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Scaffolding Visitors' Experience of Technology - an open call for discussion

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Abstract

This paper is concerned with visitors' experience of new technologies in museums. We have designed and evaluated a technology-intensive installation at the Museum of Science and Technology in Stockholm, Sweden. The Museum aims at providing visitors with a comprehensive view of the history of technology and technical innovations. The science center, the 'educational wing' of the museum, focuses on participation and physical interaction. Two important aims are to extend as much as possible the visitors' sensorial experience and allow for reflection. The exhibits include multi-modal interactive installations about scientific and technological themes (e.g. physics, human perception and natural history). We have, rather than adopting a traditional narrative-didactic approach to exhibition design, attempted to provide a forum that relies on implicit design features to encourage dialogue and discussion. The Well of Inventions http://www.shape-dc.org/highlights/invent.html is an attempt to provide an arena for discussion, collaboration and communication. We will describe this installation and then discuss technology-intensive installations at museums from an esemplastic design-perspective with concern for reflective, as well as, bodily engagement. The Well of Inventions has been developed within the Shape project IST 2000-26 069 under the IST programme. The Disappearing Computer (DC) is a EU-funded proactive initiative of the Future and Emerging Technologies (FET) activity of the Information Society Technologies (IST) research program. http://www.shape-dc.org

Keywords: esemplastic design-perspective, physical interaction, technology-intensive exhibitions, museum, evaluation

1 Introduction

One traditional way museums have set-up their exhibitions is in terms of things and signs. We are all familiar with the sort of exhibition set up in this way. There is an information sign to one side of a thing placed behind glass or by other means hidden away from the possibilities of human touch. There is nothing wrong with this kind of exhibition and they can be delightful to visit. After all they have been around for hundreds of years now and stood the test of time. However, many of us who are visitors sometimes wish to get more involved with the artefacts and move away from "hands off" to "hands on". One might want to touch the things or one might want to get behind the scenes and understand the things in the museum from say a curator's point of view. Some of us wish to get something more than the visceral impressions and the reading that the texts allow. Moreover, looking and reading is perhaps also something that appeals to some, but not others. Think of kids for instance. How many times do not parents have to tell their kids to just look and not touch anything? Kids have this natural inclination to touch (sometimes also taste) everything they see. They explore the world with their bodies to a greater extent than most of us who are adults. To read (if they can read) is not always their idea of learning or just having fun. Are tactile explorations only something we are supposed to engage in as children? Is it perhaps the case that the adult is supposed to have evolved beyond the sense of touch? With reading and reflection as finer instruments the adult steers away from experiencing using the body. There are a few studies of 'naturally occurring' visitor behaviour (Hensel 1987; vom Lehn, Heath et al. 2001a; vom Lehn, Heath et al. 2001b) and here we find interesting ethnographic observations.

Tacitly it seems suggested that it is now more adequate to only move a round, read and see. Physical objects are often not available for visitors to touch or interact with. They might for instance be too precious or they might easily break. Thus what are often left with is a more reflective stance involving looking at objects at a distance and reading signs or posters (on paper, on a computer screen or put on any other possible material). In the installation The Well of Inventions we are concerned with and are exploring ways to allow a more physical "hands-on experience" of objects as virtual objects in the museums. When using the term "hands-on" there is often an assumption that hands-on activities also involves interaction and adds to the educational value, leading to "minds-on". The term itself does not suggest this. An "interactive" exhibit implies that visitors will engage in mental interaction, but this can happen without any physical interaction (Kennedy, 1994). We use the term in a more full-bodied meaning. Hands-on and interactive exhibitions have been around for quite some time and already in 1925 curators at the Deutsches Museum introduced industrial engines for visitors to operate and in 1933 curators at the Chicago Museum of Science and Industry developed a simulated coalmine so visitors might be able to experience the disconcerting feeling of descending into a contemporary coalmine (Caulton, 1998). Our aim has been to create something open for the visitors to explore interactively without having first having to read through instructions and then reflect upon "what is it all about". We wanted to preserve some of that sense of natural involvement and curiosity that one can get when one finds something interesting, fun or perhaps mysterious. "Curiosity is a major factor in determining whether environments are appealing, and indeed curiosity triggers interaction towards its object." (Falk, 2000). The information we did provide was situated in a room close by and of non-instructive character.

