

Knowledge Lost in Information

Patterns of use and non-use of networked bibliographic resources

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Our title is taken from Eliot's 'Choruses from 'The Rock' It seems appropriate that a research team based at Eliot College, the University of Kent at Canterbury, should give the first word to its namesake. Whether he should be given the last word remains to be seen...

The basic 'information problem' revolves around the fact that the inquirer knows enough to know that he or she needs information, but doesn't know enough to ask the 'good' questions that would produce the needed information. (Keefer 1993, 336).

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Note: the online appendices are available via WWW from URL <http://lucy.ukc.ac.uk/Blerbs/>

Abbreviations

ASSIA	<i>Applied Social Science Index and Abstracts</i>
AVS	Audio-Visual Services (University of Kent)
BIDS	Bath Information and Database Service
BIDS ISI	BIDS Institute for Scientific Information
CA	Conversation Analysis
CAS	Chemical Abstract Service
CATS	CATalogueS
CD-ROM	Compact Disc Read Only Memory
CWIS	Campus-Wide Information Service (University of Kent)
EDINA	Edinburgh Data and INformation Access
eLib	Electronic Library Programme
ESDA	Explanatory Sequential Data Analysis
HCI	Human-Computer Interaction
HEFCE	Higher Education Funding Council for England
HHI	Human-Human Interaction
ILL	Inter-Library Loans
JANET	Joint Academic NETwork
JISC	Joint Information Systems Committee
JSTOR	Journal Store – digital access to published journals
ODBC	Open Database Connectivity
OPAC	Online Public Access Catalog
SuperJANET	Super Joint Academic NETwork
VDU	Visual Display Unit
WWW	World Wide Web

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Introduction

The introduction of services such as BIDS (Bath Information & Database Service), the networking of CD-ROM databases and library catalogues have taken many readers conducting bibliographic research from libraries to computer centres and to other points of access to the internet. Librarians and others with interests in both the use of the internet and library resources are posing questions with practical, managerial issues at stake as well as those raised by quality assessment exercises, such as those recommended in the Follett Report (Joint Funding Council 1993) and discussed in van House et al. (1990).

Typical of such questions are:

- 1) Who is using electronic services? Why are some people not using it?
- 2) How satisfied are users with the service?
- 3) What are the effects of the widespread use of electronic services, for example, on library use?
- 4) What are the training implications of the patterns of usage and non-usage?

Such questions are too general to be answered by any one research project. The research reported here was undertaken by a multi-disciplinary team comprising of Matthew David, a sociologist and Jane Bex, a librarian, working under the direction of David Zeitlyn, an anthropologist. The results presented address both theoretical concerns about how library research can be undertaken and are relevant to practical issues as summarised by the questions just posed.

The general methodological orientation was to conduct detailed qualitative research to complement other research undertaken, for example, by the Centre for Communication and Information Studies, University of Westminster (e.g. as summarised in East and Tilson 1993) and the department of Education, King's College, London (see Squires 1993). There were three main research strands:

- 1) a survey of every research student and member of staff in three different departments in one university.
- 2) More general ethnographic observation at different universities (including those that studied in 1) and the running of focus group interviews at all three sites with different groups of participants.
- 3) The detailed micro-analysis of video recordings of real users using an actual computer in a real library!

By undertaking qualitative research we enter a different field from most of the user research reported in much of the literature (the collection edited by Wilson (1981) is an early and very honourable exception). Like many social anthropologists we are wary of questionnaires - being uncertain in advance of the parameters that we wish to study. Similarly, the results of study in 'usability labs' using pre-assigned tasks achieves replicability at the cost of generalisability. The sorts of people who will volunteer or can be bribed to

participate will often be extremely co-operative: they try to assess what the researcher is interested in and therefore attempt to be friendly by giving them what they are perceived to want to know. Or systems may be tested which work well given the training which is included (explicitly or implicitly) as part of the testing process. The danger is that this produces systems which are perfect on the test bed but rejected outside the laboratory thus suggesting an intriguing parallel between computer systems and animal-drawn tool-carriers (Starkey 1988)! Instead, we have adopted a variety of different methods to study the use and non-use of bibliographic resources outside the usability lab. The triangulation between the methods affords us confidence in the results and has sparked new avenues of research.

