Designing The Art Experience: using Grounded Theory to Develop a Model of Participants' Perception of an Immersive Telematic Artwork

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Abstract. At the heart of our enquiry lies the need for a deeper understanding of the experiential quality of our interactive environment, Radiomap. This easy-to-use immersive telematic environment can be used by one or more individuals to listen to live radio stations from all over the world. We interviewed sixteen individuals and employed a Grounded Theory approach to get a better understanding of visitors' experience with the application. The data analysis allowed us to develop a detailed picture of the various experiential qualities of the environment and also to create a visual narrative of the successive phases of the experience. This knowledge gave clear insights into the strengths and weaknesses of the application but also of the properties that impeded the conceptual artistic goal of the experience.

Keywords. Qualitative methods, grounded theory, telematic art, immersion, art and design methods and methodologies

"Meaning is an aspect of use, interaction and practice, it is something that resides primarily in the hands of the user, not of the designer." Dourish, 2001, 172

1 Introduction

Over the past decades, novel methods, often adopted from the social sciences, have established themselves in product design, interaction design and Human-Computer Interaction (HCI). These mostly qualitative methods have become essential in industrial design and interaction design so that consumers can use software applications as well as physical products with more comfort, ease and in a more intuitive manner. Among these methods are use-cases (Jacobson, 1995), scenarios, case studies (Stake, 1995), user observation, interviews and task analysis (Preece, Rogers & Sharp, 2002,

231). The proliferation of these methods has made a crucial difference to the quality of the artefacts that surround us and in how we use and perceive them. However, in the interactive arts there appears to be little interest in a thorough understanding of how the audience perceives interactive work and applying these types of methods, although often the very same principles and paradigms of computer interaction may apply. Why is that so? What can artists lose by knowing how their audience perceives their interactive work? What can they gain?

1.1 The Software Application and an Overview of Methods

Our own experience of evaluating visitors' experience with our software application has been very positive and we won valuable insights. In our study we were interested in how our visitors perceived their interaction with Radiomap, an interactive environment that allowed them to listen to live radio stations from all over the world. In this environment participants walk upon a photorealistic map of the world that is updated every five minutes. They use a mobile ring element, overlaid on the map image, to navigate the space and select radio stations, which are indicated by small red dots. This ring element is connected to their position via an augmented line and positions itself to their direction of movement upon the map. Up to three participants may share control over this ring element as their individual augmented lines connect them to the ring element and they all share an equal amount of control over the navigational interface. Once the ring is navigated to a station, the ring changes its colour indicating that the radio stream is buffering or playing. Before our study we observed participants getting excited and immersed in the interaction; we attempted to get a thorough insight into what constituted these effects.

As the experience appeared to be emotional and multi-layered, accounts in individuals' own voice would give us a direct knowledge of the experiential qualities of the interactive installation. Quantitative data such as how long they used the application or which the most popular stations were would give too much room for speculation – and little insight into the experience as such. Analysing interviews on the other hand, would result in a clearer model of how the participant actually perceived the interaction. This knowledge again would allow us to understand, facilitate and "improve" its artistic-conceptual aims. We used interviews, together with visitor observation, to develop a Grounded Theory of participants' experience, a qualitative method borrowed from the social sciences. This promised to be appropriate for understanding how people use and experience an existing application of very low interactive complexity that is not goal-oriented.

1.2 Our Adapted Grounded Theory Approach

Grounded Theory is a type of qualitative research that often includes interviews and observations. It uses a prescribed set of procedures for analysing data and constructing a theory out of this data. The theory emerges out of the data itself, while the questions are informed by the phenomena under investigation (Yates, 2004, 201-210). Among

the experiences we were interested in, were those that can be linked to HCI theories about virtual environments and telematic environments. Among these theories are *transportation* and *spatiality* (Benford et al., 1998), *presence* and *immersion* (Lombard & Ditton, 1997), and which properties of the application constituted them.

A Grounded Theory approach normally gathers data about an environment from the people who live within it. In our case, this environment was a software application used within a setting created by us. We were interested in specific phenomena in how the interactive environment was perceived, and in the overall experience. Patterns and categories emerged from the data itself in the visitors' own voice.

