

Interaction and Interactives

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Abstract

It is increasingly recognised that interaction and collaboration are critical to our experience of museums and galleries. Curators, museum managers and designers are exploring new ways of enhancing interaction and in particular using tools and technologies to create new forms of participation, with and around, exhibits. It is found however, that these new tools and technologies, whilst enhancing 'interactivity', can do at the cost of social interaction and collaboration and inadvertently impoverish co-participation and cooperation. In this paper we address some of the issues and difficulties that arise in designing for 'interactivity' and in particular point to the complex and highly contingent forms of social interaction which arise with and around exhibits. The paper is based on a series of video-based field studies of conduct and interaction in various museums and galleries in London and elsewhere including the Science Museum and Explore@Bristol.

Introduction

In recent years we have witnessed the wide-spread deployment of digital technologies in museums and galleries. In some cases, these technologies are concerned with enhancing more traditional exhibits, providing visitors with new ways of accessing information about objects and collections, either in the museum itself or in the classroom or at home (e.g. Keene 1998; Klein 1995; Thomas et al. 1998). In many cases however, digital technologies are increasingly used to develop new kinds of exhibit; exhibits designed to create new forms of interaction and engagement. These exhibits range from conventional computer interfaces through to complex multimedia systems and in different ways are concerned with enhancing 'interactivity' and participation (e.g. Bradburne 2000; Schulze 2001; Wohlfromm 2002; Yates et al. 2001). This commitment to 'interactivity' is becoming a central tenet for many science centres and we find for example the recent publicity campaign for one museum in London declaring that 'there are thousands more buttons to press at the Science Museum'.

In this paper we wish to briefly consider the forms of conduct and social interaction which arise with and around, a number of computer-based interactive exhibits. The examples are drawn from the Wellcome Wing at the Science Museum London and Explore@Bristol. Both the Science Museum and Explore house cutting edge interactive exhibits which have been highly commended for providing new forms of interactivity and participation. Surprisingly perhaps, our own observations, suggest that while a number of the exhibits may enhance an individual's interaction with an 'artefact', they do so at the cost of impoverishing coparticipation and collaboration. In discussing these observations we are interested in addressing two underlying issues. On the one hand, how can we design exhibits to facilitate interaction and collaboration amongst visitors, rather simply between the artefact and an individual, and on the other hand, what methods are most appropriate to explore and evaluate conduct and collaboration with and around so called 'interactives'.

Background

Before discussing some actual examples it is perhaps helpful to raise one or two more general issues:- The growing interest in developing sophisticated 'interactive' exhibits is driven in part by the growing educational agenda of museums and galleries (e.g. Anderson 1999; Falk and Dierking 2000; Hein 1998; Hooper-Greenhill 1994). It is

increasingly recognised that museums and galleries provide an forum for what has come to be known as 'informal learning' and that alongside the formal programmes run by education departments, museums and science centres provide important opportunities for visitors of all ages to learn with others (Falk et al. 2000; Hein 1998; Hein 2000). This growing emphasis on informal learning is informed by debates within education and the cognitive sciences and in particular the recognition that learning is 'situated' and arises in and through interaction with others (e.g. Lave 1991; Rogoff et al. 1984). Social interaction and collaboration are seen as critical elements of the learning process and it is widely argued that exhibits which entail 'interactivity' are more likely to engage the visitor and provide a foundation to participation and learning. In this light, the growing emphasis on 'interactivity' in museums and galleries is to be applauded (e.g. Barry 1998; Dinkla 1995; Dinkla 2001). However in some if not many cases 'interactivity', that is interaction with an artefact or exhibit, is conflated with 'social interaction' and it is assumed that 'interactivity' is beneficial to the learning process.

