

Chapter 2

The View from Design

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In the preceding chapter we focussed on the general issue of the relationship between art and technology and reviewed some of the problems involved in gaining a practical purchase on the problem of *relating artworks to the design of new technologies* in general and electronic landscapes in particular. In this chapter we want to approach much the same general issues but this time from the point of view of system design itself.¹ So what are the problems of design for the emerging generation of electronic environments and what use can designers make of both the social and the artistic in terms of this design challenge?

From a design perspective, the invention and design of VR technologies involves two interrelated problems. First, in situations of invention the a-priori requirements of a system can be viewed as radically indeterminate.² Certainly in this case, and as we pointed out in the previous chapter and in the deliverables from last year, we are not designing for specific and relatively easily specifiable activities and information processes, such as in the work-oriented design popular within domains such as CSCW. In this case there are considerable debates about the extent to which we can specify and predict the nature of the work to be supported and the extent to which the development of systems can be informed from understandings gained from studying that work.

Somewhat in contrast to the more familiar world of everyday work we are faced with uncertainties as to just what the potential activities and processes might be. We might have ideas about what these might be but these will remain, for the foreseeable future, more or less interesting possibilities to explore. It is this inherent uncertainty which makes more traditional requirements capture and specification phase of limited viability and even calls into question some of the

¹ Much of this chapter is based on Crabtree *et al.* (1999) which is attached as Appendix 1.

² There is a danger of treating this as a tautology arising from the meaning of the word 'invention'. However, if we avoid taking this step then this remark can be treated as a matter of degree. For example, the Internet was an invention but the engineers knew what they wanted to do and were able to assemble known technology into a new form (though 'just what' that new form amounted to was the emergent product of years of development practice and could not have been specified in 'just what' detail prior to the accomplishment of invention activities).

iterative approaches to design already established in the development of systems to support cooperative work.

Even in the case of immature and emerging technologies such as electronic environments some understanding of the potential nature of their use and application is essential. This understanding is key to the shaping of the technologies and techniques that will be used to form these future electronic environments. In fact, consideration of situations and activities of use is essential to invention since design will, in significant respects, depend not simply upon engineering issues but also upon what might constitute the use context of the new technologies (Grint and Woolgar, 1997). Such issues are firmly concerned with the activities the new technology should support and in what ways.

It is clear that a tension exists in the emergence of virtual environments between the indeterminacy of specifications satisfying design objectives and understanding possible future contexts of use. This tension must be resolved in practice during the everyday course of the design process itself. Essentially the problem is how to understand the practical use of a technology in advance of its actual use, by people other than those involved in its development. The challenge set out to design, given the limited viability of a requirements specification phase in situations of such uncertainty, is how are end-users and practical circumstances of use to be brought to bear in constructive ways on the design and development of new technologies?

Attention to the context of use has for long been a concern of technology design across a wide spectrum of research domains. Recognising that activities of technology development depend as much on an adequate appreciation of contextual issues as technical ones – that technology and use context are irredeemably tied – has led to efforts to incorporate contextual perspectives oriented towards the practical circumstances of end-users into the design process. (Floyd, 1987; Grudin, 1990; Hughes *et al.*, 1992; Grønbaek *et al.*, 1997; Kensing and Simonsen, 1997; Christensen *et al.*, 1998). Although ‘quick and dirty’, ‘concurrent’ and ‘parallel’ social studies (Hughes *et al.*, 1994; Crabtree, 1998), and ‘experimental’ approaches to user-involvement (Grønbaek *et al.*, 1993; Mogensen, 1995) have enjoyed some, not insignificant, success in work-oriented contexts of design, integrating ethnographic and cooperative techniques into activities of invention and technology development has proved to be no easy task (Rogers & Bellotti, 1997; Grudin, 1993).

