is presented

> *in a deliberately unusual manner where it is left up to the people interacting with the device wearer to imagine the intent of the device.*

Benford et al. (2002) discuss how organising public performances allows designers to carry out comprehensive evaluations of mixed media environments by providing a way to engage people in a real setting.

2 Co-developing a tangible computing environment

The first case is taken from the ATELIER project (http://atelier.k3.mah.se/) at one of its application sites, the architecture department at the Academy of Fine Arts in Vienna. The objective of ATELIER is to develop a tangible computing environment in support of project-based learning of architecture design. The ATELIER project is based on an iterative process of two cycles of development and trial. The project started with a period of intensive field observations during which episodes of various type where recorded: ranging from observations of daily work, to students explaining artifacts to the participant observer. The episodes reported here all took place after the field observations when prototypes were already available.

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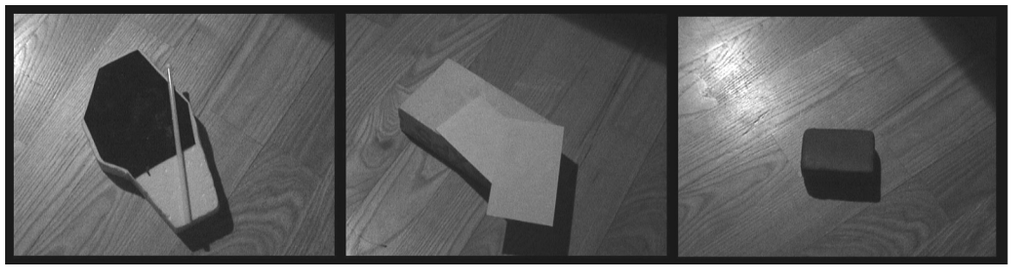


Figure 1. Mock-ups: (left) pocket PC, (centre) magnetic tag reader, (right) small sensor box.

The first episode we describe shows how we encouraged students to envision and perform scenarios in their work setting with mock-ups of technology. Part of the prototype development happened concurrently and part was carried out in co-development with the students during trials. The second episode is taken from such a trial and describes the extension made to prototypes during student's projects. The environment has several physical input components (RFID tags, sensors, infrared tracking, etc.), digital output components to play and process media files, mobile applications, a hypermedia database. A digital infrastructure and simple configuration tools provide the possibility to configure input and outputs. Finally a physical infrastructure was realised to create projections set up in the space with multiple projectors.

2.1 Envisioning future technology use with mock-ups

We constructed mock-ups of technology we were likely to develop in the project (Figure 1) and observed participants were provided with these in their environment.

The observer and the participant in the session acted out and discussed use scenarios as interesting situations arose (see Iacucci and Kuutti 2002 for a detailed discussion of this type of recording). In the following we present some recorded episodes of this performed scenario with Paul, one of the selected participants to be shadowed.

Episode 1: physical interface to retrieve media
Paul was already using one of the prototypes (the animating bARcode) that allows one to attach barcodes to the physical model to animate them with pictures, videos and sounds. He envisioned that during the project, digital pictures are automatically printed as thumbnails next to a barcode, and they can be grouped on the wall. The images can be viewed and organised using a pocket PC. (This was implemented)

Episode 2: project board
In the entrance of the room there are barcodes that are associated with a calendar of the project, contact list and messages (This was not implemented) (Figure 2).

Episode 3: movable parts in models
Paul attached the sensor box to a part of his model and envisioned that movement of the parts could be recorded as particular animation of the model that could be played with the virtual model he made, or trigger actions by the system. (This was not implemented).

Episode 4: browsing media with gestures
Paul connects pictures to barcodes without using the desktop PC. The sensor box is used to browse pictures with gestures. The pictures are displayed on the wall or on the pocket PC (This was implemented).

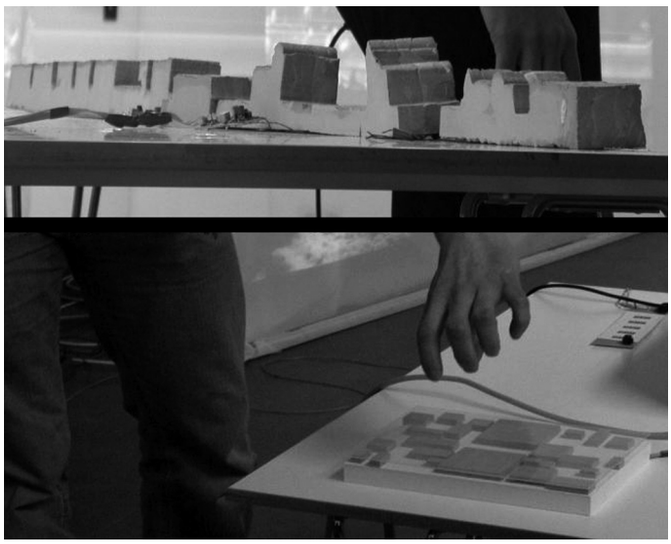
Figure 2. Using mock-ups as interesting situations arise.

