On the Social Organization of Space and the Design of Electronic Landscapes.

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Abstract. This paper reports on-going work in the eSCAPE Project (Esprit Long Term Research Project 25377) directed to the research and development of electronic landscapes for public use. Our concern here is to elucidate a sociologically informed approach towards the design of electronic landscapes or virtual worlds. We suggest — and demonstrate through ethnographic studies of virtual technologies at a multimedia art museum and information technology trade show — that members sense of space is produced through social practices tied to the accomplishment of activities occurring within the locations their actions are situated. Space, in other words, is socially constructed and shaped through members' practices for accomplishing situated activities. We explicate, by practical examples, an approach to discovering social practices in and through which a sense of space is constructed and outline how such understandings may be used to formulate requirements for the design of electronic landscapes. In explicating our ethnographically informed approach, we outline how future technologies may be developed through the situated evaluation of experimental prototypes in public use.

Keywords. The social organization of space, designing virtual worlds, ethnography, experimentation, situated evaluation.

1. Introduction

The development of electronic landscapes, virtual worlds or cooperative virtual environments (CVEs) is of burgeoning technical, social, and commercial interest, promising substantial benefits to organizations of all kinds in overcoming real-world constraints of time and space. Despite a

notable degree of hype (Hemmings et al. 1997; Tolmie et al. 1998; Hughes et al. 1999), practical research in the field has nevertheless resulted in extensive developments of such environments (see, for example, Benford et al. 1997), studies of their use (e.g. Bowers et al. 1996) and the development of commercial initiatives (e.g., Contact 1999). Although the use of such systems is growing, there has been little consideration of the *social* construction of space.

A similar situation existed in the introduction and development of early distributed interactive systems. In the case of these systems a number of significant failures were attributed to a failure to attend to the sociality of real-world environments (Grudin 1988; Page et al. 1993). A similar failure to attend to the social construction of space and activities for virtual environments is likely to result in usability and use falling considerably short of expectations (Hughes et al. 1998). Without offering a universal panacea — or "silver bullet" — to problems of development and use, this paper reports on a sociologically informed approach to the design of electronic environments. In particular, we suggest that the design of electronic spaces needs to be informed by an understanding of the ways in which space is socially constructed in the real world. This is not to suggest that electronic spaces should replicate real spaces but that they need to draw attention to common issues that need to be addressed if electronic spaces are to be usable spaces. For example, in both real and electronic space, users must be able to find their way around — or establish where they are; who else is there, co-ordinate their actions with others; and so on.

These and a great many other everyday activities and actions rely on common, social practices such as following signposts in finding one's way through a landscape. As mundane as the example is, it nevertheless serves to point out that space and spatial arrangements are essentially tied to social practices in everyday life. Thus, an understanding of the real world, real time social practices in and through which members construct a sense of — and thereby organize, or order — space seems essential in the effort to develop virtual technologies and integrate them into the myriad settings and activities of everyday life. The aim of this paper is to consider these understandings and demonstrate their applicability to the development of cooperative virtual environments.

Underpinning the practical approach to development we propose is an understanding of the social nature of space. Before we consider the use of these virtual environments we consider in the following section what we mean by the social organization of space. The aim is to sensitize those concerned with the design of electronic landscapes to a distinct aspect of space and spatial arrangement — situated practice — integral to the uptake of virtual technologies. Following this we describe, by further example, how ethnographic study of situated practice may inform the formulation of concrete features of virtual environments.

2. The Social Organisation of Space in Everyday Life

A common claim of many virtual environments is that they exploit and build upon the everyday and natural skills of users in understanding spatial arrangements (see Benford et al. 1994). The developers of virtual environments use the phrase "everyday understanding of space" to refer to the way in which people are able to understand and interact within their everyday physical world. Developers believe that the skills inherent in understanding physical space can be exploited and built upon in the development of virtual environments that can support a number of users. In this section we wish to consider the nature of space in terms of how it is understood and shared between group of inhabitants and how the social organization of space is exploited in everyday life.

By "everyday life" we do not refer to some theory of social action but to the world as experienced by the members of society in the normal course of conducting their everyday affairs. We thus refer to the world as understood by ordinary persons, the taken for granted features of which are used as a resource for going about their daily business. Under the auspices of everyday life we presume — as a condition of the organization of our daily lives — that people, objects, places, etc., are distributed spatially and intimately connected temporally. Space and time are mutually related with our sense of practical matters such as "How long will it take to get to London from here?"; "How long have I got before the last train?"; or "What time are we eating?". Space and time are not worldly abstractions then but are embodied in — and integral to — the accomplishment of the activities we do (Sudnow 1972; Lee & Watson 1991; Hughes & O'Brien 1998).