Grounded Theory analyses data through three stages: *open coding* followed by *axial coding* and finally *selective coding*. During the final stage the concepts and categories lead to a narrative which allows the researcher to develop a theory of experience grounded in the original data.

The method provided both surprising and invaluable insights into the mental model that visitors had created of the application and the narrative they constructed for themselves. The analysis clearly revealed misconceptions, resulting in practical knowledge to amend the interface in a manner to achieve the desired experience.

2 Radiomap, an Immersive Telematic Environment

In our interactive environment, participants walk upon an 8m x 4m projection of a photorealistic, live map of the earth showing day and night regions. Depending on their location upon the map, participants tune into live radio broadcasts from the corresponding place on earth. The selected stations usually have a strong local content and programme format. The artistic-conceptual idea is that these broadcasts, together with the immersive setting of a darkened space and the disorientating viewpoint of walking upon a photorealistic live map, enable participants to perceive the earth and other cultures from a new perspective. This change of perspective lies at the heart of the artistic-conceptual idea: creating enhanced experiential qualities such as a collective and holistic experience of exploration, surprise, longing and belonging, mediating between the individuals in the installation and the cultures of the broadcasting places. In several interviews we were able to record experiences of connectedness, global awareness and reactions reminiscent of an *overview effect* as described by White (1987).

In Radiomap, a graphical user interface, interaction design principles and artistic-conceptual aspects come together, forming a work of art drawing from multiple disciplines. The participants' experiences are supported by a complex technical setup in which three different computers exchange video-tracking data in realtime, generate the map and render the augmented interface. Unaware of this technical background, the participants should perceive the interaction as intuitive and the application easy to use.

Supported by The Computer Arts Society of The British Computer Society and The Design Research Society.

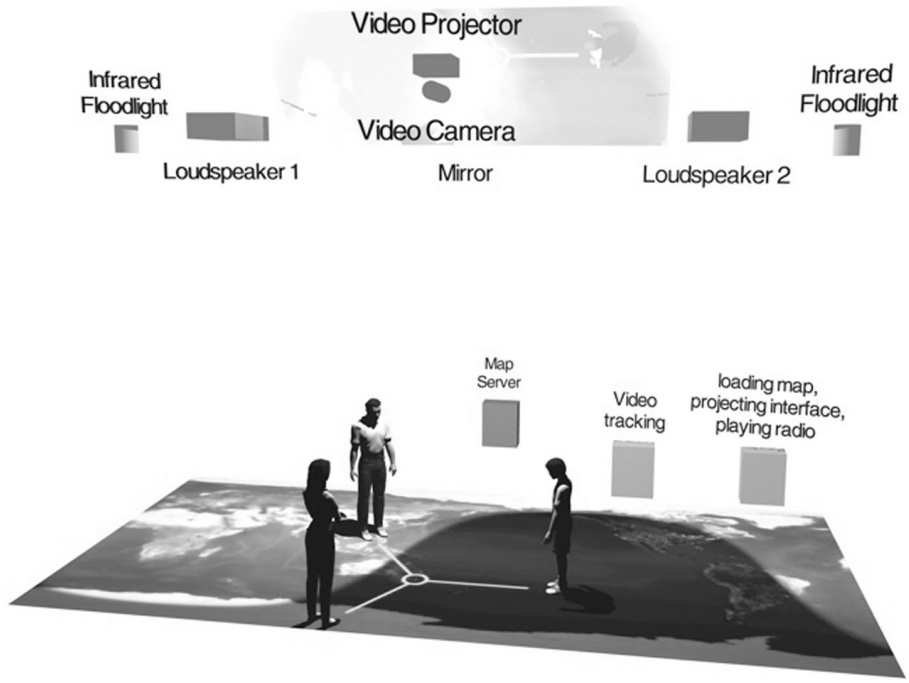

Figure 1: Three collaborating participants exploring the immersive, telematic environment version of Radiomap. Their individual lines are connected with the augmented ring interface used to select radio stations. Radiomap application by Michael Hohl and Stephan Huber. Map image by © www.livingearth.com and Hari Nair's Xplanet.