One of the main reasons underlying the particular problems we face in the eSCAPE project (and in light of the general remarks above) is that empirical knowledge of ‘the way the world is’ – of end-users and practical circumstances of use – does not drive design as such, even though such knowledge enters the design process in many ways and at many crucial points. Such ‘information’ is not a free good and nor is it always easy to deal with once gathered. Whatever the circumstances of design, constraints of cost and time make the production of contextual knowledge subject to the ‘economics of information’ (Sharrock and Anderson, 1994). As we say, this does not mean that end-users and circumstances

of use do not figure in design. As Grint and Woolgar's (1997) study of a commercial design company shows, designers employ a stock of 'company knowledge' about users in the invention and development of new technologies. Similarly, Sharrock and Anderson (1994) describe 'just how' end-users figure in design practices and characterise this as a 'scenic feature' in design reasoning:

'Sometimes when the designers were trying to work out some particular detail, reference would be made to just who the potential user might be. Thus, for instance, it might be suggested that the user might be a secretary, or a manager, or a key operator. Having designated these kinds of users, it was possible to introduce sets of expectations about what they might be trying to do, what they might know about the machine or process in question and how likely they were to initiate one or other sets of routines. In the terminology of Schutz (1974), "secretary", "manager", "key operator" are *personal types* associated with which are constellations of roles and relationships. In addition to these types, our designers also employed what Schutz called *course of action types*. Here the defining characteristic is not social identity, gender, organisational position or role, but an envisageable course of action which is being undertaken. It was around what could reasonably be said about such courses of action that "the user" entered the design decision making process.' (Sharrock and Anderson, 1994: 12)

As 'scenic features' in design end users and contexts of use are treated as distinct types of persons and commensurate courses of action. This common-sense knowledge of types and activities constitutes the 'stock of knowledge' designers routinely invoke and draw upon in their design activities. Largely, it is only late in the design process that the 'way the world is', to put it this way, enters the invention process and normally under the auspices of usability trials.

The main purpose of usability trials is to determine, and thereby make explicit, whether or not design conceptions are valid or, better, worth pursuing further, and determine ways in which the design may be refined. Central to the conducting of usability trials is the "enactment of the users' context" and "construction of natural users". That is, considerations to do with the selection of appropriate locales and users for testing. Should beta-sites or real-world settings be used? Should users be specialists – expert computer users, psychologists, managers, etc. – or novices, 'coal-face' workers, dis-interested parties, and the rest? Or should users be combinations of various competences? Whatever the choice, 'the way the world is', and (thus) the context of use, invariably enters design through observation of the performance of usability trials in the invention and development of new technologies. Observation of the ways in which users accomplish the activities set for them; of the practical problems they encounter in doing them; of the confusions that arise in the doing; and the solutions devised to make the technology work *in situ*.

This relationship between actual use of technology by real world communities and the development of technologies is central to most user (or citizen) centred approaches to development and is core to the work of the I³ programme under which the work of the eSCAPE project is supported. However, a reasonable charge to be levelled against the development of interactive 3D

environments is that there has been little or no user involvement in the development of these environments. While features of environments have been informed from studies of settings (Benford, 1997), and these environments themselves have been exposed to use studies (Bowers, 1996), there have been few systematic attempts to develop and put in place an electronic environment that seeks to meet the needs of an actual community of users. In fact, just this shortcoming motivated the studying of users of electronic environments at the ZKM and the subsequent development of supporting facilities (Trevor, 1998).

The studies of the artworks allowed the project access to users who could be considered representative of general citizens. The interaction of these general citizens with the various art pieces developed in the project allowed us to undertake some initial studies of the utility and potential of often radically new interface techniques and devices. However what is clear is that these were particular users who had come to visit a multimedia museum and for whom the experience of using these environments was sufficient. To make more progress in our understanding of the design and development of these environments it is imperative that we consider how these environments may be developed and used to meet the everyday needs of users with a real world application purpose to be met. At this point it is worth making a clear separation between the studies of the art pieces and the studies of the application domains used to drive the construction and further study of the demonstrators reported in Deliverables D4.1 and D4.2. In this deliverable we essentially consider the study of the artworks. The studies of the application environments are reported alongside the demonstrator landscapes they inform.