Previous sociological treatment of space has largely been subsumed under the rubric of urban sociology and social geography (Park 1926). The concern has traditionally to chart the geographical distribution of various social characteristics: income, industries, classes, religion, ethnicity, population types, mental illness, and so on. On this "ecological" view, space is effectively construed as an arena within which members construct their courses of action. This is a commonsense notion of space conveyed by expressions such as the "environment", "surroundings", "territory," etc. Space and spatial arrangements become — as it were — the settings within which social activities of various kinds occur. This view is consistent with the mundane observation that, within social life, certain spaces, or places, are tied to the performance of particular activities: Classrooms are organized for teaching, restaurants for eating, libraries for storing and retrieving books, roads for the orderly movement of vehicles, and so on. There is, then, a strong sense in which that particular spaces and their arrangements are tied to particular activities — that spaces are *institutionalized*, as it were (Goffman 1961).

While accepting commonsense notions of space, we prefer to adopt a rather more interactionist attitude, an attitude that considers space and spatial arrangements as inextricably embedded in and produced through courses of human action and the reciprocal construction of the observable scenes and events of everyday life. From the point of view of social action in everyday life, spatial arrangements are intelligible arrangements essentially tied to the performance of particular activities. The intelligible character of spatial arrangements consists of two related generic features: They are (1) manifestly visible arrangements and are constructed for their visibility and (2) they are public hence widely, commonly, known.

The visibility of spatial arrangements is a precondition of their sociality. For the ordinary member of society activity involving spatiality — walking, shopping, displaying intimacy, driving, finding the bathroom etc. — are not deep mysteries only open to adepts but practical matters consisting of "what anyone and everyone knows" about the organization of the world in which they live. That is, the ordinary world *of* members is an intelligible world *for* members — a world that is encountered as recognizable, observable, reportable, publicly available and accountable — a world in which spatial arrangements exhibit a *mutual* intelligibility. Thus, in everyday life we recognize places where we can catch buses or trains, where we can

eat, report crime, buy groceries, go without invitation, drive, not drive, etc. We perform a huge variety of social activities with which a sense of space and spatial arrangement is intimately connected and interwoven as a readable feature of the settings those arrangements make visible.

Social action is, furthermore, collaborative. As such, the competencies that provide for social action are shared and constitutive of a world known in common. Knowing a world in common presupposes a *reciprocity of perspectives* whereby members orient their conduct by adopting the stance that "the world as I see it" is "the world as others see it" for all practical purposes in this setting here and now. Take for example driving in traffic. Driving in traffic *trades on* the presupposition of a world known in common; on members knowing which side of the road to drive on when going in a particular direction; on knowing that traffic lights are signals which convey instructions which have to be obeyed if sanction — if not accident — is to be avoided, on knowing that certain flashing lights on cars indicate the direction in which drivers intend to turn, on knowing that other lights on cars are brake lights, and so on. Thus, the world of driving — like any other aspect of the real world known in common — consists of common understandings of, and orientations to, the *social practices* of driving through which the orderliness of driving in traffic is produced. Social practices which provide for the production of social action are essentially tied to the space and spatial arrangements within which action takes place. For example, indicating is a social practice and it is a spatial arrangement for conducting the orderly flow of traffic. Spatial arrangements are known in common and essentially tied to and displayed through social practices for producing spatially situated activities.

This brief examination of the social organization of space suggests that understandings of these spaces are produced in practice and that the properties of these spaces are developed *in practice* by their inhabitants — rather than from some more theoretical design principles inherent within the space. In order to design future virtual environments we suggest that — rather than focus on more theoretical views of spatial arrangements (e.g. Benedikt 1992) — attention needs to be paid to the situated practices in and through which spatially situated activities are produced in the development of future electronic landscapes. In the following sections we provide a practical example of what constitutes such attention in the details of investigation and design. We start by considering in the next section (3) the means by which

users move between electronic environments. This is followed (in 4) by a consideration of how users actually engage with and use virtual artefacts.

3. Discovering the Real time, Real world Social Organization of Space and Informing the Design of Electronic Landscapes

As virtual environments become more common, one of the major problems to contend with is the diverse nature of these environments and the need to support movement between and engagement with a potentially vast collection of heterogeneous virtual worlds. Development along these lines has already started to emerge with on-line environments, although a marked lack of consistency makes it difficult for users to understand these environments. Given that the disparate nature of current environments hinders their widespread use by a diverse set of users, and that a more intuitive and intelligible design of electronic landscapes would encourage use, we have undertaken ethnographic studies of the social practices members employ to move between, and engage real and electronic spaces in order to help inform design improvements.

Although we do not want to be labor the importance of ethnography — since much has been written elsewhere on the matter[1] — it should be said that the approach first and foremost requires the researcher's immersion into a particular setting. The purpose of this immersion is (1) to arrive at an appreciation of the daily activities observed as they are understood by parties to their production and (2) to explicate — or make visible — the social practices performed by participants in producing those activities. In other words, ethnography as we advocate it — and as opposed to other kinds of ethnography that seek to provide empirical justifications for and elaborations of theoretical convictions — is concerned with uncovering the situated practices productive of spatially situated (and distributed) activities. It might also be noted that it is just this attention to the embodied and locally accomplished practices whereby activities are produced that has provided the approach its purchase in systems development to date (Shapiro 1994).

