Designing for Audience Engagement

Zafer Bilda

Introduction

I will start with a question that constantly lingers in the back of my mind as an experience designer, “how do I define what I do in a simple way?” For me, the practice of ‘experience design’ is designing for people with the objective of engaging them in positive experiences. Designing for people and engaging them requires knowing and thinking about the people who might use the specific product or service. I have always kept this focus in mind during my academic research as well as my commercial design experiences in recent years.

This chapter has three logical parts: in the first part, I describe my journey wherein I used experience evaluation as a method to understand audience engagement in the context of interactive art installations. The research environment and methods we used were unique in this context and they enabled me to model people’s behaviour in engaging with interactive art systems. The final outcome of this research was an audience-centred Creative Engagement Model (Bilda et al. 2008). I developed this model in collaboration with a larger research team through long-term analysis of direct and lateral audience observations, verbal reports and interviews. In the second part, I will present some examples of participants’ verbal reports to illustrate the mechanics of the Creative Engagement Model. In this section, I draw on experiential stories that reveal participants’ recurring cognitive and emotional patterns. These patterns enabled me to see different levels with which people engage with interactive artworks. I term these levels: interaction modes and interaction phases of creative engagement. The third part of the chapter takes the perspective of my role as an experience designer into the commercial context. Here I transformed the experiential descriptions I learned from studying audience engagement into experience design principles. A designer may easily apply these guides to design interactive systems and to achieve engaging, influential and creative experiences.

Experience Design Approach

What is experience design? Can experiences ever be designed? According to Nathan Shedroff, it is an approach to creating successful experiences for people in any medium (Shedroff, 2001). This approach includes spatial and temporal design and considers all five
common senses, interactivity, as well as value, personal meaning, and emotional context. Designed experiences can be in any medium, including spatial/environmental installations, print products, websites, services, images and sounds, live performances etc. This suggests we could look at an interactive artwork as an experience design – although artists might think that “creating successful experiences for people” is not necessarily a part of their artistic process or their goal. And I hear them asking, “what is a successful experience anyway? Who judges whether an experience is successful or not and how? ”. True, it is difficult to identify or agree with these types of goals and metrics, and it is often not aligned with the essence of an artist’s creation. But we may all agree on one thing – that an artwork is an experience.

Within the framework of human-centred design, there are tools and methods for understanding, modelling and designing experiences. Prototyping is one of these tools. It is also a tool for the interactive artist to create ‘beta’ versions of interactive artworks (i.e. unfinished working models deployed for testing and refinement). In the context of human-centred design we use the term ‘Experience Prototyping’ which is a form of prototyping that enables design team members, users and clients to gain first-hand appreciation of existing or future conditions through active engagement with prototypes (Buchenau et al., 2000). I see such prototypes as valuable for understanding existing experiences, exploring design ideas and for communicating design concepts to others. My interest has been to explore how interactive artworks as experience prototypes can be designed and refined in collaboration with the artist, technologist and the audience. To achieve this, I followed a research process, which I refer to as “audience-centred evaluative research”, which involves systematically observing and documenting how the audience experiences the artwork prototype. I had two fundamental research questions in mind, during this programme: first how might experience evaluation inform the design process, and secondly, can we derive generic design principles from these studies in order to help designers or artists to create engaging audience experiences?

As an experience designer, I solve design problems everyday, actively thinking about the people who might use specific products or services. During my research phase, I observe and analyse people’s living and working environments as well as their motivations, intentions and expectations in order to understand how they engage in an experience of using an online or ‘offline’ product or a service. This phase is referred to as ‘generative research’ (Young, 2008) because it generates the contextual and user specific information that helps me start thinking about the design. Generative research helps me to prototype a concept that is
people-centred, and responsive to their behaviour. A prototype in most cases is a click-through website interface or a set of tools that the user can experience or play with. Once I develop a working prototype collaboratively with visual designers and developers, it goes back to the users. This phase is referred to as ‘evaluative research’ where I focus on understanding people’s behaviour and perceptions using the new (or re-designed) product or the service. Here, the evaluation is to validate the concept prototype.

In commercial projects, ‘generative research’ is often more pivotal in designing the right concept for the audience, and gets more attention and budget than the evaluative research. In these cases, ‘experience evaluation’ is rather short and aims to validate the certain aspects of the prototype only. Other than validating, there is the opportunity to incrementally improve the product or service when evaluation is done over a longer term and periodically. ‘Periodical evaluation’ may also help evolve the product through understanding changing needs, intentions and motivations of the user. Therefore, evolving user experience requirements would drive the product and service innovation.