One common concern when building an interactive exhibition is bluntly put: will the visitors get it? Our initial evaluation of the installation suggested that visitors construct a range of views and beliefs about the content and interaction rules, but that such constructions are associated with directly observable features of the installation rather than with the higher-level issues those features represent. We hypothesize that the reasons for this is that visitors enter the museum with certain conceptions of the kinds of experiences that they will encounter there, and if an exhibition fails to meet such conceptions it will be perceived as unstructured. What we discovered then is that it is just as important to ask "will we get the visitors point of view" as much as "will they get the exhibition".

We will discuss the results from evaluating The Well of Inventions and reflect on the different ways people explored it without having had any instructions beforehand. Observations show that some visitors used it to play and were e.g., engaged in the task of finding as many objects in The Well of Inventions as possible. We will also reflect on the differences between individual visits and group visits.

2 The Well of Inventions

Description

The content and design of The Well of Inventions was developed in cooperation with the staff of the Museum of Science and Technology. A representative from the museum was part of the team throughout the duration of the production and the exhibition time including the evaluation. The domain selected (The machine Hall) for the installation was chosen with the help of a survey that was sent to all members of the museum staff asking to identify important artefacts in the collection. It is a large hangar-like gallery containing steam engines, bicycles, airplanes and cars

Fig.1a: The Machine Hall

Fig.1b: The Machine Hall

Many of the objects and machines in the gallery make use of propellers and/or turbines in different ways. The installation is designed to be a starting point for discussions and illustrate that there is a relationship between turbines and propellers and the medium in which they are used. It also indicates that the Machine Hall is a resource for further information on the subject. The target audience for the installation is high-school students.

There are two entry possibilities to the installation; go directly towards the installation or walk through a small antechamber that contains four computer monitors with information about the installation and the Shape project. The installation area is a room with the projection surface in the centre of the room placed on a rectangular trackball-fitted table.