In order to satisfy our objective of developing more intuitive and intelligible means of moving between and engaging with heterogeneous virtual environments, we undertook an ethnographic study of activities at a

[1] See Suchman (1987); Harper *et al.* (1991); Hughes *et al.* (1992, 1993 and 1994); Kensing & Simonsen (1997); Crabtree (1998); Crabtree (to appear); Crabtree *et al.* (to appear); for example.

multimedia art museum where a number of diverse electronic environments were presented to a wide variety of users. Our rationale was that parallels could be drawn between (1) visitors to the museum moving from one installation to the next and (2) on-line users of an electronic landscape travelling from one virtual world to another. Observations of this movement in the real world provided insight into the practices employed by a heterogeneous group of people dealing with a diversity of real world electronic environments. Insofar as the museum may be treated as a proxy for a large-scale universe containing different smaller environments, such as an ethnographic study serves to illuminate social practices whereby people navigate between and elect to engage with various spaces. As such, the studies served to inform the formulation of requirements providing for the interconnection of the next generation of virtual worlds.

3.1. The Study: Situated Practices of Movement Between, and Election to Engage with, a Heterogeneous Collection of Electronic Environments

The centre for Art and Media Technology - ZKM, in Karlsruhe, Germany – is an active partner in the eSCAPE project, providing the opportunity to explore the relationship between art and technology design. The museum houses exhibitions of interactive multimedia art by local and international artists. At the time of the study (1997) there were around thirty works on exibit.[2] In very different ways, these works explored the properties of multimedia environments: the nature and affordances of cyberspace; the relationship between the interface and the interactivity of the installations; and the role of electronic technologies in our society. All these and more are topics that were — and still are being — examined at both a conceptual and interactional level.

Because the installations invite visitors to interact in and with electronic spaces, the museum provides an ideal opportunity for the study of people's reactions to and practices for managing innovative ways of transposing familiar features of everyday life into electronic environments. The majority of the works at ZKM are interactive multimedia art installations that project images onto a screen. In order to ensure the quality of the projection many of the installations are situated in an enclosed space or room.

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[2] The fieldwork at ZKM was conducted by Monika Büscher and reported in the technical report *When Worlds Collide: Supporting Collaboration Across Shared Virtual Environments* (Büscher *et al.*, 1998).

Unlike the visitor to a traditional art gallery who encounters the works within a public space, the visitor to this museum enters a succession of small, dark enclosures in order to experience the works. Through the design of the outer shells of the rooms, some first clues about what is 'inside' are conveyed. Visitors use these clues as a resource for moving through the exhibition. That is, the use of shell designs — as a resource for moving within the general space of the museum — is a practiced use. Most effective are designs that allow people to get a glimpse of the installation from the outside, as the following extract from the field notes illustrates:

> **Reconstructed fieldnote extract #1.** A man is leaning into the 'Beyond Pages' installation through a window in the wall. A couple strolling up from the left turn to face the window, and stop to peer in. He looks through the window over the man's shoulder; she glances in the direction of the entrance and sees people coming out. She turns and walks towards the entrance, followed by her partner. The man, peering in the window is joined by a friend. They watch, both leaning on the windowsill. About thirty seconds later, the couple return. They all watch the activities inside the installation through the window. Then the couple move on towards the next installation.

The couple's movement into what might be called the informational radius of this installation allows them to formulate some initial impression about it. Formulating an impression is a practiced activity. In this case those practices consist of (1) noticing (and being able to notice) that someone else's curiosity has been sufficiently caught to make him or her stay and watch for a while. 2) A permeable structure, such as a window, a gap in the wall, or other structural arrangements allows people not only to glimpse the content of an installation, but to also establish a clear sense of its popularity and the general character of the experience it provides. Over the man's shoulders, for example, the couple sees a group of people gathered behind and around a table where one person is interacting with a virtual book. 3) Moreover, such a permeable structure affords the visitor an at-a-glance availability of the queue inside the installation. The queuing system that regulates access to the installation is displayed to the passer-by through the position and orientation of people in and around the installation. Visitors can observe events as the next in line, they can be spectators, or they can be floaters — peeping in, in order to decide whether they want to stay, return, or skip this installation on their tour around the museum. This queuing system, displaying the flow of people through the exhibition space as a whole, furnishes part of the information visitors rely on, and look for, in making decisions about where to go and what to do. Thus — in addition to being able to get a sense of what is

within a particular space — at-a-glance visibility of other people's activities around and within that space is an important resource for people's orientation, in a setting that requires them to choose between different places among a string of possible events.