Understanding the use of the Artworks.

While the various multimedia art installations developed during the project represent significant endeavours in their own right and allowed the exploration of potentially radical new interfaces their principle role in terms of understanding users was to provide a point of exploration for future arrangements and technologies. As far as the eSCAPE project is concerned, the design of the artworks preceded the studies as did the design of many of the technologies used in the construction of the systems reported in Deliverables 4.1 and 4.2. With one exception, neither the design work nor the studies of the artworks-in-use done under eSCAPE directly influenced the further development of the artworks.¹ However, and from the beginning, it was felt important that the project should obtain an informed sense of how users of the artworks engaged with and used them. This provides for the possibility of bringing knowledge of end-users and practical circumstances of use to bear on the design electronic landscapes in and as of the process of design itself. Unlike the kind of design circumstances

¹ The exception is the study reported in Crabtree *et al.* (1999) and attached as Appendix 1 to this Deliverable.

outlined earlier, this was not so much a case of trials for usability after much of the design work had been done, but rather, using the studies to think about possible and interesting uses for VR technologies. The studies thereby act, one might say, as an aid to a ‘sluggish imagination’ in coming to evaluate the relationship between art and technology design.

Accordingly, the studies of the artworks were fed into a continuing process of discussion and design debate (see for example the discussions surrounding the development of the design of the tourist information centre in Deliverable D4.2). These design workshops and the process of continual debate were intended to focus the design effort toward realisable but imaginative possibilities within the constraints of the ‘economics of information’. Many of these constraints were, as pointed out earlier, technical in character. In common with much engineering, design choices have to be made between inventing new technologies and using older but workable technologies: a choice which can be as much influenced by the costs of time and money as it is by some notion of optimum efficiency. Design is, inevitably, a ‘satisficing’ activity and so it is with eSCAPE.¹

Although the major focus of this Deliverable is the study of the artworks and the various lessons for the developers of future environments, it is important to position these studies in terms of the studies of the application domains. While we can consider the studies of the art pieces (reported in summary in the next chapter) as the inspiration for design, the ethnographic studies of the Tourist Information Centre and the library can be seen as driving the development and application of the two demonstrator environments reported in Deliverables 4.1 and 4.2 respectively.

Understanding the Tourist Information Centre

This set of studies emerged out of thinking about the possibilities of using what we had learned from the study of the artworks in a real world setting. The challenge presented was to allow a situation where the exploration of constructed cityscape like structure could be put to use to meet a real world application. One possibility explored during the year was to place the Legible City installation within a fitness centre since not only were aspects of the technology, notably the bicycle, familiar but it might well provide an additional experience to the activity of exercise. However, when we undertook studies of the fitness centre, serious problems and significant issues became manifest (Murray, 1999). In particular, it became clear that the use of the Legible City in this way was not as good an idea as originally thought due to the clear observation that users of fitness centres are highly motivated and concentrate fixedly on their fitness activities and do not relish any diversion. Accordingly, the project turned to other venues and focused the efforts of those involved on these activities. A clear candidate for exploiting the concept and principles of the cityscape based electronic landscapes was to

¹ See Shapiro (1994) and Pycock (1999) for a discussion of this notion.

support those working in a Tourist Information Centre as a place where shared social reference to a city like structure was central. As a result a Tourist information centre local to one of the sites was selected for further investigation with a view to developing an electronic landscape for usability trials in such a context.