Figure 3. The original prototype proposed to students.

2.2 Staging use in trials as co-development

We organised a two-month trial to test some of the prototype components of the environment. We provided students with a room, and 'open' prototypes and help to extend them and integrate them in their projects. The prototypes we provided were open to reinterpretation by participants and could be tailored with our help. We provided barcodes and scanners, RFID tags, and touch sensors. Using physical interfaces such as sensors, tags, barcodes, and projection set-ups, students configured the space to create interactive installations.

Figure 4. Reinterpretations, sensors integrated into artifacts.



An example of how prototypes were extended and co-developed with students is the case of several sensors that were originally presented in a wooden cube (Figure 3). The 'control cube' contained several touch sensors, six tilt sensors, and made it possible to recognise which side of the cube is facing up. Originally the device was designed for selection between six choices or to associate digital material to different gestures as for example knocking or stroking.

During the trials these technologies were used to integrate interactivity in physical objects as shown in Figure 4. In the upper photograph, a student integrated sensors in the model of a section of a stadium, to trigger the playing of media. In the lower picture a small model with sensors is used during a presentation as one of the interfaces to three different projectors. The students were able to reinterpret the technology that was originally presented to them, by inventing a new use for it. This exemplifies the importance of facilitating the adoption of prototypes and their reinterpretation, enabling users to express deeper contributions to design. The particular way we did this was by organising the trials in a real setting, where students had to use our prototypes to carry out their normal projects. Moreover we provided support to extend and develop the prototypes.

3 Users recording 'experience clips' with camera phones

The second case we present is taken from a project that aims at evaluating context-aware mobile applications in a real-world environment and with real end users. The research was carried out in a city in Finland. The initial problem we were faced with was how to collect feedback on user experience in trials of location-based and outdoors applications in versatile use situations. The trial area included the whole pedestrian area of

the city centre, where the project team had set up a wireless LAN with a positioning service. The prospective users we considered were all citizens walking around this area. The context-aware applications evaluated were mainly two:

1. a location-aware map, the user could see her location on the map and could search for landmarks and businesses located in the city area;
2. context-sensitive advertisements were pulled according to the context, e.g. location and profile of the user.

The applications were used with PDAs that were loaned out without a fee to people visiting the city center during a research period of one month. To get a PDA the users were requested to complete a simple user profile and agree that their actions would be logged for research purposes. The kiosk used for lending the devices and instructing the users is illustrated in Figure 5. The users were people that happened to pass by and became interested in the trial. People often walk in a city centre in small groups; with friends, colleagues or family members. So we recruited people with the information kiosk, and equipped one participant within each group with a PDA, the prototypes and another participant with a camera phone for recording the usage situations. During the experiment, a total of 36 people acted as observers with camera phones. People often changed roles, i.e. the PDA user became the observer and vice versa. Our procedure during the field test was the following:

1. Instruct the PDA user on how to use the application. Also, give instructions to the observer on how to record video clips. The instructions were the following: a) record as many clips as possible, b) use the camera phone for capturing experiences related to the usage: failures, success, surprise, joy, anger, etc., c) aim at the user of the PDA, not at the PDA screen.
2. When the users return with the devices, ask them to describe what they did, how they used the device and how the applications behaved. We encouraged storytelling.

Figure 5. The information kiosk used to recruit participants.

The rich material collected using the experience clip technique was analysed by our research team. The evaluation sessions provided user responses on technical aspects, user interface remarks and results about services. The users participated by expressing their opinions, design comments and ideas.

The field test material naturally revealed problems in the basic technical operation of the system. We saw our users struggling with long response times and system failures. Network failures were frequent. Many experience clips were direct messages and expressions of frustration towards the device. The following clip shows an example how the users sent direct messages to our research group:

PDA Participant: *Yes I can say this because we were told to do so*. PP looks at the device and looks slightly irritated.

Camera Participant: *Say it once again*. PP holds the device at an arm's length and examines it

PP: *I am so mad. I do everything right but this does not work*. User walks the street and looks angry.

Figure 6: (left) A frustrated user .(right) A user puzzled with the positioning system.

CP: *You look awfully angry*. User makes a face at the device.

PP: *This is so irritating! Damn…connecting… OKAY!* CP laughs. PP reads the message from screen.

The users found the location-aware map fascinating. They followed the dot moving on the screen so intensively, that they hit other pedestrians and even bicycles, and did not notice their friends that walked down the street. This would probably change with long time use, but must be considered when context sensitive actions are automatically performed in the display of the mobile device. Excitement related to the location-aware map is illustrated in the next experience clip. This clip also illustrates well the spontaneous emotional responses we captured with experience clips.