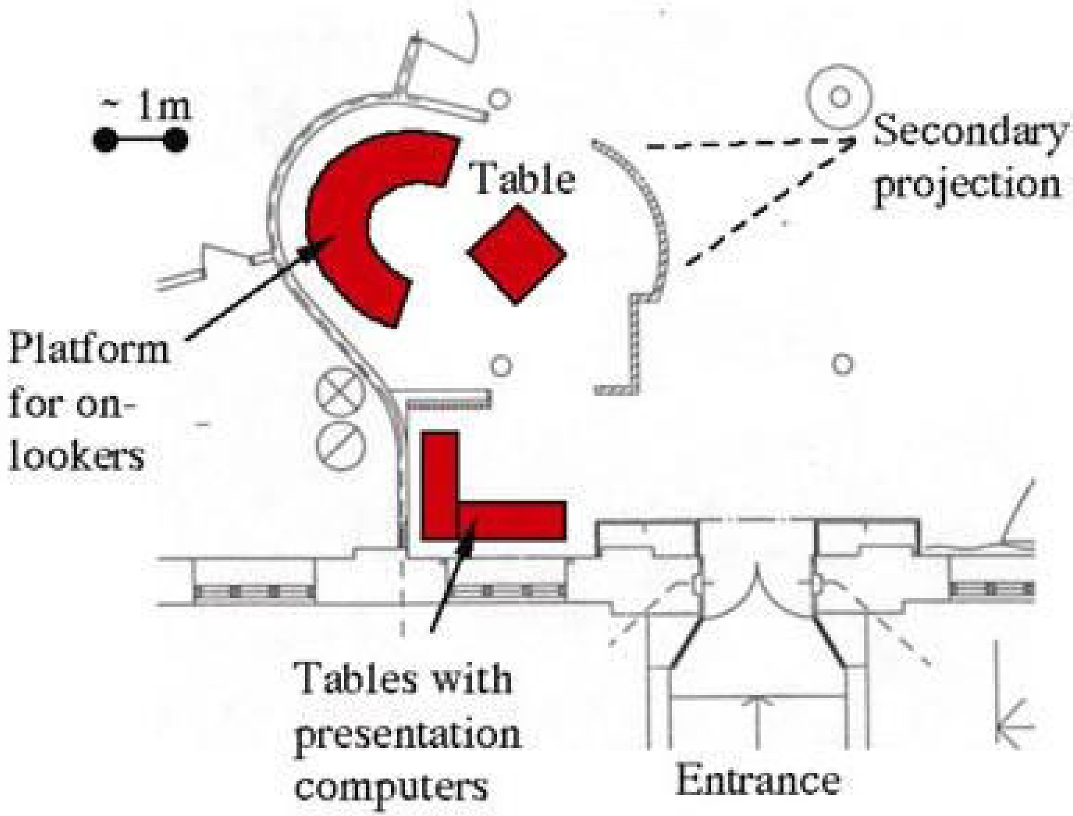

Fig. 2: The Exhibition space

Everything else in the room is painted black. This gives the table a direct attraction as being the first obvious thing in the room. Projected onto the table is a virtual environment that consists of three different simulations: (1) a turbulent fluid, (2) airflow and (3) a water surface. A number of boat propellers and turbines are floating beneath the water surface, moving with the velocity of the fluid.

Fig.3: Projection surface

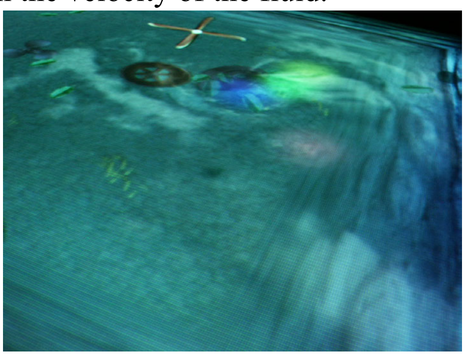

Fig.4: Projection surface

These are virtual representations of real objects displayed in the Machine Hall. When the velocity of the objects increase, their buoyancy changes, so that they move towards the water surface. As an object breaks through the surface, it is visually transformed into its corresponding object for air (i.e., a boat propeller is transformed into an airplane propeller). Above the water surface, the objects move with the velocity of the airflow. Here, their flight is connected to velocity, so that when an object slows down, it sinks towards the water surface and may again break through, transforming back into it previous state beneath the water. The visitors influence the movement of the objects indirectly through the manipulation of the shared virtual medium; the water and the air. Through collaboration, they can more easily inject force into the simulations and more readily push the objects through the water surface. Each trackball has an associated cursor that follows the trackball movement. As the cursors move, they inject force into the simulations. Each object has an associated sound that is spatialized in correspondence to the object's position in the graphical display. The velocity fields of the water and air are indicated indirectly through moving underwater weeds and leaves, respectively. In order to provide additional encouragement of higher-level subject discussions, we also decided to include a number of images of machinery where propellers and turbines are used. These images are subtly reflected by the simulated water surface and constitute the inventions referred to in the title of the installation.

Fig.5: Children interacting at The Well of Inventions

Apart from the table and a podium, the sound environment filled up the space of the room. The sound level was between 65db as the constant to active sound environment up to 80db as being the peak when people collaborated. The sound of The Well of Inventions is produced through applications written in MAX/msp (http://www.cycling74.com) and manages the mixing and diffusion of sounds and also calculates appropriate measures of participant-activity and surface perturbation for sonification purposes. We use Pulkki's (1997) VBAP algorithm to spatially locate the object sounds. The sound representing the surface is synthesised using several chaotic oscillators (with each oscillator being a sinusoidal generator that frequency modulates itself via a short delay line) and the moving objects were sonified using looped sound samples. In addition, a sampled transition sound is played when objects cross the water surface. Initially, all the sounds in The Well of Inventions were synthesised using networks of chaotic oscillators, as this has a greater potential for interactivity than replaying sampled sound files. The continuing sound environment, the darkness of the room, and the projection surface all contributed to the atmosphere of the room.

In sum, The Well of Inventions includes several features to encourage collaboration: (1) If the motion of different trackballs is coordinated, the water velocity field becomes more homogenous. This causes the propeller and turbine objects to move faster, thus making them easier to push through the surface. (2) If two trackball cursors are positioned close together for an extended period of time, the viscosity of the water surface is influenced locally around the cursors in such a way that the surface appears to become "sticky". (3) The clarity of the inventions seen as reflections in the water surface is inversely proportional to the sum of distances between the cursors, so that the reflections become clearer when the cursors are brought together.

3 Evaluation

We did observations, interviews and work-shops. We triangulated the workshop data with the data from the summative evaluation.