**Audience Experience and Evaluation**

People, who come to see an interactive artwork, may or may not know they can be actively engaged in creating the work itself. Often in interactive art, they are not only spectators, but also participants in creating the art experience. I should also mention the variety each person brings into this creation by perceiving and constructing different meanings. For any participant, the minimum requirement is being in the space of the work, interacting with it and developing an understanding through this interaction – that is, sense making through interactions - which is a natural tendency for us.

I start planning the evaluation by understanding and deciding whom the audience should be. In the context of our research, the audience consisted mostly of museum visitors, randomly selected during their visits. This method of recruitment is appropriate when interaction with the systems does not demand certain skills or characteristics (we refer to this last as ‘demographics’). Depending on the nature and requirements of interactive work, we targeted people with specific demographics such as primary school students, professional musicians, scientists, software developers etc. We also invited experts in the field such as designers, artists, and academic peers to the evaluation sessions.

An evaluation viewpoint is one that tries to gain knowledge and understanding of the audience experience that is as reliable as possible. The term ‘evaluation’ refers to the
investigation of human experience rather than making value judgments or conclusions about the artwork, or the audience perceptions. One of the challenging questions for this kind of research is whether it is possible to identify and measure engagement with interactive art as audiences experience it in a gallery or museum environment. If it were possible to identify appropriate ‘measures’ would they genuinely help determine what levels of engagement there are with interactive systems in various real-life situations? Another desirable advantage in understanding such engagement is to model the interactive behaviour in the different contexts and times that this behaviour occurs.

These questions drove my ‘audience experience’ research from which came a model for describing creative engagement with interactive artworks. I developed this model through a long-term analysis of direct and lateral observations and verbal reports and interviews. The larger research team collected and analysed observational and qualitative data from audience experiences of ten different artwork installations in Beta_Space over a three-year period between November 2004 and November 2007.

**Research Environment and Methods**

Beta_Space is a research environment located in the Powerhouse Museum in Sydney where works in progress at different stages of development, from early prototype to end product are exhibited to the public and are made available for evaluation by different audiences. Beta_Space is the principal site of research into audience experience of interactive-art in collaboration with the Creativity and Cognition Studios’ (CCS) at the University of Technology, Sydney, as described in the introduction to this book. In interactive art, artists need to see their works in action because only then is it possible to see its full realisation (see Ernest Edmonds’ chapter ‘Interactive Art’ for a discussion of its various dimensions). As soon as a version of the artwork is stable and fully operational, it is installed in Beta_Space for public exhibition. During the exhibition period the research team undertakes an evaluation process that addresses the key issues about audience engagement in relation to this work. The evaluation team comprises all people who are needed to make the process operational from initial preparation, site and artefact development to audience studies and interviews. These are: exhibition curator, artist, computer technologist, technician, museum organiser and exhibition staff as well as researchers and participants in the studies, the all-important active audience.
We employed several data collection methods such as direct observation, audio and video recordings including ‘video-cued recall’ (Costello et al., 2005), and structured interviews. Of these, the ‘video-cued recall’ method allowed us to collect and analyse in depth the verbal and behavioural data for the purpose of investigating cognitive processes. It is a technique in which a video recording of an encounter between a member of the audience and the work is subsequently played back to that person whilst they comment on what they were thinking, attempting or feeling during the experience. The video recording of the person’s behaviour in the Beta_Space was shown to them immediately after their experience as visual cues for recalling their experience. This method proved to be very useful for understanding situated experience of interactive art and how meaning is generated in situated experience (Costello et al., 2005, Bilda et al., 2006, Muller et al., 2006).

As an example, the evaluation study of Iamascope sought to deeply analyse the interactive experience in light of four categories of response, control, contemplation and belonging. Through employing the video-cued recall we have gained insights into emotional states of the participants and the interrelationships between the four categories. Similarly, the Cardiomorphologies study, employing the same methods, gave us an intimate account of participants’ lives and memories, which may have not been possible to gain through interviewing techniques (Muller et al., 2006).