3.2. From Social Practice to Systems Design: Supporting Movement Between and Engagement with Virtual Worlds

On the basis of the study of visitors moving between exhibits and their interaction with different installations, we began to formulate potential kinds of support (1) to aid navigation between different virtual environments and (2) facilitate the election of any particular environment. Predicating design on the formal features of the study — on the practiced use of design shells in formulating a sense of what is inside the environment; of noticing — and being able to notice — the activities of others around the environment; of structural arrangements affording a glimpse of the popularity and character of the environment; and of the an at-a-glance availability of things — one of the principle technical issues we wished to consider was the need to provide a means of moving between environments that enables users to understand the environments in ways compatible with their natural practices, thus supporting not only consistent navigation but also decision making. In what follows we wish to outline an initial set of properties that facilitate work. It should be noted that these properties are used within an environment we have developed to allow a number of worlds to be joined together (Trevor et al. 1998).

The problem with generalizing aspects of CVEs is the range of possible types of CVE — from 1D text to 3D worlds. Our approach to this thorny issue relies on providing a small and simple set of visual indicators of environmental properties. These indicators reflect different properties of the environment. They do not aim to categorize environments in any absolute sense or to build some form of taxonomy but, rather, (1) to provide information about a particular environment in ways supporting users' natural practices of moving between and electing to engage with virtual spaces and (2) help them learn about the CVEs they encounter. In effect, the indicators provide users with a rough idea of an encountered CVE — rather than a full description — thus providing insight into the CVE from the outside.

The indicators were formulated in consideration of situated practices at ZKM, and in light of the variability of the properties of the environments within the museum and existing on-line environments. They are not intended to be exhaustive but rather, aim to convey a publicly intelligible sense of the character of particular cooperative virtual environments. Each indicator has an associated scale consisting of five or less categories:

Structural indicators: These are intended to convey a concise sense of (1) *dimensionality* — how many dimensions the environment is presented in (1D, 2D, 3D); (2) *orientation cues* — how users should orient themselves within the CVE, whether a cityscape, planet-based, etc; and (3) *physical laws* — how strongly the CVE enforce physical laws (whether users can collide with objects in the CVE or pass through them, whether gravity is at work, etc.).

Abstractness and urbanity: These properties aim to convey the extent to which the world represents a facsimile of existing physical environments or is an artificial environment of an abstract nature such as bibliographic record. The two complementary scales reflect differing arrangements.

Scale and complexity: This set of properties seeks to convey the character of the environment. As such, the *size* the CVE is conveyed in terms of an internal *scale* indicating whether, for example, the world represents a large country or an intimate dinning room. Associated with scale is complexity, which the *density of objects* within it — whether, for example, it is a city crowded with many buildings or a wide-open desert with no objects in it.; (2) the *connectivity* of the environment, which indicates whether or not the CVE is connected to other CVEs;. (3) *population*, which indicate conditions of crowding; and (4)*media* whether, for example, the CVE exploits text, video, and/or audio forms of media.

Persistence indicators: This set of indicators conveys the extent to which the environment remembers things; whether or not the CVE grows and evolves and whether changes to objects are permanent or will be reset the next time the user visits.

Engagement information: There are a variety of different means by which users can interact with virtual enviroments. We represent the manner by which

users can engage with a virtual environment in terms of three different characteristics for determining interaction and presence within the space:

(1) *View of the environment* — how the virtual environment is displayed to the user and what control users have of their view of the environment
(2) *Action point* — how users interact with the virtual environment and how they cause action to occur within the environment
(3) *Position* — where users are placed within the virtual environment how this position appears to them and other users

Interactional affordances: There are also certain hardware/software capabilities of the devices which present the environment to users and which allow them to interact with these environments. For example, whether the environment requires an immersive head-mounted display and tracked glove or a more traditional desktop PC display and mouse.

In order to support natural practices of navigation and selection we need to make these properties dynamically accessible from a point external to any particular environment. A number of approaches are possible, and certain approaches are more suited to particular environments.[3]

Virtual environments can be visually presented to users in a variety of ways. In normal virtual environments, "gateways" transport the user from one environment or world to another. This transportation is performed when the user interacts with the gateway in some fashion (clicking on it, walking through it, etc.). In order to support natural practices of movement and election and to support learnability we have developed *annotated gateways* displaying indicators that furnish users with an at-a-glance sensibility of the world on the other side of the gateway. An example of an annotated gateway to a 3D CVE displays externalized properties of the world as icons around the portal (Figure 1).

[3] To address this issue we have developed an extended CVE session control model and system we have develop to support the connection of CVEs (Trevor etal. 1998).