Our adapted Grounded Theory approach allowed us to develop a *user-model* of the interactive experience that was distinctly different from the *artistic-conceptual-model* just described.

3 Thoughts on Art, Design and Methods

Art and design have in most cases very different agendas. A designed *product* is made to fulfil a specific function and purpose. If this function is not intrinsically clear the use of the product is perceived as ambiguous and perhaps as a result as confounding and frustrating. In interactive art exactly this ambiguity may be the intended experience. Here the interaction is not necessarily goal-oriented and does not "function" in a traditional sense. The work draws the power it exerts over us from this ambiguity; from a deeper engagement, exploration and building a mental model of the interaction with it during this process. We could also say that while interaction design is a transparent vehicle to perform tasks with ease, interactive art can be based upon an anti-transparency (Bolter et al., 2003) where the process of deconstructing and exploring results in an insight that is perceived as the reward.

Design and HCI have shared interests are both are involved in finding answers to complex problems. Rich scientific knowledge is steadily informing design practice, yet, without turning it into a science (Bonsiepe, 1994, 125). In Radiomap the artistic concept requires a design solution that specifies the overall factors of appearance and behaviour, which in turn influence the softer poetic sides of the artistic-conceptual idea. HCI with its rich research history provides the appropriate tools and theoretical frameworks to bring together, in an orderly structure, the different aspects of designerly making and theory necessary for the project.

Applying social science methods to evaluate an art project may form an unusual construct, as an artistic undertaking usually does not attempt to systematically measure the effectiveness of a work or improve its performance whereas in industrial design, interaction design and HCI this is a common practice.

Vera Molnar, a pioneer in computer arts, was unusual in adopting an approach based on user experience. To understand how visitors perceived her own work, she suggested in the 1970s to track physiological reactions of the audience, including eye tracking, to gain a better understanding of how it was perceived. Her intention was to increase control of the work's effects with the aim of improving them (Popper, 1994).

For the artist, the technology is the medium to express an idea. In some cases, perhaps, the expressive technology may be selected *before* the artistic-conceptual idea is outlined. This may regularly be seen in technology-led *explorations* of novel technologies. Unfortunately, these are often not labelled as such when presented to the public and regarded as completed works of art and not as works-in-progress. Individuals encounter these works and create their own personal experience – which may have little resemblance to what the artist intended.

Usually prior knowledge is necessary to appreciate the work. This knowledge may be an awareness of the process of making or, an awareness of the context in which it is presented or that it refers to. This specialist knowledge can also be seen as the greatest divide between the arts and the public. While in classical academic art, craftsmanship and style were important criteria, contemporary art has a conceptual and contextual content where the idea in itself may sometimes be more important then the medium or technique.

In technological art we can see craftsmanship and the idea moving closer again; a specialist knowledge of making and electronics is required. Once the discipline matures beyond a technology-led "arms race," it may be the conceptual idea again that counts. So how important is it for the spectator or participant to be aware of an interactive piece's technical background? How transparent does its interaction have to be?

Another recent phenomenon is the emergence of provocative and stimulating art from a design background. Perhaps by designers looking for a new assignment in a saturated culture that is shifting from material artefacts to services. Among the most prominent of these designers are Anthony Dunne (Dunne, 1999), Fiona Raby and William Gaver (Gaver and Benford, 2003). They have been rethinking design, and giving it new challenges by creating ambiguous, critical and provocative artefacts. Their works do not solve problems, as design usually does, but make us question our relationship with technologies on a more fundamental level.

4 Developing a Grounded Theory from Interview Data

The main research interest for our interactive environment study was to find evidence for participants' experiences of *global awareness*, *interconnectedness* and *overview effect* among the effects of the Radiomap environment and also to gain an understanding of those *properties* of the application that created these effects. Additionally, it attempted to gain an understanding of the usability of the augmented interface, the *collaboration* process among participants and of the perception of *telematic space* and the *body* in this embodied interaction. Some of these experiences had been reported in an earlier screen-based version of Radiomap.

Our interviews were semi-structured and open-ended. Initial questions were clear and distinct, while the majority of following questions served the task of keeping the conversation flowing, allowing visitors to express themselves.