We developed an analysis framework for the evaluation and comparison of three different artwork experiences (Bilda et al., 2006). Using this framework, we were able to characterise each artwork in terms of ‘Feedback’ (the audience gets from the system), use of ‘Bodily Interactions’ (referring to gestures and moves) and ‘Cognitive Indicators’ (referring to conceptual goals, logic and sense making) (Bilda et al., 2007). This study confirmed our initial working hypothesis that each individual creates a unique situation out of his or her interactions. We also discovered that the nature of the artwork interactivity can trigger more bodily interactions or cognitive activity during the experience of a participant.

**Systematic versus Informal Evaluation**

The evaluation process usually takes at least a month from initial workshops with the artist to figure out key goals of the audience engagement study, to collecting, collating and analysing the data and making sense of it. So why go through this rigorous and systematic way of evaluation, instead of leaving to the artists to quickly test a few cases and work with their instincts? I think the primary reason is that by obtaining quantifiable results, this helps us measure engagement within and across many different examples of artworks, experiences
and categories of audience. Having a more general picture enables us to move forward with more confidence about the significance of what we have observed than only for individual cases. As an example of a more general results from this kind of analysis, carrying out an in-depth protocol analysis across a number of audience experiences helped us discover patterns we would not have been able to see simply through direct observation of individual events.

The aim of protocol analysis aims is to analyse the period from when a participant walks into the exhibition space to finishing his or her interaction with the artwork. Protocols in general, embody observation data of a complex human activity over a timeline (such as problem solving, navigation, designing etc.) often in the form of verbal data transcribed as text and behavioural data tracked in recorded videos. Watching these videos and reading verbalisations several times, we assign meanings to frequently occurring acts or instances in the protocols. This is called “Coding” and is leveraged to demonstrate the occurrence of a manifest content (e.g. bodily movements, perceptions, verbalised thoughts) during participant’s interactions. After assigning various codes to protocols, we obtain a visual representation of participant states and activities recurring over the timeline of their experiences (see examples in Bilda et al., 2007). This form of a systematic analysis helped us see and better understand participants’ behavioural patterns, emotions and thinking process. Over the course of the research programme, we have developed and used a single coding scheme (Bilda et al., 2007) so that we studied audience experiences consistently across different artworks.

The systematic evaluations we conducted over two years accumulated a body of knowledge about audience behaviour and interactivity, which eventually advanced our understanding of nature of interaction between people and technology systems. In my research journey, the “Creative Engagement Model” was the reward of our systematic evaluation efforts (Bilda et al., 2008).

**Creative Engagement Model**

The Creative Engagement Model (CEM) (Bilda et al., 2008) is a model of active audience engagement with interactive systems. It is based on a definition of an interactive experience as a reflective and transformative dialogue between the audience and the interactive art system. From a series of in depth studies, I have identified interaction modes and phases of audience behaviour in this model after studying different art systems and audience experiences.
Figure 1 Creative Engagement Model

The Creative Engagement Model represents the interaction behaviour of the museum visitor or ‘participant’ who walks into the exhibition space, interacts with the artwork, stays engaged and goes through “phases” or levels of engagement during her experience. The Creative Engagement Model is human-centred in that it represents the state of mind or behaviour of a person who is taking part in a novel experience. It is not system centred, i.e. it does not represent the system architecture of the artwork. For example interaction modes (Figure 1) belong to the participant, it is a psychological mode not an operation mode; the same applies to the “Phases”, which refer to the cognitive activities of a participant.

The Creative Engagement Model represents “interaction modes” and “phases” related to the participant's experience of an interactive art system. While interaction modes define dialogues between the participant and the art system, phases define participant’s longer-term cognitive processes. I refer to the dialogue as the information exchange between the participant and the artwork through interaction. The following is a hypothetical scenario to explain the situation from the participant’s perspective:

“When I walk into the interactive art environment, I start to do something to the environment; my presence is changing the environment. What is going on inside my head is situated, depending on where I walk to, how I move my body parts, where I choose to look at, what features of the environment I pay attention to and how I perceive and understand the changes in the surroundings. My body is involved in this interaction as much as my thoughts and perceptual experience”.
The dialogue refers to instances of the exchanges (e.g. as described above) between the participant and the interactive environment. ‘Modes’ and ‘Phases’ - that are longer-term cognitive processes compared to dialogues - take place as dialogues unfold over the duration of experiences.

Illustrations of Audience Behaviour

This section focuses on specific audience experience examples with different interactive artworks to demonstrate the interaction modes and phases mentioned in the CEM (Figure 1).