The assumption that the library and computer services can provide general, drop-in voluntary courses for students is flawed. It cannot be assumed that students will attend occasional and irregular, non-compulsory lectures and courses, at a time of increased emphasis on accreditation. As Brown and Scase point out on the basis of their own and others' findings:

Even where there is emphasis upon additional benefits of the course beyond those accredited for a final examination mark, it is the final result that counts with these students. This is shown clearly by their reluctance to attend courses that offer experiences which will not be formally credited or to read any books or perform any experiments that will not be examined. The rationale behind this instrumental view of their university studies is not difficult to understand. For most students the 'credential nexus' of compliance for good grades had already worked successfully in gaining entry to university. They are already fully aware that a graduate qualification is a basic requirement for obtaining better paid and more prestigious jobs, irrespective of whether they have decided what kind of vocation to pursue. Moreover, the impact of economic recession has been to reinforce rather than weaken these instrumental orientations to university life
(Brown and Scase 1994, 55-56).

There are an increasing number of studies that demonstrate the difficulties in responding with technology to the changing profile and number of higher education students. Most of these have concentrated on the provision of teaching materials using IT (e.g. Gayle 1998, Timms 1998). The scope of our research was more restricted, concentrating on what some might see as a more fundamental level of provision: the means by which researchers (students among them) can find out what is available to read. Library catalogues, and bibliographic databases may not seem the most exciting of research domains, but we have found that problems of technophobia, misunderstanding, poor or rejected training, and inadequate resources have as much relevance to the use or

non-use of library systems (card catalogues included) as high technology teaching materials. Some of our findings are of wide relevance: the role of social factors in the distribution of knowledge how to use information technology should change how training is attempted and how users are supported. We present evidence that suggests the importance of changing the design of interactive systems to have greater sensitivity to the local context which often includes more than one human interacting with a computer.

The library in its wider context: co-ordinating electronic access and informing communities

The barefoot librarian and the meta-librarian - mediating cultural and technical networks

Some of our key findings concern the difficulties faced by university computer and information services in disseminating new facilities and ideas, particularly in the aftermath of the JISC (Joint Information Service Committee) recommendation that equal focus be paid to humanities and social science departments, who have been less active in integrating new information technology developments into their teaching and research activities than those in the natural sciences (see David 1996).

Differences between such departments and the professionals charged with helping them weaken supply led dissemination strategies (based on information push). Meanwhile, demand led strategies (knowledge pull) tend to reproduce and exaggerate existing inequalities in information technology 'take up' between the natural sciences and the humanities/social sciences. The introduction of 'technology officers' has been a sporadic outcome of decisions made by specific departments rather than being the result of any coherent national policy, the specific cases or a number of them taken together, represent a potentially helpful study of limitations and potential for adaptation. Such small scale strategies may provide valuable and practical insight for those elsewhere at a time of change and not inconsiderable confusion. These 'bare-foot' librarians or technical officers, operating at the local level, need to work with librarians (now 'meta-librarians'?) in order to best adapt the new possibilities in the realm of supply to the needs of the next generation of users.

Chapter 1

Background

The expansion of higher education in Britain in recent years has led to major strains on traditional or at least present, methods for facilitating 'learning'. On the one hand, increasing student numbers have increased the student: academic staff ratio and decreased the library book/journal stock: student ratio. On the other hand, libraries face a growing pressure to provide many sources of new materials. The increasing pressure on academics to publish, combined with the increasing technical and economic ease of production has added to the stock of academic publications in every field. In addition, there is an increasing need amongst academics for publications from, and about many places around the world, for both research and teaching purposes. This reflects the greater level of internationalisation, within both academic life (through conferences, joint research projects, exchanges and new forms of electronic communication) and the non-academic world.