As visitors came upon invitation and the research setting of the installation was evident, the influence of the researcher upon interviewees (reactivity) cannot be excluded. Most visitors appeared critical and honest in their replies and there was no evidence of attempts to provide satisfying or benevolent answers.

After participants ended their exploration of Radiomap, they were approached and asked how long they had used the environment. Together with the notes from an observation sheet, this would give an insight into the degree of immersion, as perceived duration and actual duration may differ significantly. At times this was difficult, as many visitors had come with company. Occasionally, an interview consisted of the replies of two or even three individuals. While the conversation began visitors were asked if they minded if the conversation was recorded: none of the visitors had any objections. A handheld Canon DV camera was used for the interviews due to its easy handling and unobtrusiveness.

4.1 Analysis of Data

The results of the interviews, two sixty minute Digital Video (DV) tapes, were digitised and transcribed. Sixteen individuals were interviewed, eight of them male and eight female, in thirteen unique interviews. The interviews lasted between five and thirty minutes, resulting in approximately 9500 words. This text was printed out in a narrow column to leave sufficient space for codes, notes, memos and annotations.

In the initial open coding process, visitors' replies were coded into *general themes* or *categories* such as "emotion" or "perception". As the process is open and the data rich, the context and circumstances in which themes appear often allow for other significant themes to emerge as well. In practical terms, coding was accomplished by hand on the printout. People's comments were identified, categorised and grouped into increasingly clearer concepts. Once all interviews had been coded, identifying categories and patterns, we added relevant quotes into a second code-collecting document for axial-coding, following Grounded Theory procedures (Yates, 2004, 201-210), each time focusing on one specific category or pattern only and the context it appeared in. This procedure was followed for each pattern or category. Occasionally other items previously overlooked or multi-attributed were included.

The open-coding process attempts to reduce the vast amount of data to a smaller set of general themes. In our case these consisted of:

- global awareness - holistic overview - interconnectedness
- perception of the visuality of the map
- exploration and discovery, aha!-effect
- programme content: music and voice
- telematic experience - immersion - spatiality
- awareness of the body
- geography and culture

Data was also grouped under:

- ease of use - transparency
- the augmented ring interface
- alternative uses for the map
- the voice interface
- collaboration - communication – negotiation

Another category collated comments referring to the overall experience. During the open coding process it was important to remain open for unexpected findings. Unexpected themes included references to:

- a critical perspective towards globalisation
- expectations and stereotypes of radio programmes
- awareness of physical space, dance
- anti-aha!-effect (slow realisation)

These themes identified in the open coding sessions were refined during the axial coding into categories.

4.2 Distinct Themes Appearing in the Initial Coding Sessions

Figure 2 depicts the cluster of experiential themes as distinct categories.

The experiential categories visitors referred to most often are the following: The ring *interface* and its behaviour, the *performative* aspect of being observed and the closely related categories of *collaborating*, *negotiating* and *communicating* with other participants. Several comments referred to the body as an unusual interface and a changed perception of space. Very obvious were remarks about globalisation and post-colonialism which are seen as indicators that the environment while in fact successful in creating experiences of global awareness does permit a critical distance as opposed to a state of overwhelming immersion that perhaps leaves less faculty for a critical perspective.

A distinct category contains references addressing perception; occasions where interviewees reported how their direct perception changed. These were mostly comments about the space and the time individuals spent interacting. They would refer to how they *"lost track of time"* or mention a special quality of the perception of space; for example, *"you don't feel you are in a room."* One visitor described the experiential quality of the hearing experience as *"a sound window into the world."*

All visitors voiced an opinion about the augmented interface and the experience of interacting with it. They distinctly addressed individual interface elements, the voice guide, the ring element and its behaviour and appearance, the connecting lines and overall interaction. This comes as no surprise as this principle of interaction is not an everyday experience. A separate set of comments dealt with alternative uses for the application, including the learning of languages, teaching geography and learning about other cultures.

Figure 2: Distinct themes determined during the open coding process. They refer to the perception, insights and different types of experiences relating to the phenomena under investigation but also unexpected findings.