In recent years we have witnessed the emergence of a substantial body of research concerned with the behaviour of visitors in museums and galleries. To a large extent, it has been driven by an applied agenda which focuses on whether exhibits achieve their learning outcomes (see for example Butler et al. 1989; Durbin 1996; Falk and Dierking 2000; Gilbert et al. 2001a; Gilbert et al. 2001b; Hein 1998; Schaefer 1996; Screven 1976). Various criteria are used to evaluate the potential educational contribution of exhibits, the most important of which is 'dwell time' (Bitgood 1991; Bitgood 1994a; Shettel 1968a; Shettel 1973). In consequence, museum managers and designers are keen to develop and deploy exhibits that hold the visitors' attention for extended periods. Interactive exhibits and in particular computer-based exhibits are viewed as a way forward. Visitors spend far longer with exhibits that require some kind of manipulation than with more conventional exhibits and their dwell-time can be multiplied through the installation of computer systems (e.g. Bradburne 2000; Schulze 2001). It is even argued that visitors read more when writing is displayed on computer-screens and not with standing the size of the screen and text they attract groups and families as well as individuals (e.g. Flagg 1994; Morrissey 1991).

The focus on learning, coupled with the traditional bias of social science research methods, has driven analytic attention towards the ways in which visitors reflect upon and recall aspects of an exhibition and its messages. Interviews, focus groups, and

surveys have proved the favoured methods of much visitor research (see for example. Falk et al. 2000; Korpan et al. 1997; Stevenson 1991). Despite a range of initiatives over some years (including for example Blud 1990b; Diamond 1986; Leichter et al. 1989; Lucas et al. 1986; McManus 1987b; McManus 1988a; Paris 2002; Tulley et al. 1991; Tunnicliffe 2000a), the conduct and interaction of visitors, actually at the exhibit face, has received less attention, and we still know little of the ways in which visitors in interaction with others explore, discover, examine and assess exhibits in museums and galleries. The relative absence of such research becomes even more surprisingly when one considers the growing emphasis on informal learning, communication and 'interactivity' and the idea that exhibits are increasingly concerned with creating new forms of visitor participation and interaction. In other words, when exhibits are designed to create and enhance 'interactivity' it would seem somewhat important to examine how visitors actually respond to and participate with the exhibit in question.

The design and development of new technologies over the past decade or so has not been without its difficulties and even their deployment into more conventional domains such as the workplace has not been unproblematic. Indeed, it is increasingly recognised by engineers, computer scientists and management that we need to find new ways of identifying the requirements for technology and methods to ease their deployment into organisations. The difficulties associated with the design and deployment of novel technologies have led to a range of initiatives in areas such as requirements engineering and to a sustained critique of more conventional models of human-computer interaction with their emphasis on the individual, the cognitive and the experimental (e.g. Bannon et al. 1991; Suchman 1987; Winograd et al. 1987). In comparison to many workplaces, even quite complex organisational environments, museums and galleries pose major challenges to designers and engineers which stand at odds with more conventional models of human-computer interaction and the interface. The system, the exhibit, has to be usable by a broad range of visitors with very different expertise and expectations, it has to work when visitors are alone or with others, its function and purpose has to be accessible and interesting, and it has to engage the visitor for relatively brief periods of time.

For those who are engaged in the design of interactive exhibits there is little in the computer or social sciences which can provide guidelines, insight or even principles for their development, and not surprisingly we find a curious mix of case law, good

examples and conventional human-computer interaction and ergonomics drawn into the ad hoc creation of 'interactive' exhibits. It appears that detailed studies of the ways in which visitors operate, use and experience interactive exhibits, both alone and with others, can contribute to our understanding of the requirements for exhibits that are designed to facilitate and support interaction and participation in museums and galleries. The design of such exhibits poses a unique challenge; a challenge which resonates with many of contemporary developments in museology and education.

The approach

Over the past few years, we have begun a programme of work which is concerned with conduct and interaction, social interaction, in museums and galleries. The aim of the work is to examine how people respond to artefacts and exhibits in museums and galleries and the ways in which their response emerges in and through interaction with others, both those they are with, and other who happen to be in the same space. One project is concerned with communication in science centres and museums and in particular with the ways in which people encounter and experience relatively sophisticated 'interactive' exhibits. The project is funded by the Wellcome Trust and has focused on exhibitions and centres which have received substantial support from the Trust as part of its commitment to the public understanding of science. Extensive data collection has been undertaken in various centres and museums including for example the Science Museum London and Explore@Bristol and for comparative reasons we have also collected materials in a range of other museums and galleries including the V&A, the Courtauld Institute of Art and Tate Britain and Tate Modern. As part of this general field work, we have also held interviews and discussions with members of the design and evaluation teams which were involved for example in creating the exhibits Wellcome Wing of the Science Museum as well as with curators, museum managers and of course the visitors themselves.