A ‘quick and dirty’ ethnography was undertaken in a local Tourist Information Centre (TIC) which supported the idea of developing a first prototype to explore some of the ideas further (see Deliverable 4.2 for a description of the study and subsequent development). There seemed to be a number of benefits to the Tourist Centre:

1. Such places are required to be ‘information rich’ in terms of the need for the staff to respond effectively to whatever queries might arise from people ‘dropping in’.
2. At the point of the initial contact of a user of the service, the staff do not know what information is required. While the experienced staff of the TIC may have a good idea of ‘the kind of things’ people need from such a Centre – railway timetables, list of hotels or boarding houses, entertainment sites, etc. – they do not know precisely what this person wants until the query is articulated and a search for the relevant information can begin. This posed interesting issues for the design of innovative information browsing services to support TICs.
3. There was the opportunity to exploit ideas culled from the artworks; ideas which might offer stimulating possibilities for the presentation and representation of information in such a setting.

It is important to note that the connection between the study of the Tourist Information Centre and system design was not that of requirements capture so much as using the former as an inspiration and point of real world contact for the latter – as an aid to design in the face of radical uncertainty. The ethnographic study furnished a detailed sense of the day-to-day work of the personnel of the Tourist Information Centre along with an informed idea of what the possibilities might be for a system to support that work. Again, it is important to stress that the research is more to do with exploring ideas – particularly ideas concerning interaction with a potential multiplicity of different virtual environments - than it is with designing systems which could have a more directed relevance to the current work of the Centre. But, having said this, it was important to gain a sense of the work of the TIC (which inevitably focussed on users both as users of its services and providers of its resources) in order to design the prototype.

The process was very much one of ‘design by brainstorming’, looking at what we had, what we had learned from the studies, what was doable within the time-frame and, as important, what the potentially interesting next steps might be. As indicated, this last point is an important one knowing that the future work of the project might well depend crucially upon technical decisions made at this stage. Accordingly, and for example, although the TIC demonstrator/prototype elaborated in Deliverable 4.1 is currently not used in a fully distributed manner it

was felt important that the architecture of the system should support this for the coming year's work. This meant that the demonstrator/prototype could be used in initial usability trials – in the sense discussed earlier – and from which we could learn in order to feed into an incremental design which did offer the possibility of supporting distributed use.

Understanding the use of the Library

In a manner akin to the studies of the Cityscape to support the development of the physical (or cityscape) based electronic landscape demonstrator, the need for a real world application and site of study emerged for the abstract electronic landscape demonstrator. The library studies emerged out of a concern to further develop existing abstract eSCAPE technologies within a concrete community of end-users and for the express purpose of public (citizen based) utility. Libraries are, amongst many other things, very public spaces concerned with the provision of public services and, as such, seemed to provide the opportunity to explore some of the key objectives of the eSCAPE project, namely, developing electronic landscapes for public use in cooperation with distinct communities of end-users. This becomes even more crucial given the on-going shift to digital libraries and the emergence of on-line public access facilities to allow users to search for and use a growing range of digital material.

For the eSCAPE project the concern lies with developing electronic landscapes that bear no resemblance to physical spaces. Rather we are concerned with how users of an on-line library system interrogate and make sense of an abstract information space. We are interested in how the presentation of an abstract space whose appearance is based on the semantic content of the information within the space can be used by on-line citizens. This requires us to consider different techniques for presenting information and user searches for information across a community of users and exploiting this landscape as a means of making sense of the large on-line corpus of material stored within the library. In contrast to the physical electronic landscapes where we are exploiting the static and slowly evolving structure of the environment the abstract information space builds upon the dynamic nature of these virtual environments and the ability to rapidly reconstruct these environments based on abstract criteria.

This presentation of a digital library as a virtual environment represents a fairly radical move away from the current predominantly web based 2D interfaces and environments. Although a number of existing demonstrators have considered the use of 3D interfaces to present a range of different collections of information a distinctive feature of the work of the library is that the presentation has a strong real world setting. A real world on-line public access catalogue is used to access an existing library collection and this is presented to actual users of the library in order to assess and understand its utility.