Unintended Mode

_Unintended mode_ refers to the initial interaction with a system or environment where the audience expectations are not set. This means the audience have no prior idea about what the system does. In this mode the participant interacts with the system without knowing what her specific intentions are. In the Beta_Space context, this is before the participant reads the descriptive information about the work (descriptive information is often printed on a poster and displayed on the side wall).


Participant: Museum visitor – John works in Human Resources

Method of data collection: video-cued recall.

About Contagion: _Contagion_ is a large scale audio-visual installation in which the audience becomes part of a complex interactive system based on the idea of the spread of disease. _Contagion_ has a rich and complex set of experiential goals that emerge from its diverse conceptual concerns with themes such as the body, bio-medical issues and the power of imagery. The challenge in the creation of the work was to create a lucid and engaging audience experience which contains within it opportunities and means for audiences to explore the deeper conceptual underpinnings of the work.
Figure 2: Contagion in Beta-Space. Photo by Czarnecki

In Contagion, the audience’s movements were represented by coloured plumes, which resembled ink in water. Participants enjoyed playing with and exploring these patterns. The participants’ interactions slowly built a complex trace history of their movement, which implicated them in the fabric of the system, and its complex ecology of cause and effect (Muller, 2008). In one of the evaluation sessions, one participant entered the Beta_Space, read the information poster, and wondered how she could do anything. The following excerpt is taken from the recorded session of this participant:

“...So then I turned around and looked at this thing straight in front of me and that looked like a solar eclipse, and because I wasn’t actually moving that green spot was stationary. So I was looking at it for a while wondering if it was going to do anything, then I moved and it did move. So then I figured that it was obviously tracking my movements.”

I refer to the participant experience illustrated by this excerpt as “Adaptation” phase, which occurs at the point when she is just “realising” what the interaction is about. Her interaction was an unintended initiation (“I moved and it moved”) because she had no previous expectation of the feedback. She was aware of the change, which led her to understand that it was tracking her movements.

**Deliberate Mode**

*Deliberate mode* often follows the unintended stage; audience is past the initial interaction but still does not know what to expect. In this mode, the participant should be able to establish a (desired) outcome from exploring and understanding what the system is capable
of doing. Participants often expect features and functions to work in a familiar way (based on their initial knowledge and experience of similar systems).

Example Case: Experience of Contagion, a work by Gina Czarnecki (2006-2008)

Participant: Museum visitor - IT worker

Method of data collection: video-cued recall.

The following excerpt is taken from the video cued recall session of the same participant, following the unintended mode:

“I wanted to see how subtle the movements were which is why I started moving really slowly at first and then I wanted to know where the cameras were so I then I started moving to see the outer spheres of where the camera angles were ... Then I thought if I stuck my hand out I can work out if the cameras are above me or below me or to the sides ... Then I realised it must have been on top of me because when I moved my hand on my head I was a small circle”.

In this instance, the participant is “learning” about the possible interactions and their outcomes through exploring his bodily movements in the space - he refers to his ways of exploring how the cameras work and track her movements. That is why he deliberately tried different movements (like moving slowly or sticking his hand out) to discover how he influences the production of colour plumes on the screen. Through his explorations, he learned the camera was above, and the system was only capable of showing his body as “a small circle” regardless of his body postures/extensions. At the end of the “Learning” state he was able to establish his (desired) outcome from exploring and understanding what the system was capable of doing.

Intended/ in control mode

*Intended/ in control* mode refers to a stage where the audience is capable of setting a purpose for his/her actions and expectations about the interaction outcomes.

Example Case: Experience of Iamascope by Sid Fels (2005)

Participant: Invited Expert - choreographer

Method of data collection: video-cued recall.
About Iamascope:

It is an example of a dynamic-interactive art system is ‘Iamascope’ (Fels and Mase, 1999), a work which includes a camera capturing viewer images and movement and which is connected to a controlling computer. The work reacts to human movement in front of it by changing kaleidoscope-like images and making music at the same time in direct response to viewer’s movements.

Figure 3 Iamascope audience experience

In one of the Iamascope evaluation sessions, a choreographer was enjoying the kaleidoscopic figures appearing along with sound and, as she moved, the figures changed and evolved. The following is from her comments during the video cued recall session:

“Yeah I was just playing around with different shapes that I could make. I liked the more detailed little - little details that I could add into the kaleidoscope, so when I could see my face, or my fingers or something that was recognisable as a part of my body I was most interested in it”.

This instance refers to the “development phase” where she has a “sense of control”. She was playing with different shapes and intentionally initiating these movements and figures. She interpreted recognising her face in the image as an opportunity to further explore. The next excerpt is taken from the same session, only couple of minutes later...