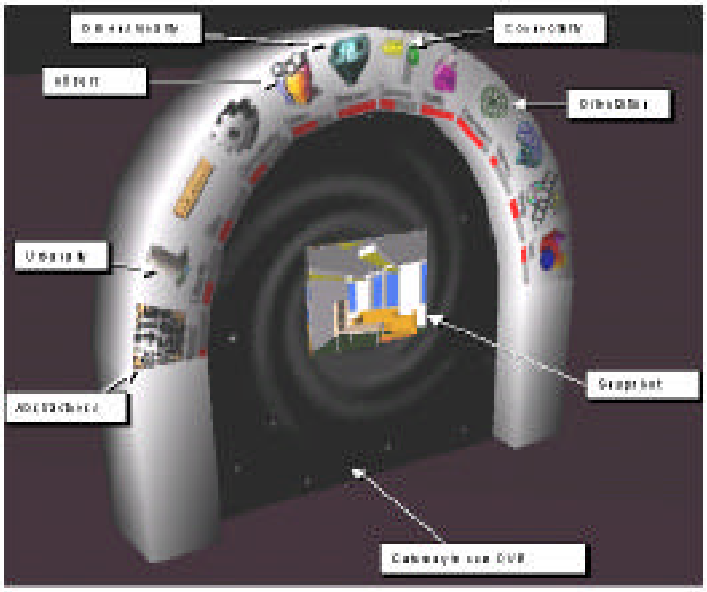

Figure 1. An annotated gateway

On viewing the annotated gateway the relationship between embodied navigational practice and the design of virtual technologies becomes apparent. We can see, for example, (1) that the gateway affords users a glimpse inside the virtual environment from the outside by providing an assortment of visual indicators informing the user of the character and popularity of the environment and (2) the annotated gateway affords all of this at-a-glance. Thus, among other things, the indicators embedded in the gateway enable users to notice that the environment is multi-user and currently populated; it is a urban 3D world; and that audio and video media are employed within it, etc. Navigation and decision-making is also supported by indicators elaborating engagement information such as hardware/software requirements.

An annotated gateway may lead directly to a new CVE or for more novice users, it may lead to a more elaborate reality lock. Reality locks are inhabited spaces that link CVEs together. They provide access conduits that highlight and teach users travelling between two CVEs about the changes and differences between the source CVE and the destination CVE. For example, consider the user moving from a virtual world that employs a city metaphor to an environment exploiting an abstract visualization of information. In this case, the lock would attempt to show that the new CVE no longer presents a facsimile with navigational clues that mimic the real world, but instead contains large amounts of abstract data in a three dimensional space.

One reality lock is associated with each pairing of CVEs. For example, all users travelling from CVE A to CVE B will enter a particular reality lock, whereas all users travelling from CVE C to CVE B will enter a different one. The reason for different locks connecting to the same CVE is that users may be travelling from very different environments to reach the CVE and thus require very different property changes to be imparted. The inhabitants of locks may be real users or automatons that interact with users to provide particular information. For example, “tour guides” who provide information about the environment. In addition to presenting the differences between the CVEs — in iconic form — reality locks can also provide tools which teach users skills appropriate to the new CVE — by means of some form of animation that shows how users navigate through the environment or initiate some environmentally specific action. Reality locks provide the opportunity to train users in the use of engagement properties thus supporting the transition from potential user to user. In other words, reality locks provide the opportunity and support for users to become users.

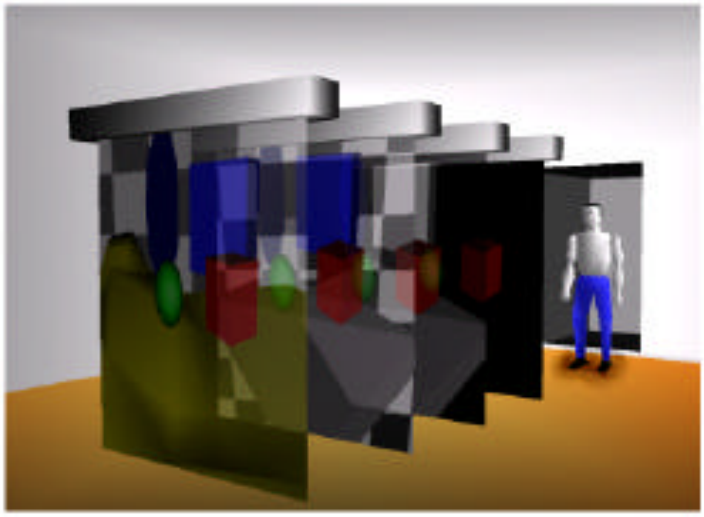

Figure 2. A simple reality lock

4. Supporting Engagement: Experimentation and Situated Evaluation

In the previous section we considered how users might experience a heterogeneous collection of environments and understand their relationship with those environments. In doing so we took it for granted that users of these environments existed and provided little indication as to the nature of these users. In this section we wish to focus on the means by which any person might become a user of a virtual environment.

Supporting potential users in making the transition from potential users to actual users seems to us to be a primary issue in the design of electronic landscapes and the attempt to integrate emerging technologies into the myriad activities of daily life. We exploit ethnographic study here as well as an aid to design. In this case we consider the role of situated evaluation of experimental prototypes which allow members of the public to elaborate future requirements in the present (Grønbæk 1991; Mogensen 1994; Grønbæk et al., 1997) and again we elucidate the approach by practical example.[4] The example provided here is of a 3D environment — the Legible City (Shaw 1998) exhibited at an information technologies trade show.