Clearly, if the explosion in information continues, it cannot be handled by present means. If by 1985 the volume of information is four (low estimate) or seven times (high estimate) that of 1970, then some other way must be found to organize this onslaught of Babel. ... The historical picture of the knowledge explosion was first formulated statistically by Derek de Solla Price in 1963, in his work 'Little Science, Big Science'. The first two scientific journals appeared in the mid-seventeenth century, the *Journal des Savants* in Paris and the *Philosophical Transactions of the Royal Society* in London. By the mid-eighteenth century, there were only ten scientific journals, by 1800 about 100, by 1850 perhaps 1000. Today? Estimates range between 30,000 and 100,000 (Bell 1980, 500 - 550, 526).

The academic library is thus faced with both volume and circulation pressures which challenge the traditional role of the university library, as a repository of knowledge necessary for research and teaching.

The introduction of electronic databases (OPACS, CD-ROMs, and online services) has transformed many traditional features of information searching. In particular the CD-ROM and the off-site but online database dislocates the library from the sources of data available within it. Although traditional paper abstracts and indexes achieved this to some extent, the advent of electronic systems has increased the scope of searching and increased the ease with which complex searches can be combined and displayed (provided one has the necessary skills).

The Chemical Abstract Service (CAS), the largest in the field, is a case in point. Before computerization, it took the CAS about twenty months to produce an annual index; these are now available twice a year, while the unit costs of indexing have decreased from \$18.50 to \$10.54. Moreover, as the new substances are recorded in the Chemical Registry System - there are now 3,000,000 items in the files. (Bell 1980, 529).

The combination of demand pressure (for a wider range of materials not held in the particular library) and supply pressure (the increasing ease with which researchers are able to identify the existence of publications related to their work but not available to them within their own institution) adds qualitatively to the quantitative pressure of increased student numbers.

The suggestion has been made by some that the library will increasingly play the role of mediator between demand from students, academics, and external sources of supply, along the lines of the existing Inter Library Loans system (with an increasing level of electronic mediation). Just as Benetton, the clothing company, in fact manufactures no clothing and runs no shops, acting only as an information management centre between out-sourced small manufacturers and franchised retailers who pay a licence for the Benetton name and who guarantee to stock only 'Benetton' labelled products (see Kumar 1995), so the library of the future may shift its organisational resources increasingly away from the management of storage (of paper in space). Information technology has enabled a greater degree of co-operation between companies at various levels of the production process, enabling increasing levels of integration of manufacture between sites across wider geographical space and reducing the need for the specialised division of labour to entail the large self contained 'fordist' production line/factory. Such an increased proximity of virtual space has enabled some companies to adopt more flexible 'just in time' stock ordering policies, rather than bulk storage of raw materials, components etc. 'just in case'. This is seen by some as a model for modern library provision, particularly in the form of the virtual library, an institution which devotes its resources to the flexible management of demand by sourcing outside itself from a multiplicity of external primary or intermediate suppliers, rather than warehousing information within its own walls. The 'library without walls' is a virtual location in which supply and demand are linked. It is suggested that this will increase the flexibility of libraries and enable a sharing of resources that would otherwise be replicated in multiple sites.

A cautionary reflection is that where companies (in particular in Japan where 'just in time' management is said to have originated) have adopted out-sourcing in a bid to reduce internal storage time and money costs, they are at the mercy of the transport infrastructure along which their non-site-specific integration operates. The experience in Japan has been that the increased volume of traffic

on the roads, in part the result of the switch to more flexible modes of production and out-sourcing, has undermined the 'efficiency' gains that were said to justify the system in the first place. The same may be true of virtual traffic along electronic lines of communication. Already existing systems creak under the pressure of increasing volumes of traffic and the virtual flexibility of the Internet is offset by the tedium of long waits for information to be downloaded along down 'congested' wires.