“I kept trying to get little recognisable parts of my body onto the screen. And I was thinking that there was a really - I don’t know - a really cool picture - I was thinking oh this is quite cool and at this point I was thinking like - because I do a lot of choreography and I was thinking oh this is a really interesting choreography”.

This instance refers to a “deeper understanding” and familiarity: she had moved beyond the sense of control and felt she was more familiar with her interactions and the artwork. Familiarity is a stage where participants do not have to consciously pay attention to the mechanics of the interaction, e.g. an experienced driver may be thinking about his past conversation with his boss while driving rather than paying attention to which gear he is
going to change to later on. Similarly, the choreographer was moving and purely enjoying the visualization, which seemed more familiar to her now. She noticed the “really cool picture” and this gave her a chance to relate this to her life and suggested an opportunity to use it in her choreography in the future. I describe this as a deeper understanding of what the artwork might mean to her; e.g. enriching her dance practice, a way to express herself and a means of sharing this with many other people.

**Intended/uncertain mode**

*Intended/uncertain mode* refers to a stage where the audience starts expanding her/his intentions for her actions and expectations about the outcomes. This mode has a high opportunity for creative engagement, where the user can end up with creative outcomes or understanding from her experiences.

Example Case: Experience of *Absolute 4.5* by Ernest Edmonds and Mark Fell (2006)

Participant: Invited expert musician

Method of data collection: video-cued recall.

**About Absolute 4.5:** *Absolute 4.5* is an art system that reacts to people but that also generates its own behaviour with or without an audience. The work is comprised of a large screen with a changing grid of colours accompanied by a complex sound track and controlled by a generative set of rules carried out by a computer. As the audience approaches the screen, Absolute 4.5 detects their presence through sensors in the floor. Aspects of the system’s behaviour, such as its rate of change, are influenced by audience behaviour in the space.

![Figure 4 Absolute 4.5 Audience Experience](image)

Interacting with Absolute 4.5 creates a change in the grid of colours on a large screen accompanied by a complex sound track. The work is controlled by a ‘generative’ set of rules.
carried out by a computer. By analysing the interactions in real-time, the system applies meta-rules as it learns from experience about human reaction to it.

The following excerpt is from one of the evaluation sessions with an expert musician, who explored how he influenced the grid of colours and the sound in the space. During this session, he moved from the unintended mode to the intended / in control mode. He figured out that the sensor pads on the floor were driving the interaction and also learned that his movements did not necessarily align with the feedback from the system.

In the following excerpt, the expert musician is trying to recognise patterns in the sound feedback from the system. Previously he changed from moving slow to fast, and he tried doing the same movements repeatedly to see if he could obtain the same feedback. His focus was more on the sound and rhythm, as the following excerpt shows:

“You can see I’ve got the beat in my head, I’m going to go like this now. So I was definitely trying there to make a pattern in a time feel. That wasn’t in time (awareness of unexpected change, interpretation of change). Okay so that again here I was trying to do something in time with the rhythm. Then I was getting out of doing it in time, I was going more starting to really jump around and going bam, bam so it happened in time”.

This instance refers to the “development” phase with a “sense of uncertainty”. He tried to make a sound pattern in time by his movements (intended initiation) - and in return expected to hear the sound in similar in the same timing. However, the sound pattern was different each time – which created the uncertainty. He was aware of this unexpected change in the sound pattern, but he continued performing the same hoping to discover a pattern. At one stage, the sound rhythm was in time with his movements (aligned with his expectation), and then not in time again (pushing him to the uncertainty mode). The system eventually produced the feedback he was expecting when he said “bam, bam, so it happened in time” and in that moment he thought, “he was in control”. However, he was hardly in control, because the artwork was actually creating its own behaviour. He soon realized this behaviour. The following excerpt is from the same participant’s experience after around ten minutes

“....I occasionally stumbled across a series or a series of lights or rhythms which I enjoyed and I’d sit there and play with it for a few tries or so, but a lot of it was just pacing backwards and forwards and seeing for the trial and error. Of course at the beginning I thought I’d be able to work it out or fathom out some system for it, and I suppose about now I’m probably thinking it’s got the better of me and I can’t systemize it so I’ll just work with its randomness”.
In this instance, the musician is in the “deeper understanding” phase with a sense of uncertainty. He eventually decided that there may not be a pattern in his interaction and accepted its “randomness”: in other words he could not predict the behaviour of the work. Acceptance requires the participant to shift his perception (i.e. his expectation from the system) which often leads to a new way of seeing the situation.