The principal data are video-recordings of 'naturally occurring' conduct and interaction in the museums and galleries augmented by field observation. Video-recordings provide the unprecedented opportunity of gathering (versions of) conduct and interaction as it occurs and subjecting it to detailed and repeated scrutiny using slow-motion facilities and the like. In each the museums, galleries and science centres we have unobtrusively placed cameras and microphones and recorded how visitors approach and examine particular exhibits. Notices have been placed at the entry to the museum and in the particular galleries informing visitors of the project and seeking

their permission and cooperation. Visitors are also provided with the opportunity, following the event, to request that materials be destroyed. As yet we have received nothing but strong support from visitors who seem pleased that researchers are taking an interest in their response to the museum or gallery. In all, we have gathered more than five hundred hours of recording and subjected a selection of these materials to detailed analysis and investigation (see for example vom Lehn et al 2001ab; Heath et al. 2002b and in press).

Our analytic standpoint is drawn from recent methodological developments in the social sciences namely ethnomethodology (z.B. Garfinkel 1967, 2002) and conversation analysis (e.g. Sacks 1992). These developments direct analytic attention to the ways in which participants, *in situ*, produce and coordinate their actions and activities in concert or collaboration with others. It explores how these actions are accomplished through talk and bodily conduct and the ways in which they emerge, moment by moment, in and through interaction with others, be they those they are with or those who happen to be in the 'same space'. The approach therefore is concerned with the situated, evolving and highly contingent character of conduct and interaction and with exploring the resources, the practices and reasoning through which participants produce their own actions and make sense of the conduct of others. Analysis necessarily entails scrutiny of particular moments or fragments of activity captured on video; detailed investigation of the ways in which the participants themselves accomplish their activities in interaction with others (see for example Goodwin 1981, Heath 1986, Heath and Luff 2000).

Unfortunately in this brief paper, we can only provide a brief flavour of one or two of the observations which have derived from the analysis. In particular, we wish to provide a sense of the patterns of interaction which arise with and around a few relatively well known 'interactives'. The aim of the paper is to use one or two examples to begin to reveal the ways in which 'interactives' structure conduct and how they can 'inadvertently' undermine co-participation and collaboration in museums and galleries.

Prescribing interaction

One of difficulties with 'interactivity' is that it tends to reflect a particular model of human interaction which is not primarily concerned with interaction between people, indeed far from it. The model is implicitly, sometimes explicitly, drawn from computer science or at least the ways in which people are thought to interact with

computer systems. It is a model which pervades the design of computing technology ranging from simple work stations through to complex systems and it is model which has a long-standing tradition in Artificial Intelligence and HCI (Human Computer Interaction) see for example Dreyfus 1992, Suchman 1987). There is not the space to discuss the approach in any detail but it is worthwhile mentioning one or two points. The model places the individual and the individual's interaction with the artefact or system at the heart of the agenda. It assumes that activities derive from plans and goals, and that actions are organised in terms of rules that determine patterns or sequences of conduct to allow those goals to be achieved. The execution of action involves complex cognitive processing through which the individual develop representations of the system, for example, and enacts the appropriate sequence of conduct. Many computer-based systems are based implicitly on this approach to human interaction and ironically perhaps it was computer systems and their operation which provided the basis to the model in first instance, not unlike the ways in which the telephone exchange became a model of the mind in the 1930's.

Despite the provenance of the term 'interactivity' and the model it ordinarily encompasses, it is believed that computer-based exhibits attract visitors and engender lengthy dwell time. It is also suggested that whilst they may be primarily designed to interact with individual visitors groups or families can gather around and enjoy the exhibit. Consider for instance the Word Skills exhibit at @Bristol.

The exhibit is designed to test the linguistic skills of visitors. It consists of a conventional 19" active screen monitor which is placed on a large floor standing casing and visitors are provided with a seat directly in front. Interaction is through touching the screen. The system presents the visitor with a series of tests which become progressively more difficult as s/he proceeds though a series of successive topics and issues. At the end of the exercise the visitor is provided with a score. Completing the sequence of actions and achieving a score can take up to ten minutes and at busy times in the museum this can cause some difficulties.