In addition, internal factors need to be addressed in more detail. The increase in student numbers has led to less interaction between academic staff and students. This has both quantitative and qualitative effects. As contact time diminishes, so the pressure on students to become 'self-directed' increases. This pressure is increased by the decline in the books per student ratio and hence the need for students to search for alternatives to standard or recommended sources. Alternatively, students may become more reliant on a limited number of purchased general textbooks which remove the need for searching and the frustration of seeking out that which may not be locally available. In different academic fields this will be more or less the case.¹

Increasing numbers in seminar groups and the increasing tendency to 'farm' out seminar work to non-staff members with little experience and few institutional ties makes the informal transmission of research skills less flexible. It is now possible in UK higher education to gain a degree without ever talking to an academic member of staff (apart from one's personal tutor).² Brown and Scase summarize:

More also means different in the sense that the university ideal of small-group teaching and intimate tutorial discussions between lecturers engaged in front-line research and half a dozen students is unsustainable, even in the established universities which aped the Oxbridge ideal. As a result, the university lecturer as a cultural model for the student is likely to decline in importance. It is the informal student peer group that almost exclusively performs this role. For working class students this absence of a cultural 'model' is reinforced by the fact that student peer groups tend to be self selecting on the basis of background, money to participate in certain leisure activities, etc. More importantly, seminar groups of 20 or so students effectively deny students the opportunity to develop their communication and discursive skills in a sustained manner. It is therefore not surprising that the new universities which have the largest student/staff ratios are introducing social and communication skills into the formal curriculum (Brown and Scase 1994, 177).

Information as culture or capital? Electronic communication and exchange in the academy

A popular computing magazine recently contrasted two possible Internet futures. The first suggested unequal access would polarise society in the next century as Marx predicted polarisation over the 'means of production' in the last. The second saw the Internet as little more than the CB radio of the late twentieth century, an un-commodifiable dustbin for valueless chatter. Such different visions of the future raise important questions. What social relations of technology will the Internet mediate and what effects will it have on the production, ownership, and distribution of information and knowledge?

Online sharing of library catalogues is already common-place. The development of Metropolitan Area Networks, linking colleges in the UK, for instance, via the Joint Academic Network (JANET) and in the future by SuperJANET³, will enable far greater access to learning resources. Yet, this explosion of communication is accompanied by economic pressures toward the commodification of intellectual activities and resources. Co-operative relations between neighbouring institutions over resource sharing are increasingly being replaced by formal and contractual relations which constrain or inhibit such sharing. Universities and colleges are under intense financial pressure. While it is attractive to imagine institutions sharing resources in a grand virtual library, the likelihood is that access will be charged for. Smaller, newer colleges, unable to compete with old university libraries established 'capital-stock' of books and journals, will be forced into dependent exchange relations with established institutions, buying access to their shelves, both physically and virtually. Increased student to resource ratios create pressures to restrict access to outside users. Online catalogue searching may locate a book or journal, but this provides no guarantee of access to it. Virtual proximity does not ensure actual access. In fact, unlimited catalogue accessibility is used to justify 'smart' library cards not only allowing you to take books out, but also enabling entry to the library. This is occurring in institutions worried that their students are being deprived by hordes of 'alien' researchers, fresh from scouring the Internet for accessible resources to plunder. Competition between institutions is replacing a sense of academic community.

Journals, paper, or pixels?

Average academic journal costs in Britain have risen by 300% since 1985 part of a vicious circle of decreasing subscriptions and higher prices. Smaller, less prestigious, college libraries are hit hardest and have no option but to reduce the number of titles they subscribe to. Readers have to turn to

current awareness services and other bibliographic aids in order to find out what is being published.

In the UK access to services such as BIDS and use of databases on CD-ROM and online, has increased pressure on smaller institutions to rely on Inter-Library Loans (ILL). Access to information of the existence of material is becoming out of step with local stocks. For institutions whose staff undertake relatively little research ILLs may be more cost effective than expensive journal subscriptions, but choosing this strategy means that current financial resources are not being used to develop permanent library resources, perpetuating low research scope in the future.