**Unexpected mode**

*Unexpected mode* refers to a stage where the audience questions her/his intentions, expectations about outcomes and what the system is about. From the participant’s perspective this could be either chaotic where she may quit her interaction or a reflective experience where she continues to enjoy.

The unexpected mode of interaction may trigger a transformative type of dialogue between the audience and the system. It has the highest risk of driving the audience to frustration and highest potential for creative engagement and influential experiences to occur.

**Example Case: Experience of Absolute 4.5 by Ernest Edmonds and Mark Fell (2006)**

Participant: Invited expert musician

Method of data collection: video-cued recall.

The excerpt below is taken from the same session of the expert musician and illustrates how the unpredictability of the system may lead to minor frustration:

“I think this is probably one of my experimentation phases again, so I’m just having a go, seeing what I can get out of it. I think that must have been a moment of frustration, I couldn’t get the thing to do what I thought it would do”.

Here the musician is in the “development” phase (developing his understanding of the work) in a state of unpredictability. At this stage he tried many times with failure to discover a pattern or a meaningful explanation to how the system gives feedback to his actions. Frustration is a critical moment in the overall experience journey: the participant may walk away or find another motivation to keep going. In this case, the expert musician’s motivation was his passion for sound and rhythm. Below is an excerpt from the same session, more than half way through his experience:
“...so I stood on one foot and tried to get all my weight onto one foot. I then tried tapping very hard at other stages. So I tried to implement this plan but kept on getting distracted because it’s quite mesmerising I found; I got drawn in by the sounds and the changing of the sounds”.

Here, the musician is in the “deeper understanding” phase in a state of unpredictability. He was trying to predict a pattern in the system to satisfy his expectation but got distracted. As he mentioned, he was 'drawn in by the sounds and the changing of the sounds'. This is probably where he found “being in the moment/ being in the flow” within the unpredictability of the situation. He gave up on making sense of what the system was doing in relation to his intentions. He only re-interpreted what the current sounds meant to him:

“I tried to figure out, because I’m a musician, I tried to work out the rhythms in my head and work out if I could layer them or how they related to each other, so if I could get a steady rhythm going in one place, how this affected or how the tempos or moving to another place were related”

In this case, the musician transformed his dialogue with the system; he made sense of his experience by accepting and enjoying its randomness, rather than attempting to control its action-feedback loop. The meaning of the work has changed for him. In the longer term, he will probably forget about the unpredictable nature of his interactions with the work, but will remember, perhaps, the visual or auditory instances of “being in the flow” and probably his awareness of shifting meanings. These influences often stay with the audiences for longer time and may trigger them to revisit the experience in the future.

**Designing for Active Audience Behaviour**

The audience experience examples discussed previously illustrated different interaction modes and phases of the active audience behaviour. How can we apply the knowledge emerging from the engagement model to experience design? The best way I found was to write up these insights as design principles. These insights are intended to be useful to curators of interactive exhibitions as well as artists and researchers who are creating interactive works.

Here, I have outlined nine design principles based on the following stages of the engagement phases: Initial encounter, Adaptation, Anticipation, and Deeper Understanding.

**Engagement Phase: Initial Encounter**

Design Principle 1

Set expectations:
Prepare the audience for the initial interaction, by informing them in a clear and encouraging, but not prescriptive, way as to what is going to happen.

The informative poster hung on the wall in Beta_Space is a good example of this. The poster gives background information or theory that the interactive work is build on. Depending on the artist’s preference, this introduction may give cues to interaction, no cues at all or, by contrast, full instructions as to how the participant should be interacting with the system. Based on my considerable experience of observing audience behaviour, this introduction should not be prescriptive of the experience because it is inclined to reduce curiosity or set expectations rigidly or too high. The best strategy is to encourage the audience to set their personal expectations and find their own ways to make sense of their experience.

Design Principle 2

Invite for interaction:

Stimulate the initial interaction in an inviting manner, strive to make initial interaction style easy to understand and achieve.