Image 1.1.



Image 1.2.



Image 1.3.



The 'interaction' therefore is primarily designed for a single user who undertakes a series of actions which are responses to pre-specified questions or puzzles posed by the system. In the case at hand, the man sits down and initiates the first activity and progressively responds to the queries and puzzles posed by the system in response to his previous answers. Throughout the 'interaction' the man remains visually and physically oriented towards the screen and uses his right hand to select responses and progress the activity. His interaction with the system is organised through a series of two part 'actions'. The first part of each of these actions is produced by the system; the second part is the response provided by the 'user'. Each of these two part sequences of system-user action allow the visitor to progress towards the achievement of the particular goal which is explicitly presented at the beginning - 'Test Your Word Skills'. The system entails one of the most pervasive and highly structured models of human-computer interaction; the system initiating a series of sequences to enable a single user to achieve a particular goal. In the case at hand, the man spends more than seven minutes undertaking the task. He says almost nothing to those around him and throughout he remains principally oriented towards the exhibit. The interaction is primarily therefore interaction with the system.

From the illustration it can be seen that the man is accompanied by others. The woman standing behind and slightly to one side of him is his partner. As he undertakes the activity, others gather behind in a queue and wait their turn. The physical arrangement and orientation of those gathered around the man and the exhibit is quite revealing. It points to an *ecology of participation* in which others, even those that are with the principal user, have limited access to exhibit and the activity in which the man is engaged. The woman is given little opportunity or encouragement to contribute to the activity in which he is engaged, and certainly the system itself, and the 'interaction' it affords, does little to facilitate collaboration. Those who are waiting their turn are at best *partial witnesses* to the actions of the user. They have limited access to the information presented on the screen (through the size of text and position of the user) and cannot necessarily see the actions in which he engages. If close enough they can catch a glimpse of what is on the screen, though decorum probably dictates that they do not watch the user's progress, and so to a large extent they remain disengaged from the scene of action. The size of the screen therefore, coupled with the form of interaction the exhibit entails, creates a curious

ecology of participation, turning those that are co-present, at best into witnesses of a another's interaction with the exhibit and at worst simply waiting in line for the end of an activity which is largely indiscernible. The lengthy dwell time associated with the exhibit may reveal something of the satisfaction gained by the principal user but little of how others experience the exhibit.

It is worthwhile raising an additional point. It is inevitable that others will arrive at the exhibit when a visitor has already begun the 'game'. If the queue is short, or they are with the visitor who has begun the game then it is likely they will be able to see at least a part of the action which arises on screen. In this, as in many cases, even before the visitor has his or her 'turn', he or she will have been witness to some of the queries and puzzles posed by the exhibit and the answers selected by the previous user. When they begin their turn therefore users are already aware of the game, its question and puzzles, to some extent, and it is unlikely that they experience the exhibit in the ways intended by the designers. In some sense they have already seen at least part of the process once, so far from being new or a surprise. Later moves in the game are often those which are familiar to the (next) user, a form of 'second hand' use.

Readers may be surprised to learn that the principal user of the exhibit is not necessarily willing to encourage others to participate in the interaction with the exhibit. Indeed, the very nature of the interaction, with its emphasis in evaluating the word skills of the individual discourages rather than encourages collaboration. In various fragments we have observed that the user will prevent a companion to reach past him/her to touch the screen or to call in answers to posed test questions by verbally warning her or him off or even slapping his or her hand.

The Word Skill Test does appear to provide visitors with an interesting challenge which can engage individuals in an activity for a relatively lengthy period of time. It provides an extended and progressive form of interaction with the exhibit and visitors with a way of assessing the range and depth of their vocabulary. It achieves these aims though at the cost of precluding co-participation and collaboration and to a large extent those accompanying the principal user simply become witness to an event. The form and function of the exhibit, the interaction it affords, and the lack of visual and tangible access it provides to those even within a relative close proximity, undermines the co-participation and collaboration of others. In a sense therefore, a complex form of interaction with the exhibit is achieved at the cost of undermining interaction between people with and through the exhibit.