Summative Evaluation

Two researchers observed visitors interacting with The Well of Inventions during approximately 12 hours, spread across 2 days. About 130 visitors approached the installation. The dwell times varied widely from a few seconds to more than 10 minutes (the longest dwell time we observed was about 30 minutes). Visitors would stay for about a minute. A large majority of the visitors that entered the exhibition area also interacted with the exhibition, although a few groups seemed to be unable to spot the trackballs. Of those that interacted with the exhibition, about 20% discovered that it is possible to push the underwater objects through the water surface. It is unclear whether any visitor observed that the objects in the installation are virtual replicas of objects in the Museum's Machine Hall. The Well of Inventions gave no clear directions how to go about the exhibition.

Visitors entering the room at first looked at the projection surface then if they found the trackballs they pressed, rolled, (slow and quick) or rotated the trackballs to gage the outcome of that behaviour. Some almost immediately started to look for the technology and climbed the podium were behind we had positioned most of the computers. Some visitors spent time just moving the trackballs around while exploring the sound change rather than focusing on the virtual objects of the projection surface. A number of people immediately looked for signs and labels describing how to go about the exhibition. Some explored the installation room before going for the table with the projection surface and the track-balls.

The difference between one-person visits and several-person visits has much to do with the intensity and speed of the activity. Competition often occurred between people chasing each others items controlled by the track-balls. Several-person visits tended to look rapidly for obvious activities not acting as relaxed as the one-person visit. The person who uses the installation by himself can decide the speed of the exploration of the exhibition. In recent years there has been a growing recognition that people often visit museums with others and that their experiences of exhibits and exhibitions is produced in and through interaction and discussion with companions, family members and others within a group (McManus 1987, 1988). Within visitor studies there is a growing call for more detailed studies of social interaction with and around exhibits (Leichter et al. 1989; Lawrence 1991, 1993).

It was common for visitors to discover a feature and then demonstrate it to others. Children in the ages 10-13 seemed to be more interested in the exhibition than other age groups, putting their fingers on the display to "feel" the water. These children typically viewed the exhibition as a game: they often (quite enthusiastically) referred to the transformation of objects moving through the water surface as "a kill". Adults showed the least amount of interest, and would often encourage their children to leave the exhibition while the children were still engaged at the table. Many of the visitors that entered the space as a group discussed the purpose of the installation and the nature of the interaction. They also verbally negotiated the meaning and underlying rules of the motion of the objects. Few visitors read the text on the computer screens in the antechamber. Occasionally, adult visitors would go back to the antechamber to read the texts after having tried interacting with the installation. Some groups also spent extended amounts of time exploring the physical features of the room, such as climbing the platform or searching for the hidden control room.

Two staff members of the Museum of Science and Technology and three visitors were interviewed. The interview data largely confirms the information we obtained through observation. The museum staff members we talked to observed that the installation has a strong ability to attract people, even children that would otherwise be less prone to stay and concentrate. Most visitors express a curiosity and want to know more. Thus, from the point of view of the museum staff, the installation is more of an indication of the possibilities of technology than a way of presenting content.

Workshops

Three workshops were held at the Museum of Science and Technology on November 20 and 26, and December 3, 2002. The first of these was organized as an open seminar and had about 15 adult participants. We invited two high-school classes (with about 15 and 30 students, respectively) together with their teachers to participate in the two remaining workshops. Our workshop procedure is adopted from the *future workshop*, an evaluation/brainstorming methodology developed within the cooperative design movement for assessing workplace organisations (Kensing and Halskov Madsen, 1991, Bødker et al., 1993). In our interpretation, the data acquired from the observations, interviews and workshops share five common themes.

(1) the educational purpose of the installation is perceived as problematic or non-existing.
(2) the audiovisual design of the installation is largely perceived to be successful.
(3) many visitors perceive the installation as engaging and fun.
(4) the installation has the ability to encourage collaboration.
(5) the physical design of the installation environment made the interaction devices hard to spot for some visitors.