4.1. The Study: Towards an Evaluation of the Legible City in Public Use

The Legible City was exhibited at the Information Society Technologies conference in 1998 (IST '98) in a large public auditorium at the Austria Centre, Vienna, between the 30th of November and 2nd of December. To persons attending the conference, the Legible City was described by conference organizers in the official guide as follows:

> *'Created in 1989, the Legible City is generally considered to be the first computer-based interactive art installation ... The Esprit eSCAPE project has developed the installation from a single to a multi-user version that can show new possibilities of visual and vocal shared experiences in an artistic virtual environment … At IST '98 a 21" monitor is mounted on a modified*

[4] It might be noted that the notion of situated evaluation we employ here is not derived from the Scandinavian tradition of Cooperative Design practiced by Mogensen, Grønbæk, and others, although it does complement their activities and arguably goes some way to resolving the problem of involving end-users in the commercial design process (Grudin, 1991).

> *exercise bicycle … The cyclist wears headphones and a microphone … the installation is connected .. to two other remote locations (the 'surroGate' exhibition at the ZKM Media Museum, and the V2 gallery in Rotterdam). The cyclist can explore the Legible City's virtual text formed cities, meet cyclists from the other two installations and talk to them to imprint their own text architectures on the virtual environment.'*
>
> (*The Guide;* 130)

The Legible City was one of a number of other demonstrations in a conference exhibition and had its own demonstration area that was manned by a demonstrator responsible for showing it to passing visitors. In the course of interaction with visitors, the Legible City was invariably described by the installation's sole demonstrator as an artwork that you can ride through, meet people and talk to others. The demonstrator was not always present and visitors were, at times therefore, left to their own devices (Murray 1999). Insofar as the demonstrator was present, then all visitors were encouraged to become users of the Legible City in the same practiced manner.

The ethnographic study below explicates the practices whereby visitors became users of the Legible City. Particular attention is paid to the demonstrator's work of explaining to visitors what's going on as it is in *doing the work* of 'explaining' that visitors came to engage with the Legible City and (thus) became users of a novel electronic environment. The purpose of attending to natural practices of engagement is not to assess the efficacy of the Legible City in a real-world, real-time context[5] but to explicate the kinds of natural competences people ordinarily employ in getting future technologies to work in the course of their becoming users of such technologies.

4.2. The Legible City in Use

Potential users — persons displaying a curiosity or interest in the installation or passers-by otherwise solicited — approaching the Legible City,were typically invited to try a bike ride. Accepting this offer, the visitor would mount the bike and donning the audio headset — usually without

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[5] What *measures* for efficacy? That is, in what ways could the Legible City be considered efficacious? For what purposes? By whom? To what ends? Why? Could it not be considered otherwise? A veritable confusion of tongues. We elect instead to let the artefact speak for itself in details of its use — let practice be the measure and arbiter.

prompting — and immediately begin to pedal. From this point, the exhibitor begins to introduce the installation, explaining that the installation is connected to other installations in other locations. Typically the rider would at this point stop pedalling and treat the talk instructively as elaborating the character of the virtual world: that s/he is connected to others located in other places. From this very brief and general description the exhibitor proceeds to show the rider the connected others. The exhibitor pulls up, and at the same time points out the operation for pulling up' the 2D installation map. Having pulled up the map the exhibitor describes the map's features; including where the connected others are on the map, where the rider is on the map, and with which others the rider may interact. Again the rider treats the description instructively — that is, as a set of instructions providing for engagement with the world and its content.

Fieldnote extract #1.

Exhibitor: hi . would you like to try the bike ride

Potential rider: yeah (gets on bike, looks at earphones and mic.; puts them on, starts to pedal)

E: so you're basically riding through an artwork call the Legible City

Rider: OK (slows down pedalling and looks at exhibitor)

E: it was originally created in 1989 er . by Jeffrey Shaw and its . its on exhibition in the media museum at the ZKM at Karlsruhe .. and we just took the idea and created three of those installations like this .

R: (stops pedalling, looking at exhibitor)

E: and they're all connected you know .. so [inaudible] press a button and [inaudible] map (presses button and pulls up map: Figures 3)

E: you see there are other little dots here and that's yourself (pointing to dots on map, showing which dot represents the rider and others: Figures 3 & 5) . and there are other bikes just like that . there's people out there .. in this case we have only this one [inaudible] in the museum (points to other bike's representation on map: Figure 5) .. er . and you can interact with them . you can meet them in the space you know . and talk to them

Fig. 3 Pointing out the map button

Fig. 4 Pulling up the map

Fig. 5 The map (circled in red)

Further description is offered to render the installation intelligible for purposes of interacting with it and its content. The rider can meet the connected other and explore the world together with that other. The rider is also instructed that s/he may talk to the other if close to him or her.