Voicing Instructions

The characteristic forms of interaction we find with Word Skills is by no means unique and reflects aspects of interaction which arise with and around other computer-based exhibits that are designed using conventional computer hardware and interfaces. In the Wellcome Wing of the Science Museum in London there are a number interactive exhibits which despite being housed in large amoeba like casings, commonly know as the 'bloids', involve users in relatively lengthy sequences of conventional computer-based activity. They mainly use a touch-screen interface though one or two do provide alternative methods of interaction. One of the better known pieces is known as the Sex Change Exhibit. It allows visitors to take a photograph of themselves and change the various physical characteristics so that they appear to have changed sex or aged.

Consider the following example. We join the action as three adults attempt to use the exhibit. Soon after their arrival, the man stands back, realising that he is unable to see the screen or its operation. Edith remains with her friend Jenny who tries to operate the exhibit (Image 2.1. – 2.3.).

Image 2.1.



Image 2.2.



Image 2.3.



Jenny touches the screen to take the photograph only to discover that she is not properly aligned so the camera fails to capture the appropriate image. Jenny sits down and begins the procedure once again. This time her friend Edith helps her by providing instructions as to how to align the face to the camera. As Jenny adjust her position, Edith provides advice as to how she should align towards the camera and then recommends that her friend take the picture. Once again, Jenny fails to produce a realistic image and two friends begin once more, attempting to produce an appropriate alignment for the camera. After successive attempts they abandon the exhibit and move to try something else in the exhibition.

As with Edith and Jenny, visitor dwell time at the Sex Change Exhibit is often quite lengthy, anything up to four or five minutes. Moreover, though the exhibit

provides limited access to multiple participants to gather and see what is happening, we do find two or three visitors gathering around the exhibit and engaging in discussion. It would appear therefore that the exhibit does facilitate interaction and collaboration and could be thought of as relatively successful.

Unfortunately however on closer inspection interaction with the exhibit appears somewhat problematic. In the first place, many visitors have difficulties in following the instructions and the first picture they take is frequently unsuccessful,- either failing to capture an image of the visitor or creating the appropriate transformation. Secondly, whilst dwell-time at the exhibit is relatively lengthy, a significant proportion of the time involves visitors in attempting to work out how the exhibit operates rather than using the exhibit to explore and assess the transformed images and their implications. Thirdly, co-participation and collaboration largely consists of one person providing instructions to another, whilst other members of the family or group stand back and watch the proceedings. It should be added that many visitors abandon the exhibit before successfully completing the task at hand.

In one sense therefore, the Sex Change Exhibit encourages collaboration and in terms one of the conventional criteria for measuring success in museums and galleries, namely "dwell time", like Word Skills @Bristol people do indeed spend extended periods of time at the exhibit. The character of the collaboration, the social interaction, which arises at the exhibit, however raises some serious questions as to whether the exhibit is as successful as we might light to believe and doubts as to the usefulness of conventional measures like dwell time. When we look at what happens when people use the exhibit, we find that in many cases, users spend a substantial proportion of their time attempting to make the exhibit work in the way intended and collaboration is often limited to one person helping the other to follow the instructions; the prescribed sequence of actions. Dwell time becomes extended further not by virtue of participants discussing the end result, the transformed image and its implications for our perception of sex characteristics and conventions, but rather in having to make successive attempts to produce a satisfactory image; an image which is clear enough to be able to see the user in the guise of the opposite sex. The collaboration therefore which arises at the exhibit is largely concerned with trying to operate the exhibit rather than discussing, or even appreciating, sex characteristics.