The British Government's Joint Funding Council's Library Review Group recommended academics travel more and that institutions collaborate in sharing costs through regional consortia. However, an early example, London's M25 Consortium gives little comfort. In 1997 the Consortium's web site enabled subject searching of the best field-specific collections within 110 London academic libraries, increasingly these very libraries are barring entry to students other than their own, unless an inter-library financial agreement has been formed or the individual pays.

For example, consider the BIDS service. An annual subscription give access to several online services without additional per-session cost. However, BIDS own data on cost per session for BIDS-ISI shows that while large research universities pay as little as a few pence per search, low research institutions, are paying anything up to three pounds fifty (from East 1993, 20). The flat-fee subscription system, for all its potential benefits, maps existing institutional disparities⁴. Smaller institutions face great difficulties justifying subscriptions on the basis of present research activities, while dropping out offers the prospect of relegation to the academic slow lane. The emergence of full-text online journal services such as JSTOR will again raise the question of whether smaller institutions can keep up.

The research project

This research project was an attempt to understand one aspect of the methods by which researchers within academic environments go about their academic work. In particular, we address the process of learning that enables a 'researcher' (at all levels of the 'academic career' - after Goffman 1961) to ask questions. Why talk of 'researchers' not 'end-users'? The term 'end-user' is sometimes used in information research and by library professionals to describe, for example, the non-expert user of electronic databases. The end-user is the person at the end of the production line, the sometimes less-than-fully competent consumer of the services being provided for them. However, this is to see the non-library/information-specialist from the point of view of the library professional. They are external, the fly in the ointment. A lay reader assessing specialist

librarian web sites and Internet user groups may easily gain the sense of how alien the 'end-user' is in the eyes of those who do know a Boolean operator from a toggle. Within traditional library based research the 'end-user' is someone defined by their relation to 'information' delivery technologies as an outsider. To some they are not even considered 'users' (who are competent professionals, trained in the management and organisation of information).

Using the term 'researcher' reminds us that the understanding of the point of view of our research 'subjects' is one of our main objectives. 'Researchers' are goal directed actors, with particular orientations and resources. Their information gathering is affected by, and affects, knowledge-based criteria of relevance. This is not to say that the researcher is always fully competent at the task at hand, finding information appropriate to their needs, but that they are intentional actors working towards the resolution of particular problems, defined in terms at least partially different from those used by the skilled information 'users' who are ostensibly there to help.

All 'end-users' from undergraduates to academic staff, can best be understood as more or less able, or experienced researchers. The process of 'learning' in higher education may be analysed through the study of how researchers do research and how they acquire the skills to undertake research successfully. Our project examined the use and usefulness of library resources, with special reference to bibliographic databases. So we undertook the study of the negotiation of the researcher role within the library context and its emergence and maintenance within departmental, faculty, and campus contexts.

We differentiate the structural and the functional dimensions of information and knowledge. From a structural point of view, individual publications are to be ordered schematically in relation to a numerical system of classification, with reference to a limited number of criteria, only some of which relate to 'substantive content' and even that is reduced down to abstracts and keywords. It is not the role of the information/systems professional to know what things mean, only where they go and how to find them again. From the functional/knowledge point of view information is ordered according to its substantive content. The criteria of relevance used by readers to decide what to read or set aside, are more densely bound up with the full content of their work, rather than a schematic set of markers. For this reason knowledge specialists, with their deep but restricted knowledge, need information specialists. In part, we considered the ability of these two sets of skilled actors to communicate with each other. The process of negotiation between distinct types of expertise requires the ability to ask questions and provide satisfactory answers.

Traditional library research has evaluated resource use from a supply-led perspective. The prescriptive ordering of relevance to the information managers set the agenda and the site of research. This lends itself to opinion survey and self selecting sample errors. The limitations of this perspective lie

in the failure to recognise that the library is not the context in which information gains its sole meaning and ordering. Daniel Bell (1980) gives a summary of the problem of meaning in relation to the ordering of information. He relates it to language's intrinsic ambiguity in general and the librarian's dream of a knowledge programme in particular.