Axial coding begins after general themes and categories have been identified and new patterns have stopped emerging. The axial coding process attempts to learn more about each category, examines its context, relationships to other categories, their conditions and their consequences. Similarities and differences between the experiences of different individuals emerge. Patterns and relationships within the data begin to appear through thorough and repetitive examination of the text. In this process catego-

ries become increasingly refined and finer grained. Axial coding allowed us to acquire deeper knowledge about the individual categories determined during the open coding process. It examines the context within which a term appears, how the condition is triggered, strategies that participants develop and the consequences of these strategies. From the axial coding process a whole range of detailed categories was extracted, leading to the following analysis.

4.3 Orientation in the Interactive Environment

The dominating experience in the interactive environment was found to be one of *orientation* and learning how to navigate the map with the novel ring interface. Only two visitors directly address *exploration* as an intrinsic element of the experience, a slight evidence that they progressed from a state of orientation and perceived the interface as *ready-at-hand* and feeling at ease using it. For most visitors the unusual character of the interface and its behaviour received more attention than its intended purpose as a *function* of the interactive installation, used to navigate, access and listen to radio stations. In one of the very first sessions it took a visitor ten minutes to successfully listen to a radio broadcast. She believed the interaction to simply consist of navigating the augmented ring element across the map. In this case the delay between selecting a station and the sound beginning to play was too long. This led to the crucial insight that our ISP's routing tables appear to be cleared every 24 hours. To allow stations to play almost immediately upon being selected required us to access all stations once, on a daily basis, before visitors arrived.

An additional effect is the voice guide announcing the connection to a radio station, for example, "ABC FM, Melbourne, Australia." While some visitors experienced the voice guide as disturbing their flow of experience, others regarded this feature as positive.

Additionally, the interface provides an unfamiliar experience of walking upon a photorealistic map, a perspective without the clear "top" or "bottom" perspective of an observer. Parts of the map are also lying in darkness as a result of it being night in this hemisphere. While orientating themselves, participants may also have to collaborate with other participants, during which they may be observed by spectators.

The attention necessary to engage deeper with the content and reach a possible *flow-experience* (Csikszentmihalyi, 1981), is continuously diverted by an external engagement shared between controlling the ring element via bodily movement and complex social interaction with other participants. This provides a continuous obstacle of proceeding into a state of deeper, cognitive immersion.

Most visitors would have been familiar with common screen-based GUIs operated with a mouse. Through regular exposure, such an interface becomes intuitive to use. It is ready-at-hand and requires little or no conscious attention. Even for the novice user it "disappears" from conscious attention very fast, allowing the user to focus less upon this external interaction process itself than on intuitively manipulating the actual content. Engaging with the augmented ring element of the interactive environment is unfamiliar, as motion of the whole body is necessary to interact with the system.

Additionally, collaborating with other participants to control the interface requires a visitor to *communicate* with them. This implies all the related complex social and convivial characteristics associated with *speaking*, such as making eye contact, speech acts, physical gestures and social status behaviour. This creates another layer of complexity that distracts attention and prevents immersion into the actual environment. The performative aspect of being observed by other visitors at the same time adds to this overall complexity. Collaborating participants find themselves in a continuous cycle of orientation, negotiation and re-orientation, which interfers with a deeper stage of individual immersion. An indicative comment was: *"When I used it on my own, I had a relationship with the circle, [...] when I used it with you, I had a relationship to you."* Interviewee 02

5 Conclusions

The experience of Radiomap is complex and structured in distinct phases which build upon each other. On the basis of our evaluation we acquired a clearer model of how participants encounter the work.

5.1 Understanding the Participant's Experience

A visitor commented that it was impossible to describe the experience to a third person as the knowledge about it could not be adequately conveyed in words. Visitors step onto the map attracted by its visuality. They find themselves in a state of curious excitement and an unfamiliar situation. They discover that the augmented ring attaches itself to their movement and they explore the reactions of this interface by moving across the projected map image. Once participants discover the ring's purpose they enter a phase of consciously exploring the behaviour of the interface. Their attention is focused upon its novelty and behaviour. Thus exploring the map is secondary after exploring the interface, because it is new and unfamiliar. Any sharing of the agency of the ring with another individual results in a further division of attention, as this requires communicating and negotiating with the other person.