Involving end-users in what is effectively a 'blue-sky' research project (Rogers & Bellotti, 1997) is no easy task however, not least because at the outset we have little tangible sense of what it is we are to involve end-users in. To say "the informed design of e-scapes" is, quite obviously, not enough. Like general formulations as to the relationship between art and technology, such a position statement says little, if anything, of practical use in local circumstances where cooperative design has to be achieved. In order to involve end-users in a 'blue-sky' context, we thought it would be of most benefit to establish some 'realistic possibilities' for design (Randall *et al.*, 1995; Crabtree, 1998) with which end-users could sensibly engage with, elaborate, change and / or refine. Accordingly, studies of library usage served to 'sensitise' the members of the project to the everyday activities of library users, and naturally led to a particular focus on 'search' activities. In developing an appreciation of the real-world, real-time ways in which library users undertake and accomplish searches for information, the studies served both as foci and input to the design of the 'abstract' e-scape demonstrator.

In terms of the library demonstrator consideration of the real-world character of search activities, and available technological possibilities, led to the formulation of some rather specific requirements to be implemented in the demonstrator or prototype (see Deliverable 4.2, Chapter 2). In concrete form, the first version of the prototype presents to end-users some basic but nevertheless realistic possibilities for the support of search activities. These possibilities are not in any sense intended to be 'complete' but elaborated, built upon and transformed through 'hands on' experimentation by end-users. Thus, it is in and through bringing end-user competences to bear on, and producing iterative versions of prototypes, that end-users inform design in confronting the demonstrator with practical situations and requirements of use from the perspective(s) of end-users.

End-user involvement in design is reported through 'situated evaluation' of 'hands on' experimentation. The focus here is an ethnographic one directed towards the technology-in-use and the embodied work that makes the technology work. Attention to the lived or embodied work of technology usage enables the design team to develop an appreciation of the practical problems, confusions and solutions end-users encounter in confronting the demonstrator with practical situations and requirements of use. In addition to documenting end-user feedback, it also provides further input into design in explicating the sociality of 'hands on' experimentation. Such 'situated evaluations' of the TIC demonstrator and the artworks were conducted and it is towards a deeper consideration of the artworks and their input into design that we now turn.

Connecting with the artworks

Returning to the art works which is the main focus of this Deliverable, we want to present in this final section the main elements of the strategy followed for bringing the interactive artworks to bear on the design of electronic landscapes.

As we pointed out at the beginning of this Deliverable, the strategy was worked out in the course of the project, through discussions and studies, and trying to think through a basis on which the artworks could inform the design of systems. Inevitably, practical considerations have played a large part in determining what was feasible and doable with the time and resources available both from the point of view of carrying out the fieldwork and, importantly, what ideas it was realistic to develop.

The method used for the evaluation was ethnography, which is a method intended to gather material on the real-world, real-time activities of persons. In the context of Computer Supported Cooperative Work (CSCW) this has proved to be an important addition to informing the design of systems to support work activities.¹ Its value lies in observing first hand how work is actually done rather than relying upon reports or, worse, idealised versions as these appear in job descriptions, work process models and the like. In practise, the method involves a fieldworker spending some time in a work setting observing what people do, talking to them and gathering whatever material comes to hand. The aim is to understand the social organisation of the work setting from the point of view of the participants to that setting and, importantly, bringing this to bear upon the design of systems which better resonate with the ways in which the work is actually done.

However, it became clear from the outset, as we have already pointed out, that studying artworks was not quite as straightforward as studying work. For one thing the fieldwork would not be studying the production of the artefacts – these had already been designed and built – but rather the realised artefacts on display and, accordingly, beyond our control to affect further. Moreover, examining artefacts on display is not, on the face of it, equivalent to studying the users of computer systems as this is traditionally understood.