The scholastic ordering of Mortimer Adler may help an individual to trace the bibliographic cross-relationships of ideas, but if the purpose of a library or a knowledge-based computer program, is to help a historian to assemble evidence or a scholar to 'reorder' ideas, then the ambiguity of language itself must be confronted. Terms necessarily vary in different contexts and lend themselves to different interpretations and historical usages shift over time (consider the problem of defining an intellectual or ideology), making the problem of designing a 'knowledge' program quite different from designing an 'information' program.

The process of creating new knowledge (reasoned judgements) proceeds by what Leon Walrus, the great mathematical economist, called *tatonnement*, trial-and-error tapping, by taking fragments of intellectual mosaics whose larger shapes cannot be predicted in advance and fitting them together in different ways or by regarding large conceptual structures from a new angle, which opens up wholly new prisms of selection and focus.

(Bell 1980, 529-31)

Ethnographic fieldwork, in its orientation to the specificity of local criteria of ordering and relevance lends itself to the study of divergent contextual settings and the processes of initiation of individuals into particular cultural modes of rational thought and action.

A major focus of our project was on everyday conduct, as an ongoing and active process of maintaining the impression of order as something external to the everyday conduct itself.⁵ We are interested in the means by which researchers engage in the dialogic process of generating and asking questions. The relationship between informal communication (most often characterised as conversation) and formal structured communication (either one-way talk as in lectures, one-way mediated forms such as text and non-negotiable machine interaction) contains the ordered creativity that is 'research'.

Jane Keefer distinguishes between approaches to information that see 'information-as-product-or-thing' and her own approach in which 'information is never taken to be context free but is also differently interpretable depending on who is seeking or providing it! Since this is so, the finding of information is clearly a process, perhaps a never ending one.' (Keefer 1993, 334). The advent of the 'computer age' in libraries has only rekindled the tendency to see information as an array of reified units of 'data'.

Keefeer suggests that 'document delivery and other electronic library schemes are also firmly rooted in the information-as-object model' (1993, 334).

The shift from information as product to information as process (which is implicit in the difference between information and knowledge) requires the perception that 'the journey is just as important as the destination' (Keefeer 1993, 335). The journey is a creative process through which the destination is as much created as 'discovered'. Citing Robert Taylor (1968) Keefeer points to the importance of negotiation when the research problem is being generated, questions and search terms are being formulated.

It may be as someone has said of formal education, that the storage media which libraries handle are noise in the system. The real education and communication which may take place outside or on the periphery of libraries and formal education. Indeed, it may be that the reference interview, the negotiation of questions, is the only process in libraries that is not noise. For it is through negotiation that an inquirer presumably resolves his problem, begins to understand what he means and begins to adjust his question to both system and substantive noise in the store of recorded knowledge called the library.
(Keefeer 1993, 335)

It cannot be assumed that the stock of noise can be translated or edited into any kind of meaningful, or harmonious order by natural ordering principles. Keefeer draws on 'the sense-making model of information seeking' (Dervin 1983; 1986).

Of particular interest to librarians is the technique Dervin calls neutral questioning, which can be used to facilitate the question-negotiation process in the reference setting. Neutral questions, in contrast to closed (yes/no questions) or open (tell me more about the subject questions), follow the sense making model by asking questions that assess the inquirer's situation, gaps and uses
(Keefeer 1993, 335)

By raising questions about the associations a researcher is making and their relations to the subject they are asking about may help overcome the communication breakdown that often occurs in researcher/ librarian interaction. This is one of origins of 'the basic "information problem" [which] revolves around the fact that the inquirer knows enough to know that he or she needs information, but doesn't know enough to ask the 'good' questions that would produce the needed information.' (Keefeer 1993, 336).