Word Skills and Sex Change are not unusual computer-based exhibits. They utilise basic information system and conventional hardware. They embody many of the

features of the common, conventional, computer-based interactive exhibit found in science centres, museums and galleries. The forms of interaction and collaboration they engender are not unusual. Like many other computer-based 'interactive' exhibits, they are designed for a principal user who interacts individually with the system to achieve a particular goal. The interaction with the system is scaffolded to elicit successive, single actions from the user in response to 'moves' by the system, be they instructions, questions, queries or whatever. The organisation of the 'interaction', a series of two part sequences of action,- computer-user, computer-user and so on,- is designed for and preferences a single respondent. The organisation is not dissimilar to a series of questions and answers in conversation, such as interview, which can provide little opportunity for the respondent to initiate action and that biases the interaction towards the same respondent (see for example Sacks 1974, Sacks, Schegloff and Jefferson 1973). The conventional input and display technologies used in these exhibits also undermine the collaboration of others by restricting the ability of people gathered at the exhibit to see the screen, to see the principal user's operation of the system, and to select items or moves on the screen itself. Like conventional PCs and workstations on which these exhibits are based, these types of computer-based exhibit are designed for single users, people or their own interacting with the system to accomplish a particular task. The collaboration of others is restricted in large part to watching the principal user 'interacting' with the system and occasionally helping or interjecting comments.

None of this is suggest that visitors do not use, or attempt to use, these exhibits for more complex forms of collaboration, indeed they do and sometimes succeed. Moreover, when the opportunity arises and they have successfully worked out how to use the system, visitors will take turns in using the exhibit and compare and contrast their performance and results. Indeed, not unlike some games in amusement arcades and the like, some of these computer-based exhibits are specifically designed to encourage comparison and competition between users. Unfortunately however, despite their commitment to 'interactivity' in many cases, computer-based exhibits, support relatively limited forms of collaboration. In many cases this consists of little more than helping operate the system or interjecting answers or solutions to the puzzle often to the frustration of the principal user. The fact that many people visit museums and galleries with other people, makes this something of a disadvantage.

Interactives for collaboration

There is a growing interest in developing exhibits that support interaction and collaboration amongst multiple participants. It is increasingly recognised that in developing these forms of 'interactive' it is necessary to move away from conventional computing hardware and single user interfaces to exhibits which provide real time access to a number of participants who may simultaneously engage in interdependent activities (e.g. Bradburne 2000). Examples of such exhibit can be found in various science centres and galleries including for example the Exploratorium in San Francisco, Think Tank in Birmingham and Explore @Bristol. Designing these multi-party 'interactives' has not provide unproblematic and it remains questionable whether many of the exhibits provide more than common access to a field of action which is created by one or two participants. One of the more innovate examples, which has met with some praise, are the interactive, circular tables found on the top floor of the Wellcome Wing at the Science Museum, the exhibition called In Future. The tables are positioned on a tilt to allow visitors of almost all ages to easily see and touch their surface. Through a digital projector mounted to the ceiling atop the tables games are projected onto the tables' surfaces. At seven locations around the table small round, turn-able plates and an illuminated button are embedded into the tables. Participation in the games works by virtue of turning the plates and pressing the buttons.

The games address controversial topic,; chip-implants in children that allow their parents to track them, male fertility, driverless cars. To encourage discussion and debate, at the end of each game a question is projected onto the table; visitors then vote on, "yes" or "no". On arriving at the tables a button lights up to indicate whether the visitor has the authority to select the next game. The exhibit has been greeted with some commendation and has proved popular especially with children and teenagers.

Image 3.1.



As with other computer-based exhibits dwell-time at the tables is lengthy, often more than five minutes and people speak highly of the exhibit in surveys after the event. Our own preliminary observations suggest that the tables are perhaps most successful when they involve two or three different participants; participants that arrive at the same time. In these circumstances, participants are able to produce a series of coordinated contributions and develop a coherent, mutually focused activity. However problems do arise.-

The tables allow up to seven people to play a game together. The participants however are not necessarily able to detect whether responses that arise on the tables are a consequence of their own action or moves by other participants. In other words, visitors lose track of how they are affecting the changing images on the table and of course how the actions of other participants are contributing to the game. In turn, it becomes increasingly problematic for participants to coordinate their actions with others and to develop a coherent, interdependent collaborative activity. We have noticed, that as visitors lose track of the activity as it appears on the table, their gestures and bodily activity becomes increasingly animated and dramatic. Through their bodily actions and vocalisations, visitors attempt to display to their co-participants the actions they are producing and the associated 'responses' revealed by the system. The interaction becomes increasingly 'mediated' through the participants' bodies rather than through the principle focus and scene of action on the table.