While becoming acquainted with the interface, adapting to its behaviours, visitors encounter the voice guide that announces the radio stations. The sooner the radio programme itself starts playing, the clearer the association between action and response. Initially unaware of its live radio character, participants gradually become aware that it is live radio they are hearing. This realisation enhances the situation into a *live-experience* of increased attention, excitement and immersion. Once they have become aware of this, participants *recontextualise* the mental model that they have made of the interactive experience. Their actions become more directed and they begin to explore the map consciously, searching for radio stations in areas they are interested in. They have built a mental model of the reactions of the interactive environment related to their activities.

Depending on a variety of factors, technical and psychological, some participants proceed into an enhanced state of awareness. They become more deeply cognitively

immersed in the interactive environment and its radio broadcasts. This deeper state may result in a number of conscious realisations. Eight visitors had experiences of global awareness, holistic overview of the world or of connectedness with the remote place they listened to. One visitor alluded to this by saying: *"While I was doing it, I learned something about myself, about the world. It made something conscious that wasn't there before."* (Interviewee 02). Participants may have become aware of the variety of different times of day or night on other continents, of different seasons, dialects and languages. They gained insights into cultural differences and became aware of different patterns of musical interests, radio jingles, and news reports of the same topics. Some developed a "big picture thinking" of the world, experiencing it in this live-state. Some participants are drawn into the telematic space and their perception of the local space changes as it loses some of its conventional spatial properties.

5.2 Collaboration and Negotiation

Collaboration among participants was intended to be a fundamental part of the artistic-conceptual idea of the immersive environment, allowing participants to become aware of the necessity of collaboration from a local to a global level. The similarities between the microcosm of local collaboration in Radiomap and the macrocosm of global collaboration in the world was something it was hoped participants would recognise.

The adverse side effect of the collaboration among participants has only been discovered in the process of data analysis. The act of communication, with all its convivial, social and behavioural characteristics, effectively prevents a state of deeper cognitive or psychological immersion and thus jeopardises proceeding into the advanced state of experience, insights and reflections that might otherwise be achieved.

5.3 Reflections on the Artwork and the Method

Preparing and analysing the data required about 30 working days. This includes digitising video tapes and compressing the video files, transcribing their content (one week), coding the interviews and creating the diagrams. This excludes any of the work involved with creating the installation itself. We also did *not* create another iteration of the environment to test the validity of our findings. Nevertheless, our data analysis provided sufficient evidence that the artistic-conceptual idea underlying the implementation of multi-user collaboration made it prohibitively difficult for individuals to reach the advanced stage of psychological immersion necessary to perceive the enhanced experiential qualities. Additionally, the augmented ring interface introduced to facilitate multi-user collaboration was a novel experience to the extent that individuals paid more attention to exploring its behaviour then using it to explore the map to listen to radio broadcasts. From this analysis, the following improvements to can be suggested:

a) In our case embodied collaboration, in combination with interpersonal communication, appear to interfere with a deeper state of individual immersion.

Collaborating participants appear to be able to either communicate *or* to be cognitively immersed – yet have difficulties accomplishing both simultaneously. Our analysis suggests that a novel and unfamiliar method of navigation may not be recommended for computer mediated experiences intended to facilitate reflective and introspective insights.

b) In the case of our interactive map navigated with an augmented ring element, the best interface appears to be no visual interface. Although easy and intuitive to use, the novel ring interface became an attraction in itself, instead of functioning as a ready-at-hand device "disappearing" to the user. A solution permitting individual listening experiences such as headphones or directional speakers could amend this situation.

Although time consuming, it has been very rewarding to develop a Grounded Theory of our participants' experience. By applying this qualitative method, we have gained a much better understanding of the manner in which participants perceive the interaction with the application in their own voices. This gave us detailed insight into the process of interaction itself, a knowledge resulting in unexpected findings we could not have determined by observation or interviews alone. We remain convinced that no matter how hard an artist works, he or she may offer, at best, only a portion of what a visitor perceives – much of the meaning is created again and again in the perception of each individual visitor.

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