The issue of evaluation

Quite early on the issue of standards surfaced as a problem relevant to the evaluation of the artworks. In summary form this was an issue to do with aesthetic criteria. In some significant respects this had to do with a lack of confidence on the part of the computer scientists and sociologists on the team to be seen as passing judgement on the work of artists. However, it did point to some very real puzzlement as to how aesthetic evaluations could inspire system design? System designers, and this has also been the experience of the design-

¹ See COMIC Deliverable 2.1, 2.3 for extended discussion of ethnography in CSCW.

oriented sociologists on the team, tend to conduct evaluations against a backdrop of design lore about users and what it takes to make a system accommodate to some notion of the domain in which it will be used.¹ Such design lore, although not ignoring the decorative, tends to focus on more utilitarian matters rather than aesthetic and the experientially challenging.

In contrast to this, as commissioners of art, ZKM has focussed on the ‘aesthetically informed’ rather than the ‘aesthetically decorative’. The rationale for this is a view that

‘ .. the engagement arising from committed conceptual exchange between artists and developers is more likely to engender profoundly new approaches to eSCAPES than engagement at a superficial level.’ (Norman, 1998: 235)²

However erudite, this reasoning did not provide us with clear guidelines as to how the evaluations and studies might proceed. Moreover, and another contrast with the previous experience of the researchers, the typical environment of an artistic production is an exhibition or gallery into which an audience is invited. As we shall discuss below, unlike work settings, in galleries or exhibitions the opportunities for observing the interaction of a putative user with an artefact are much less available and, when they are, much less straightforward to understand. This was compounded by the fact that it was an important element of the audience’s experience of the artwork that they should receive little or no direction and guidance but, instead, be open to whatever experience the artefact might provoke in them. As we have already indicated, some of these issues are discussed below.

Moving from evaluation to experiment

Given the uncertainty of what was being assessed it became clear that the evaluations we were to undertake would be very much by way of explorations of what is a little understood evaluative context. As should be clear, evaluations of artworks even from within the art domains themselves are variable and likely to occasion no little debate and controversy as to their artistic merit let alone how they might relate to technology design. Nonetheless, in significant ways, we took it that the artworks could usefully be viewed as ‘breaching experiments’ - that is, as temporal infractions of taken-for-granted organisations of space³ - and as such, provide an initial purchase towards developing an appreciation of the prospective relationship between interactive artworks *and* the design of electronic landscapes of (potential) widespread public utility. Accordingly,

¹ We are not saying that following this lore always gets it right.

² It is important to note that the term ‘superficial’ here is not intended as a pejorative judgement. The point is to argue that for artists to be effective partners in technological development they need to be involved as early as possible not only to have an influence on shaping technology but also themselves to benefit more from the exchange.

³ The term ‘breaching experiments’ is taken from Garfinkel (1967)*. We use the notion in the spirit, if not the same (sociological) sense, of Garfinkel’s notion.

observing and reporting on the ways in which such infractions were produced, managed, repaired, etc. would serve to make visible, and available to design, the “just what’s” of occasioned use.

The spirit in which Garfinkel uses the idea of ‘breaching experiments’ is as ‘aids to a sluggish imagination’. As such, the artworks, in breaching members’ taken-for-granted organisation of space, serve to elucidate some of the practices and practical troubles arising in encounters with electronic spaces which may well require support in design. It cannot be stressed enough that the studies of artworks are aids to design and important ones at that. They are a starting point towards understanding the very practical relationship between interactive *artworks* and the *design of* shared virtual environments in the eSCAPE project and it is to a consideration of such matters that we now turn our attention.

In the following chapter we present in a summarised form the studies undertaken of a collection of rather radical artistic investigations. These studies provided a significant background to the motivations for the different technical decisions and approaches undertaken in the design of the demonstrators reported in Deliverables 4.1 and 4.2 and these studies were reported alongside the detailed studies of the settings within which the demonstrators were to be placed. It is worth noting that many of these art pieces are also documented in the accompanying CD ROM containing video clips and images of many of the different interfaces explored during the second year of the project.