A further observation should be mentioned. When a small number of participants are gathered at the table they will often develop a coherent activity, coordinating their activities with each other as they appear on the table itself. The arrival of new people however can be highly disruptive. They are unable to determine what game is or where it is at; indeed in many cases they are unfamiliar with how the table operates.

There initial attempts to participate disrupt the activity at hand and whilst there may period through which all participants attempt to reconfigure the game in the light of the new visitor, it is not unusual for original visitors to abandon the exhibit altogether. It should be added that despite the overall aim of the exhibit, to engender discussion concerning controversial topics and issues, there is little evidence that participants talk to each other either during or following a particular game, other than in an attempt to coordinate their moves with each other.

Participation at the projection tables in the Science Museum illustrate the difficulty designers face in creating exhibits that engender collaboration involving more than one or two visitors. In particular, the tables reveal the difficulties in enabling visitors to coordinate distinct activities with each other when they have limited access to the operation of the exhibit and the contributions of others. It is not surprising therefore that many 'interactives' that entail collaboration either treat the visitors as a group and have them undertaking single actions in concert with each other, or implement a management structure which oversees and coordinates the different actions of the participants (see for example Koleva et al 19XX). Designing exhibits which support the highly variable and contingent forms of participation and collaboration that arise in museums and galleries is indeed difficult and it is hardly surprising that it is by luck, rather than plan, that one or two exhibits turn to be relatively successful. Whether any of them achieve their original goal is less certain.

Rethinking interaction

The term 'interactive' is misleading. It encompasses an extraordinary range of tools, technologies and techniques, objects and artefacts which are designed to create 'interactivity' in museums and galleries. It includes sophisticated information systems which prescribe complex forms of interaction between the user and exhibit through to 'low tech' artefacts designed to enhance visitors' understanding of particular objects. Different 'interactives' engender very different forms of interaction and provide highly variable opportunities for coparticipation and collaboration. As yet we know little of the conduct and collaboration that different 'interactives' afford, still less of the ways in which they might contribute to learning.

The problem arises with the term 'interactivity'. It suggests active participation, human action creatively articulated not only with regard to an object, artefact or

system, but in response to an active, potentially intelligent, and intentional agent. Unfortunately 'interactivity' is conflated with human interaction and in many cases with social interaction; interaction that is between people. Unfortunately, however, 'interactives' are rarely designed to support or enhance social interaction, rather in most cases they are principally concerned to provide individual users with the ability to operate or manipulate a system or object. In the case of exhibits based on information and communication systems, these operations can be relatively complex and engage the user in a lengthy series of structured actions and activities prescribed by the particular 'interactive'. The design and development of 'interactive' and new exhibitions, including a number of major projects over the past few years, continues to prioritise the individual user often at the expense of coparticipation and collaboration. That visitors are with and in the presence of others and that the object, artefact or system may well be used in interaction with others is not infrequently disregarded. There are important exceptions and it is interesting to note that these often involve 'low tech' objects and artefacts and are designed to necessitate co-operation and collaboration. With the development of more technically sophisticated 'interactives' when the presence of others is taken into account, their participation is often limited to the role of spectator or witness, an accompanying visitor(s) who, it is believed, will watch their friends or partners and then engage in the particular activity itself. The *'myth of the individual user'* as Jo Graham suggests continues to pervade the design and development of 'interactives' in museums and galleries; a more general reflection perhaps not only of the provenance of the term, but more problematically perhaps the prevailing curatorial and educational concept of the visitor.

It is hardly surprising that 'interactives' meet with variable success when deployed in museums and galleries. Their actual use rarely appears to reflect the ideas and assumptions which informed their original purpose and design. In prioritising the individual visitor rather than the social and interactional circumstances in which the 'interactive' will be used and seen, a complex array of issues and factors come into play which profoundly affect the visitor's encounter with and discovery of the exhibit(s) or artefact. These are largely disregarded in the design and deployment of the 'interactive' and yet have a critical effect on its ability to function and engage. Visitors do whatever they can with many 'interactives' and show remarkable ingenuity in using an 'interactive' to support forms of social interaction and collaboration that

they were never intended to support. Despite their apparent success in terms of conventional measures such 'dwell time' the forms and quality of interaction and collaboration which arise with and around the exhibit would do little to please the original; designers or the curatorial staff.