How do you make an interaction inviting? Before even the initial encounter, how do you attract the audience to the art system? For example, if an art system has a static mode before initiation, this may reduce participation or exploration. However, if it generates a certain level of feedback without initiation this could invite the audience to come in and see what is to explore. In the initial stage of interaction, the participant is unsure of the interaction style or whether the system is interactive and therefore, it needs to be easy and inviting in the beginning. This means the feedback should be immediate and recognisable in order to capture the visitor’s attention. Consider the Contagion experience, when the participant walked in the room she saw a man’s face projected on one of the screens. This was an invitation for someone to walk closer to the picture. As they did, their attention was captured and maintained by the motion tracking later on.

Engagement Phase: Adaptation

Design Principle 3

Surprise:

Create situations where the audience may initiate an interaction unintentionally and may be surprised about the outcome.
“Surprise” may suggest the unintended initiation where the participant perceives feedback from the system without intending to, or having a particular expectation. Surprise may also be encouraging for the participant to explore further possibilities. Consider the *Iamascope* experience, the image on the screen was quite visible and interesting for the audience to engage initially — and surprise came when the choreographer realised that her body parts (fingers and face) were in the kaleidoscopic image generated on the screen. This feeling of “surprise” was quite common amongst other participants as well.

**Design Principle 4**

Allow time for adaptation:

Provide sufficient ‘adaptation’ time for the audience to practice and learn the interactivity.

Interactions evolve through time; we gain more control and understanding as we become more familiar with the situation. If an interactive system produces changes in the environment, a participant needs enough time to adapt herself to the changes. This varies from person to person depending on expertise, skills and expectations. During the adaptation period we assume the participant learned how to work with the system and how to set her expectations. Consider the *Contagion* experience, where the participant noticed the coloured plumes and explored how she could influence the coloured traces. This exercise is, in itself, about learning a specific interaction and needs time for adaptation. If there is bombardment of feedback and changes in the environment all at once, this does not provide enough time for adaptation. This principle is about allowing the participant enough time before s/he can focus on the next feedback from the system.

**Design Principle 5**

Provide consistent feedback

Adaptation is easier when there is clear and consistent feedback from the system.

During the adaptation period, consistent feedback from the art system helps the audience learn interactivity quicker: each time he makes a movement he receives feedback from the system. The feedback type or nature could be similar or different each time, but there needs to be consistency. In cases where art systems did not provide consistent feedback, I observed that the audience lost focus and eventually interest in the interactive experience. On the
other hand, consistent and repeated feedback over extended time leads to being able to predict the response of the art system, which tends to lead to loss of interest. Therefore, it is important to design the timing of the consistent feedback, which, as a rule of thumb, should not exceed the participant's adaptation period.

**Engagement Phase: Anticipation**

Design Principle 6

Allow for anticipation:

Reward the audience with a sense of achievement or control to move them into the ‘anticipation phase’.

A sense of achievement is easy to identify when playing a game, as we know the rules, the levels and the rewards. However, with an art system, when do we say “...I learned this, I achieved it”? Are those questions even appropriate? A sense of achievement from interacting with an art system is not the same as winning a game. The changes that occur for each person are subject to individual differences but one criterion for a sense of achievement is gaining control of the interactivity. When the participant says “I am in control”, it is the quickest and most obvious sign of achievement. Another could be mastery: when the participant says, “I got this system to do everything it could do”, they believe they have achieved mastery of a certain kind. This is not the quickest reward; it involves exploring different options, and receiving all possible feedback from the system. Then the participant can predict her interactions, and say, “I am done with this”. Anticipation comes when the audience achieves the “in-control” or “done with this” states. The process has to keep them engaged until they reach anticipation. Consider the Iamascope experience, the participant ‘plays’ with the system, experiences surprise, enjoys the interactivity and eventually reaches anticipation, reflects on the experience, and then at a certain point reaches the final anticipation, quits the interaction and walks out of the room.

**Engagement Phase: Adaptation to Uncertain / Unexpected**

Design Principle 7

Allow for uncertainty:

Create an ambivalent experience, switching between a sense of control and a sense of uncertainty.
During adaptation and anticipation, a participant develops a mental model of her dialogue with the interactive system along with expectations, emotions, memories and beliefs. A sense of control comes from knowing that she is in control of her dialogue with the system. Although a sense of control and achievement is rewarding, it may, nevertheless, lead to lack of motivation for further interaction and exploration, and eventually boredom. A design principle to keep the audience engaged is to introduce uncertainty (after allowing for anticipation). Uncertainty can be created as a system feedback that is outside the mental model of the participant.