4 Discussion

Physical Design perspective of Technology-intense Exhibitions in Museum

While the traditional set-up with things-not-to-be-touched and posters-to-be-read can be engaging for visitors inclined to visceral experiences and reflection it brings about a sort of detachment. One comes to engage only the mind and eye and leaves the body largely outside of the experience of the exhibition. The body is to be used only as a means of transportation for the mind and eye throughout the museum. Touching is a sensory and experimental confirmation of what one sees, and as a memory reinforcement (Dean, 1996). We are looking for a broader design perspective when it comes to how humans move around and use their bodies in a museum especially museums with technologically intensive exhibitions. What facilitates the body's encounter with these exhibitions and what will be a hinder? When designing The Well of Inventions we build on previous exhibition, The Tone Table, produced and placed at our workplace at the Royal Technical Institute were we invited our colleges and their children to explore it. When observing them we got a more realistic and a more physical view on how people would interact with this idea.

Dean (1996) is describing the human being as "one archetype with minor variations in size, weight, features, and the like". This model includes a main section, appendages and a head symmetrically organised along the mid-line of a spinal column. This gives a somewhat rough but clear image with what we move around. People will not only find exhibitions in the museums but also other people. They will most certainly influence each other when it comes how they go about in the museum and how they interact with the exhibitions. "The human being is a design factor that influences and relates to all other composition-related considerations". When describing human factors in exhibition design Caulton (1998) builds on learning theories when he suggests how to design interactive exhibitions:

- Have direct and obvious actions and reactions.
- Have clear goals, expressed in terms of encouraging visitors to develop physical skills, to improve their knowledge or understanding, or to refine their feelings and opinions (i.e. psycho-motor, cognitive and affective outcomes).
- Are intuitive to use and require minimal label-reading.
- Work at multiple intellectual levels, for visitors of different ages and abilities.
- Encourage social interaction between friends and family members.
- Have open-ended, variable outcomes.
- Are founded upon research into the existing knowledge and understanding of targeted visitors, and which do not include confusing information.
- Are multi-sensory and employ a range of interpretative techniques appealing to visitors with a wide range of interests and learning styles.
- Are challenging but not threatening to visitors, and which help to build confidence.
- Provide enjoyment for visitors, and leave them feeling they have understood something more than they did previously.
- Are well-designed, safe, robust and easily maintained.

(Calton, 1998)

This walking around with a curios eye and a reflective mind might look like a light task. Indeed in terms of physical work the load is light. However, one may yet experience a sudden lack of energy when one's body after a short time feels heavy and tired and one has difficulties in continuing the museum-walk-around. In e.g., art museums we see visitors carrying around those portable chairs for time of rest or just sitting down on the floor or lean against something. What is really going on here? Even people who do not exercise regularly might walk around for hours on end in shopping malls without feeling out of energy or take long Sunday walks or play golf for hours. The sort of fatigue then with an early onset in museums seems not to be so much a matter of being physically tired as being mentally so *or is this the way our bodies tries to tell us that they are bored*. It seems that the very activity of looking, reading and reflecting is mentally demanding. This is of course nothing new. There is a common condition called exhibit fatigue (Dean 1996). We want to propose however a way in which we think that the "visitor fatigue syndrome" or the exhibit fatigue can be tackled. Our suggestion is going to be spelled out in terms of how we attempt to bring the body back into play and thereby lessen the sort of cognitive overload that can occur in museums. Moreover, by bringing the body back into play, by transforming the design of exhibitions into a design for the body as much as for the reflective mind, we want to say that we are looking at something with great potential. We align ourselves to some extent with the phenomenological tradition that stresses the profound importance of the body even in seemingly intellectual activities such as learning about abstract matters and not simply in learning physical skills.

Some museums are already moving from traditional "read and see" exhibitions of artefacts towards more hands-on experience oriented ones.
When doing this we often see computer technology involved (some exploratoriums and sciences parks are exceptions). We can now touch a screen, a button or a surface to get some software to start displaying images or texts and often with sound. To use a keyboard, a mouse or RFD-tags is also a common way to do hands-on oriented exhibitions. Many museums are making use of computers within their exhibitions. So e.g. when we walk into museums these days we often see these booths or stations with computers that are to support the visitor experience. What is running on these computers varies a lot. Sometimes we see computer game-like environments and at other times web sites that we can browse through. In some cases one gets the impression that what is really going on is that the posters and signs, the information content of the "read and see" exhibition style has been moved to the computer screen and one might question such use for wherein lies the added value? Interactivity has been seen as the sort of universal remedy. Thus it is said that one should not just present information with computers, but we should go beyond this and give the visitor an interactive experience. There has been some talk lately in education on the potentials of computers in allowing for a kind of engagement that goes beyond that of media such as books. Perhaps the passionate engagement one finds with computer games can be understood and explored in educational software also. However, we would like to point out that prior to the question of how to build the right sort of learning applications within the educational setting of the museum, there lurks another more fundamental question to consider. We need to take a step back and really ask ourselves what it is that we want to accomplish with computers in museum exhibitions. Is it really the implementation of interactive stations that rely on traditional computer artefacts or are there other possibilities? When we think of the ways in which computers have so far come to be commonly deployed in museum