The rider is then instructed to experiment a little. The exhibitor takes it that furnished sufficient instruction for the rider to begin engagement with the installation and its contents. The rider starts pedalling and shortly encounters a practical problem: s/he cannot see where s/he's going. S/he cannot see the way to the other. The exhibitor instructs the rider to pull up the map and describes both the rider's and connected other's location. This description the pin-points the two positions precisely and traces the route from the rider to the connected other. The description is a specific in-action instruction as to the map's features and its uses. For example, this triangle is you and you go in that direction so that you can meet the connected other. Such descriptions are repeated until the rider is ready for the next action necessary for successful engagement from this point. The description thus reads as an instruction (1) to pull up the map to see where you are going, (2) that you are just here and the connected other just there, and (3) that the way to go in order to meet the connected other is along this route from here to there (which means, in this case, that the rider must turn around):

Fieldnote extract #2.
R: OK
E: and explore together the world .. so
R: so it depends if there's another one on the bike or
E: yes yes . you can also talk to each other if you're close together . just like in the real world .. meet each other before you can talk
R: OK .. and is it possible to see all the time
E: yes
R: where the other one is . er
E: yeah . you can always pull up the map
R: if you don't like the person you can avoid him . er

The rider proceeds to follow the instructions using the map. Constant use of the map goes against the spirit of engagement from the exhibitor's point of view however. He instructs the rider to stop using the map, and to just go along the streets — these streets the exhibitor points out very specifically and the rider proceeds to the place pointed out without the aid of the map. At this point the rider starts to become noticeably disorientated. The exhibitor instructs the rider to check his or her position using the map. The rider pulls up the map. This instruction serves to demonstrate competent use of the installation's features in the course of acting.

Figure 8. Achieving competent use: pointing out directions and using the map to check

The rider proceeds using the map to check where s/he is in relation to the other. The rider can see by the map that the other is close, but cannot see the other in the virtual world. Again the exhibitor provides further instruction, directing the rider to a specific point in space by pointing it out. This is followed by a description of details providing for the accomplishment of the objective — engagement with the connected other, established by talking to them. The provision of situationally relevant descriptions/instruction providing for collaborative engagement is followed through as the rider attempts to locate and meet the connected other. Description here consists in the exhibitor pointing out where to turn to meet the connected other. The two riders talk briefly and then quit the installation.

Fig. 9 Meeting the connected other

4.3. The Embodied Performance Formally Considered

Analysis of the situated talk produced by parties (exhibitor and rider) in, and indeed *as*, the course of practically accomplishing engagement with the Legible City, displays members' worksite-specific practices providing for the achievement of use. Of central importance here is the temporally sequenced production of situationally relevant descriptions, which are understood and treated by recipients (novice users) as instructions for interacting with the virtual environment and its content. Situationally relevant descriptions are of *unique* and *methodical* character and elaborate the following phenomenon constituting the achievement of use.

Doing introduction. A precursor of use consists of the potential user being introduced to the environment and its features. Introductions are descriptive and the user treats such descriptions as elaborate the character of the environment and the kind of operations that may be performed within it

The indication of key features. Accompanying introductions, engagement features are pointed out — or ostensively defined — and their use described. In the case of Legible City, the demonstrator instructs the user to pull up the map in order to interact with the environment. For example the demonstrator demonstrates just what to do here, pulling up the map by pressing this button and describing relevant features of the map. Thus, the demonstrator instructs through description and action just how to begin engagement.

Demonstration-by-showing-and-doing. Becoming a user of novel technology, in real-world, real-time settings, observably relies on the taken for granted and reflexive method — or practice — of demonstration-by-showing-and-doing. Demonstration-by-showing-and-doing follows and accompanies the pointing out of engagement features and their operations. The method displays for members doing engagement just how to go about using pointed out properties in accomplishing the work of the site. Its application enables users to fill in the irremediable practical gaps between

instruction and action.[6] Instructions are always incomplete in and as of themselves. That incompleteness is experienced and manifest as practical troubles — just how is this or that done? Through the method of demonstration-by-showing-and-doing — that is, through instructed action walking the user through details of use — for example, you [the user doing engagement] see that this using the 2D map to find and meet a connected other is done like that by pushing this button to pull up the map and by assessing your position by comparing the relation of your dot to the other's.

The natural practice of demonstration-by-showing-and-doing is accompanied by the natural practice of emulating-demonstrated-doings — that is, of following instructed action(s) in the details of their embodied and witnessed performance. Instructions for engagement and emulations of demonstration-by-showing-and-doing are members of what might be called a *lebenswelt pair* (Lynch 1983).[7] Actually two pairs are at work here. The first pair «instruction-instructed action» may be treated as a designers' pair. The second pair «practical trouble-following instructed action» may be treated as a users' pair. The pairs are connected in and as of practice, and practical gaps between instruction and action bridged through instructed action and the following of instructed action. Insofar as instructed actions are performed for purposes of resolving practical troubles of engagement (such as achieving competent map use) then they may be, and often are, repeated until the user acquires the knack, competence or skill of doing the action.