Camera Participant: *Does the dot move?* Two young boys are walking on the street.

PDA Participant:: *It moves now!* PP is excited.

CP: *Wow!* CP stops.

PP: *Check it yourself!* PP moves towards CP and shows device screen.

CP: *Show it to me too.*

PP: *It was there a moment ago, and now it is here.* PP shows the route on the screen and sounds amazed.

Our case demonstrates the advantages of the experience clip technique in answering the challenges posed by mobility and evaluating use experience. In particular other techniques we applied were not as useful: using traditional methods such as questionnaires and interviews did not provide interesting insights into use experience, and collecting data by 'shadowing' with a video camera evidently disturbed and inhibited the users. The tools (camera phones) and procedures (public participation) we devised, enabled video recordings of usage situations in 'the wild'. By eliminating the disturbance procured by the presence of the researcher, prospective users were able to free themselves from inhibitions. This resulted in recording more realistic situations, but also induced users in creating 'genuine' expressions as short performances that could be directly used to evaluate use experience.

4 Discussion and conclusions

4.1 Performed and facilitated episodes as design 'happenings'

We described several types of facilitated and performed episodes for exploring or investigating experience of technology design. We propose to call these lived episodes 'happenings'. We can draw an analogy with performance art where the work may be presented anywhere not always following a script. Participants include not only the artist or the spectator but also strangers (Goldberg 2001). The artist might frame a particular aspect of everyday life. The work lives on as a photograph and a textual account sometimes also as a video. As an example, *Following Piece* (1969) of Vito Acconci (Moure 2001) where Acconci is choosing

> *a person at random, in the street, any location; following him wherever he goes, however long or far he travels (the activity ends when he enters a private place—his home, office, etc.).*

This piece exists as a record of a performed episode. Allan Kaprow a pioneer of

performance art used the word 'happenings' instead of

> *theatre piece or performance because he wanted this activity to be regarded as a spontaneous event something that just happens to happen. (Carlson 1996)*

Although some of these pieces were carefully prepared and rehearsed, performance art helps to explain a new way of considering records of episodes. As designers inquiring about use experience one of our aims is to create 'happenings' that further our understanding of technology design and use.

4.2 Resources for experience and its expression in design

The analysis of the two cases indicates three resources that promote experience and its expressions:

Performance space: creating or choosing the right space where the expressions can be performed. In the second case we presented, the right space was created by eliminating the presence of the researcher and by encouraging recordings in the city centre between participants that knew each other. The mobile camera phone also contributes to create the right space, as it was non-obtrusive as a video camera would have been, but it also provided an opportunity or pretext for the participants to perform expressions. The performance space as a resource is also evident in some of the related work we referred to. In Steve Mann's work performance art is used in a provocative way in public places. In this case the performance space is provocative and the participants are unaware (Mann and Niedzviecki 2001, Garabet, Mann and Fung 2002). Also Benford et al. (2002) show how comprehensive evaluations of mixed media environments can take place in public performances as they provide a way to engage people in a real setting.

Props: with props we mean all those devices and tools that support and encourage expression. In our first case props are, for example, the mock-ups (Figure 1) that encouraged the performing of scenarios or the open prototypes that encouraged reinterpretations by the students. Props are in these cases generative constraints, helping to form and perform expression.

Interactional creativity: the process of externalising experience, in our examples, specifically made use of interactional creativity as a resource. In the second case there are at least two participants. Previous work has shown that it is easier for people to express opinions and ideas about a product when they interact with a person they know (Kemp and van Gelderen 1996). Interactional as opposed to individual creativity recognises the importance of the 'other' and the context in producing expressions. Reviewing various forms of performances in design, we can better articulate how interactional creativity is an imaginative resource for participants (Cf. Iacucci, Iacucci and Kuutti 2002). Utterances or acts can be interpreted and 'reacted to' by some other participant, as in the first case, the scenario of use of the mock-up emerges collectively between the student and the designer. In this case utterances or acts can maintain or can be part of the fictional space in which participants are performing. Moreover, interventions in the physical world during a performance can be inspiring, enlightening or provocative.

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Minna Isomursu is a professor at the Department of Information Processing Science, University of Oulu, Finland, from which she received her PhD in 2000. During the past twelve years she has held several research positions in software engineering, user centered design and digital multimedia as well as mobile and ubiquitous applications, in both academia and industry. Her current research interests are digital media, community communication and user experience in mobile and ubiquitous environments. She has published over 30 research publications in scientific journals and conferences.

Giulio Jacucci is a researcher at the Helsinki Institute for Information Technology. He has worked at the University of Oulu where he completed a PhD applying an anthropology of performance to the design of mixed media spaces. He has published technological works as well as ethnographic studies in the areas of ubiquitous computing, tangible interfaces and mobility. His current research focuses on ubiquitous multimedia and changing practices of configuring-perceiving expressions in communicative events.