exhibitions, even though we are allowed to touch and interact the sort of interaction that is taking place is limited. It seems that the way in which the computer enabled "hands-on" exhibitions has come to materialize is still not really hands on or if it is hands on then where are the hands? They are in most cases operating a keyboard and there is this gap between the computer and what is being explored. Thus we might e.g., engage ourselves with some computer model, say a marvellous rendering of some ancient artefact that we can rotate on a computer monitor by using standard input devices. However, in some sense what we are interacting with directly is the computer and not the ancient artefact. The link to the information about the artefact is still wearing the face of a computer-technology and it is not as transparent as to augment the experience of the artefact without being a layer itself. What is more, the computer and its peripherals (though perhaps partly hidden) stands out as something that is not really integrated with the exhibition.

To involve both "body and soul", could be what motivates a more integrated museum experience. What do we mean by this? Let us begin our explanation by noting that there is a long standing tradition that goes back at least to Socrates which sees the body as a hinderance to thought and learning. So in the *Theatetus* Plato has Socrates say the following.

"the body fills us with loves and desires and fears and all sorts of fancies and a great deal of nonsense, with the result that we literally never get an opportunity to think at all about anything." [Socrates, in the *Theatetus*]

On such a Platonic view the body becomes a hindrance to learning. It is just this confusing thing that the soul is forced to dwell in. If it was not for the body we would be able to think and reason like we have never thought before and reach all kinds of marvellous insights. The body is, on the Platonic view, something to be despised.

"in despising the body and avoiding it, and endeavouring to become independent--the philosopher's soul is ahead of all the rest" [Socrates in the *Theatetus*]

So the Platonic view really leads to this strong sense of alienation to our bodies. Then in the 17th century Descartes gives us our modern conception of the mind and this too is a conception which continues this theme of alienation and separation with respect to the body. Descartes did a lot of work on the physiology of vision and one thing he discovered was that there were these nerves that lead from the back of the eyeball to somewhere inside the brain. Being a clever person Descartes also noted that a lot of other nerves also went to the brain. In fact he came to see that all sense organs had nerves that ended up in the brain and so he concluded that the brain is really were all sense data gets channelled. Well if that is so he thought then it must be for some reason and what he came up with was that the brain is really were our conscious experience takes place and it does so through the mind which is somehow housed in the brain. Well what this showed then, according to Descartes, is that our experience of the world is never direct, but always mediated through the body. So for Descartes it made a lot of sense to think of the mind as separate from the body and the world. This is an idea that became widespread throughout modernity and we tend to think along Cartesian lines of reasoning when we talk about such things as inner experiences, knowledge and mental life in general. We make this assumption of dualism that there is the external world on the one hand and the mind as the thinking, experiencing thing on the other.

In response to the Cartesian view of the mind, pragmatists such as William James and John Dewey argued that what should be of concern to us is our experience of the world. Do we experience ourselves as disembodied observers or involved embodied agents? For them what gives us a sense of reality is that we are able to interact with and control events in the world. Dewey is critical to the western intellectual tradition that in his view became obsessed with questions of knowledge and knowing from a detached reflective standpoint. He claims this obsession has given us a distorted view of human beings. The upshot is that we have come to neglect the kinds of experiences that we have which are not cognitive or reflective in the Cartesian sense. So we have come to neglect that we are actively involved with the world around us, doing things, enjoying things and suffering, in short the panorama of meaningful experiences that serve as a background for knowing and understanding. For Dewey a human being is fundamentally a being that acts and experiences emotions and most experiences are not primarily reflective in nature. What the philosophers had tried to do according to Dewey was to reduce all experience to forms of knowing. But to understand knowing Dewey thought we really need to get back to our basic involved experience in the world. When we do this we come to see that the nature of thought and reflection can only be understood against the background of prereflective experiences. For Dewey the way to knowledge is through active inquiry, manipulation and testing. He was opposed to what he called the 'spectator theory of knowledge' which he thought had haunted philosophy ever since its beginnings. So Plato, Descartes and all the philosophers up to his day had got it all wrong in his mind. They are all victims of taking on this passive reflective stance on knowledge. We do not aim here to depict Dewey as someone who is going to save education or museums. We see nothing wrong with visitors being spectators and in our minds all philosophers tend to have this natural tendency to reject whatever came before them and Dewey is no exception. We want to ask with Dewey, however, how we can go beyond the spectator view towards a more actively involved view of learning as something that involves embodied engagement. In doing so we also wish to affirm the importance of the museum as a long standing tradition which has evolved into an art of making public exhibitions. What we are suggesting is not a hiatus shift in the history of museums, but a synthesis in which the know-how and skills of museum workers come to expression through technology as a transparent means for allowing the body to come into play.