In addition to the above, the achievement of use also relies on taken for granted knowledge of common objects. Upon confronting the map — either through instruction or natural experimentation — users do not orient to the map as any map. The map is intuitively understood as a map of the Legible City, and thus without second thought it is a map to aid navigation of just this place: the Legible City. Oriented to as a situational map it displays for users situationally relevant features. That is to say, that an integral feature of situational map use is that any map presented as being situationally relevant is presupposed, as a modus operandi and feature of its use, to display

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[6] See Garfinkel (1967; 1996) for a discussion and treatment of the irremediable incompleteness of instructions in practical circumstances of everyday life.

[7] It might be noted that this is a "creative" misreading of the notion of a lebenswelt pair. The purpose of this is to highlight endemic features of embodied technology usage to design.

situationally relevant features. Thus, from the point of view of an engaging user, it must unless the map is fraudulent display features relevant to the task at hand even though that task is not necessarily known. Seen as such, the 2D map displays — at-a-glance and only insofar as the user knows that he or she is in a city — an abstract urban layout or streetplan on which the purple circles – the only outstanding features or marks on the map – assume a distinct significance. Those marks made meaningful by the demonstrator (as in the case above) or by audience members trying experimental acts of interpretation in absence of the demonstrator (Murray 1998).

The point here is not to labor map use but to draw attention to the affordances of common objects (maps, bicycles, audio headsets, etc.) and otherwise taken for granted organizations of space as resources to designing readily learnable and thus usable virtual spaces. Nowhere can the affordance of the organization of space be better observed than in the very layout of the Legible City itself. As the official description points out the Legible City is a "text form" city, buildings are not represented architecturally but textually — by letters and words which may be cycled through. Nevertheless, users undertake cycling as they would in real time by cycling down the city streets and around the buildings regardless of the fact that the urban space is constituted by textual representations rather than facsimiles of real-world structures. This behavior displays a natural attitude towards engagement with, and understanding of, particular spaces that may be studied under the auspices of situated evaluation and exploited in iterative design.

Engagement sequences may be similarly developed. The designers' pair consists in the development of situationally relevant techniques. (1) Instructing users in the concrete character of the environment. (2) Ostensively defining engagement features and their use. (3) Walking users through the use of engagement features by the natural methods of demonstration by-showing-and-doing. (4) Iterating the specific in-action use skills required for using, and coordinating the use of, engagement features.

These formal features of situated practice in accomplishing engagement are generic applying to all publicly available electronic environments. Unlike in large organizations of work, training cannot be assumed in the development of virtual worlds for public use. Just how users are to become users is a significant problem to be reckoned with in the effort to develop electronic landscapes for public use then. Formal features of the

sequential organization of public engagement with existing prototypes specify usability criteria to be satisfied in future developments. Of course, the particular features of any environment that require instruction will depend on that environment. Nevertheless, appropriate engagement sequences may be developed through the construction of experimental prototypes; through making prototypes available to practical experimentation by members of the public; through the situated evaluation of experimental prototypes in public use; and through implementing and refining the designers' pair instruction-instructed action. This latter finding provides novel insight for us and has yet to be implemented in actual design.[8]

5. Conclusion: On the Social Organisation of Space and the Design of Electronic Landscapes

In conclusion, we have attempted to convey a sense of how the design of electronic environments may be informed by a sociological perspective that pays unique attention to the social organisation of space and spatially situated activities. While conventional sociological approaches treat space as a container within which activities take place. We, however, emphasize the way in which space and spatial arrangements are interwoven with and constructed through, the performance and accomplishment of situated activities. Situated activities are ordered or organized in and through social practices for their production, and it is to such practices that we draw particular attention in the effort to develop electronic spaces.

Examples of movement between a number of heterogeneous electronic environments in a multimedia art museum and the achievement of use of an advanced 3D interface at a trade show have been employed to elaborate the relationship between practice and space. Thus, we have seen how space and spatial arrangements are intimately tied to the practiced accomplishment of situated activities.

In explicating cases of specific developments, we have also sought to show by practical example how ethnography employed in the study of

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[8] Although this may appear to be an impossible or extravagant task, we need only consider the preponderance of Playstationä games to recognize that it is both a desirable and achievable task. While the adequacy of a great many engagement sequences may be questioned, the point is clear and as the evolution of the games elucidates, subject to continuous development and refinement.

situated activities may be used to inform the design of electronic spaces. Undertaking ethnographic study in design is not a straightforward matter and in addition to elaborating the nature of ethnographic inquiry and, reciprocally, what we mean by the social organization of space, we have thus outlined a particular approach towards informing design. This approach recommends:

> Undertaking ethnographic studies of real-world situations and settings relevant to design in order to develop a detailed appreciation of the social practices in and through which space is constructed.
>
> Constructing prototypes and placing them in public settings of use so as to enable end-users to get 'hands-on' the future thereby informing design in the present.
>
> Situated evaluation of experimental prototypes displaying and analysing the practices, practical problems, confusions, and solutions members employ in becoming users towards informing further iteration and refinement.

These activities are pulled together in an evolutionary process of design and bring competences from social science, computer science, and digital art, together with members' expertise in the construction of virtual environments.

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