When we consider the Absolute 4.5 experience, uncertainty was introduced from the start without allowing for anticipation in which the participant never reached a real anticipation phase. The musician initially had a mental model that his movements would create a consistent pattern of sound and grid of lights. He was able to validate his mental model at times, but he was also uncertain that the system was ever giving the right response to his movements. This uncertainty kept him engaged while he switched between a sense of control and sense of uncertainty during the adaptation period.

Design Principle 8

Introduce challenge:

Introduce ‘unexpected’ changes to the audience experience, where audience might be challenged.

Uncertainty is only the first phase of participant’s response to unexpected changes. When unexpected feedback continues, a participant may feel challenged or frustrated. Challenge ending with triumph has been defined as fun depending on the personality and the context – e.g. in psychology of player experience, “fiero” – being in the moment of personal triumph over adversity is defined as part of experiencing “hard fun” (Lazzaro, 2004).

Consider the musician’s experience of Absolute 4.5; he perceived the unexpected changes as a challenge that motivated him to continue his engagement with the work. He finally adapted himself to the changes in the environment and learned to work with uncertainty and reached a different and deeper understanding of his experience. On the other hand, there were participants who did not take the unexpected changes as a challenge and lost their motivation to interact further. If the system design aims to support the kind of audience response where they seek anticipation (rather than challenge), then the design principle would be to provide guidance for unexpected situations. Guidance may help the audience
reach a sense of control and possibly anticipation at the end; however, *Absolute 4.5* design strategy is certainly not for audiences who seek closure.

**Engagement Phase: Deeper understanding**

Design Principle 9

Provide audience space to reflect on their previous intentions and question their current interactions.

The audience needs some ‘mental space’ in which to pause from all the interactions happening during their experience to be able to reflect on and make sense of their actual experience. This cognitive activity may occur during or after the experience. Sometimes participants may go to that space during continuous stimulus and feedback, e.g. the musician experiencing *Absolute 4.5* was drawn in by the sounds and changing of the sounds, almost in a ‘flow’ experience (Csikszentmihalyi, 1990). We have also observed post experience influences, for example, a participant, days after her experience of *Contagion*, mentioned how she was influenced by leaving her traces in the system and realising that the man’s face on the screen had changed over time.

**Final Remarks**

Researching interactive art experiences has been critical to gaining a clear understanding of active audience behaviour. That understanding has informed the development of the Creative Engagement Model and the design principles for interaction design I described previously. The CEM contributed to our understanding of interactive experience.

CEM identified engagement phases which interactive art audiences may experience; namely initial encounter, adaptation, anticipation, adaptation to uncertainty and deeper understanding. In addition to phases, interaction modes describe specific audience behaviour based on audience intentions and/or their perception of the situation; namely these modes are unintended, intended/ in control, intended/ uncertain, and unexpected.

One of the key understandings is about how the relationship between intentions and expectations influence the way the audience interact with art systems. Participants often have prior expectations, and if their expectations are not fulfilled based on their initial intentions, the original intention may transform over time, which leads to a creative engagement. If the participant preserves his/her original intention there is less opportunity
for creative engagement. In order to be able to generalise about this behaviour, I have studied audience intentions and expectations in different contexts such as exhibition, laboratory, and outdoor public space and through numerous art systems created with different artistic intentions.

As a final remark I would like to further emphasise the role audience intentions in understanding and describing interactive experience as well as designing and improving interactive art systems. In the context of interaction design I see one of the most important design decisions to make is whether to align (or not to align) system response directly with audience intentions. Depending on this decision, the nature of the experience may be playful, sometimes surprising and often may end up with anticipation when audience intentions are aligned with the system feedback. On the other hand, the audience experience becomes uncertain, unexpected and somewhat more intriguing, and may end up with deeper and creative understandings when audience intentions are not aligned with what the system feedback.

This is where I see the interactive art creation similar and parallel to a design process, specifically to experience design. In my practice, I have to consciously explore multiple facets of my design decisions, because each design facet influences the nature of the customer’s experience with the product or system. For example I aim understand and design the composition facet - the ideal story that drives the experience - along with the spatial and temporal facets involved in the experience (physical environment and timing), as well as the intangible elements such as participant’s senses, intentions and expectations.

Similar to an experience designer, every time the artist creates a specific experience or influences a participant’s experience, I believe he or she is making a design decision. For this reason, I suggest the interactive artists may have to take the role of a movie director, animator or a choreographer, where a certain experience is designed and enacted using the compositional, sensorial, temporal, and spatial elements.