Technology can provide possibilities of transparent interaction with different materials, but only in so far as technology does not become an obvious layer, an evident shield between the visitor and the object of exploration. Another way to put this is to say that we simply need to get away from computer-behaviour. We need to make the computer disappear from the field of experience in order to leave room for a new synthesis: the interactive museum exhibition. When the computer disappears from the field of experience we can bring back the exhibition itself to the foreground. One can think of this as resolving the potential conflict between technology and what exhibitions are about. Our position then is that computers can be used to support bodily engaging interaction with virtual artefacts in ways that are otherwise not possible and that they can do so invisibly, i.e., without disturbing the plan of the exhibition or the visitor experience of the exhibition.

We suggest a more open-ended view of the Museum exhibition planning, to broaden the meaning of “Hands-on”. To ask ourselves when designing exhibitions: how can we design for reflective as well as bodily interaction from an esemplastic stance? We think of the exhibition as allowing people to be performers, spectators, socializers, quiet observers, experimenters, physically engaged, mentally focused, reflective, tinkerers, experimenters in brief: as explorative human beings. An affirmation of the body also involves designing for a range of movements: reaching, turning, grasping, bending, holding, letting go, feeling, rubbing, pushing, pulling, walking and modalities of action: high, low, quick, slow, small, big. To stretch, to bow down, or to lean to a side, all these different postural adjustments for the body, makes for a more physically inclusive experience of the museum visit than if all items is placed in an average height for the average body size. There is a need to consider physical features when designing artefacts. The way we interact differs with the size and weight of the artefact. There is also the question of how the events can unfold over time. So we can think about active time, time for reflection, time for rest and relaxation. To further illustrate this we can use as a metaphor the design of an hour of gymnastics with periods of lower and higher intensity. “The average maximum attention span for an adult audience being thirty-minutes.” (Dean, 1996). We might, through an esemplastic perspective, design exhibitions so as to prolong this time span.

At this point we would like to bring up some examples of how technology might be applied in esemplastic design. We could design the sound environment so that it is addressed to the body as well as the ear (one can feel level vibrations for instance). To experience the sound environment by moving around in it (sound can e.g., be triggered by the way people move). Graphics can be projected in a way that it triggers a more bodily interaction (directions to move might be displayed). Artefacts can be deployed so that we move away from the traditional index-finger ways of interacting with computers and allow for experience with gestures or through another medium for example sand, water, stones, clay (the lifting of a stone might e.g., trigger a recording of its natural history).

There are aspects to consider if the expected visitor groups are children, adults, teenagers or visitors with different handicaps, different cultures etc. There is also the aspect of a visitor’s minimum comfort space. In the last two or three decades, museums have been classified as “leisure-time activities” while still retaining an identity as intellectual centres (Dean, 1996).

General themes and open questions

An esemplastic design perspective on museum design. Computers can be used to support bodily engaged interaction with virtual artefacts. How do we refer to our bodies? A mean of transport, a motor, a multi-tool, a receptor for “feelings” and the atmosphere in a room? Even where data is collected using video rather than audio-recordings (and field observation) researchers have disregarded the visual and bodily conduct of the visitors to a large extent. There is an emerging body of studies that is taking seriously the embodied activities in which participants engage as they explore museum exhibits (Hemmings et al. 2000; Büscher et al. 2001, Crabtree et al. 1999).

5 Future works

We will try to implement more esemplastic aspects when designing future exhibitions in cooperation with museums.

Fig.6: Poster picture for The Well of Inventions

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