One of the more interesting issues that arises when one considers the incongruity between the design of the 'interactive' and conduct and interaction that arises when it is actually deployed bears upon the growing concern with learning and education in museums and galleries. Many 'interactives' have been driven in part by the learning agenda in museums and galleries and yet if the interactions which arises with and around the interactive is somewhat at odds with the original design then it perhaps raises problems concerning the motivation and warrant for the interactive in the first place. Learning may well take place, but not necessarily in the way predicted and as yet given, we how little we know of the interaction which arises with and around 'interactives' then we are hardly in a position to making an informed judgement.

Surprisingly perhaps curators and museum managers have long been aware of their inability to prescribe how visitors explore and experience objects and exhibitions. In his introduction to "A Grand Design' Baker suggests for example;-

while guidebooks may suggest what a visitor should look at, and even the route that he or she should follow - and the meanings that the single individual might read into the objects encountered along the way - will only rarely coincide with the strategic thinking of the Museum's planners. How a visitor interacts with artworks and their settings is determined by personal needs, associations, biases, and fantasies rather than by institutional recommendations. In considering this history - that of response to, and reception of, the collections - the issue is not with the Museum defined by its official aims and aspirations, but with how it is reconstituted in the individual imagination.

Baker, M. (1998) pp. 18-19

In the case of many 'interactives' these difficulties become exacerbated. The 'interactive' is designed to facilitate particular forms of conduct and experience and relies upon visitors using the exhibit or artefact in particular ways. the 'interactive' may even necessitate the visitor interrelating objects and making connections between exhibits which are not necessarily co-located. Unfortunately however visitors do not necessarily respond in the ways we imagine or hope and that circumstances may arise which make it difficult if not impossible to undertake the pattern of action required by

the 'interactive'. Even if we reflect on one of the more seemingly straightforward assumption entailed in many 'interactive' and exhibitions, that visitors will normally follow particular navigation paths and thereby be in a position to undertake the relevant actions in the appropriate sequential order, we can see how easily such an assumption may be undermined simply by virtue of the number of visitors or different pace at which they pass through the galleries. These and many more considerations besides are the stuff of designing exhibitions and need to be placed high on the agenda when we are developing 'interactives'.

In designing and developing exhibits for museum and galleries we have to reshape the ways in which we think of, and conceptualise the visitor, break from individualistic model which continues to pervade the 'interactives' and the very idea of 'interactivity'. Unless we place the social and interactional at the heart of agenda will continue to be frustrated by the unanticipated ways in which people use our 'interactives' and disappointed when we examine their conduct, experience, let alone learning. The lone visitor wandering through galleries and achieving a pure aesthetic or scientific encounter with objects is largely a misnomer despite the wishes of certain curators in more contemporary spaces. The presence and conduct of others has a profound impact on what we see and what we do and the opportunities that arise for exploration, investigation and learning. 'Interactive' are encountered and used with regard to the conduct and interaction of others, just the 'interactives' have a profound affect on the opportunities and organisation of conduct which arises within the domain, perceptual range of the exhibit and its surrounding conduct. Social interaction in museums and galleries is highly contingent and reveals complex and variable forms of participation and collaboration. Our discovery and experience of the museum arises in and through this interaction and, if they are to meet with success, our 'interactives' have to be sensitive to, and designed with respect for, the social interaction which will inevitably inform their use.

One final point; despite the substantial body of research concerned with visitor behaviour and the growing interest in 'interactivity' in museums and galleries, we still know relatively little as to how people respond to exhibits in museums and galleries and interact with and around the objects and artefacts they contain (e.g. Stocklmayer et al. 2002). Save for a few important exceptions, conduct and social interaction at the

exhibit face remains an unexplored territory and yet provides the foundation, the very basis, to people's experience of, and learning in, museums and galleries. It seems critical therefore that in developing new forms of exhibit and exhibition which are designed to enhance learning and interaction we need a more thorough understanding of how visitors behave in museums and galleries and the ways in which their behaviour arises in and through social interaction with others. Without this understanding, it is unlikely the hopes, principles and ideas which underlie the development of new forms of interactivity will be reflected in the actual response and conduct of visitors.

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