We draw on parallels between human computer interaction and the information professional-researcher interaction. The 'extreme symptoms of overdrive' (Keefeer's phrase) exhibited by library users, who are under pressure to locate ambiguous materials yet uncertain about whether they are going about it in the right way (she refers to this as 'library anxiety'), parallels the apparently irrational behaviours

displayed by people interacting with machines. Keefer points out that the dual stresses of functional ('I'm not sure what I want') and structural ('I'm not sure how to get it') uncertainties have the effect of inducing a serious deterioration in the ability of the researcher to see and interpret visual cues. 'Literally hundreds of details can derail even the most determined students if those details occur repeatedly' (Keefer 1993, 337). Low self-esteem will encourage the personalisation of failure, while higher self esteem will encourage external projection of failure ('they didn't teach me this'). The result being that the low self-esteemed will not ask for help as much as the higher, despite their greater need to do so. The relationship between failure and isolation is also relevant to success or failure in relation to computer databases. Whether one becomes locked in a frustrated cycle of repeating the same mistakes or are able to ask for help depends on of where one goes, who one goes to and what one asks them. This requires study not just of the immediate situation in the library but also of the wider contexts of social networks, friends, seminar groups, departments and so on.

At a time of increased emphasis on financial 'efficiency' within higher education, vague talk of the value of informal interaction and cultural networks of communication within tutorials, small group seminars, greater contact time between users and library staff as an acknowledged part of library staff timetables, is likely to be ignored in the face of more mechanical assumptions about the use of technical networks to substitute for human contact time. The assumption that technical networks can somehow replace cultural ones is highly misguided. The reduction of knowledge to information and of culture to technology is a pressing instance of alienation within the academy. As one overseas postgraduate research student commented: 'I hate computers. They always make me cry'.

The ethnographic dimension: cultural and technical networks

The broader context in which bibliographic searching occurs was studied in order to assess the differential impact of electronic systems across a range of departments and disciplines. How do users find out about systems or why don't they? How do they learn how to use them? Why do some users learn while others do not or do not use what they have been taught? What are the differential motives and resources behind the acquisition or not, of the necessary skills? Are the systems useful anyway or do other sources of information serve much better?

Ethnographic research encompassing a range of different qualitative techniques attempts to understand the subjects own view of the world. This is critical in library and information studies since although it is much easier to produce quantitative data as required by HEFCE bench marking and other so-called quality assurance regimes, the meaning of the numbers so produced is extremely varied. The scope of that variation, let alone its significance cannot

be resolved by quantitative research. When issues of take-up are raised it becomes rather irrelevant that a certain number of machines is available if no one is using them (though we note that numbers may be significant if demand were heavy). In order to understand why human actors behave as they do it is important not only to see what they (e.g. by counting them as they pass through turnstiles or perform searches online) but also to talk to them in order to see how they understand their own actions. Questionnaires are extremely blunt instruments for attempting this, so we carried out surveys and focus group as well as more classic 'participant observation' by chatting with researchers in corridors, tea rooms, bars, or as they carried out their research in the library. Finally, to look at the finer grain, and provide some means of seeing whether peoples accounts of themselves might be at odds with their actual behaviour we recorded some users undertaking online searching. These recordings were analysed using methods drawn from the general program of ethnomethodology.

The main concern of ethnomethodology is with the 'immediate' and complex nature of human interaction in everyday life⁶. At its core is an attempt to grasp the fundamental features of human intersubjective interaction, which has a bearing on wider social and political questions. In particular, the ethnomethodological understanding of intersubjectivity can make a fundamental contribution to the study of new electronic and 'interactive' media.

Ethnomethodology centres attention upon the means by which human actors maintain a sense of a shared understanding and of the orientation of each participant towards the understanding of the other that is central to communicative action (as opposed to other forms of behaviour (human or otherwise)). Break-downs in communication can yield a better understanding of what maintains communicative action and what distorts it. Such work contains implications for the understanding of 'democratic' interaction and communication.⁷

The questions of accountability and control, discussed in ethnomethodology in terms of the normatively self-regulated orientation towards understanding the other, of maintaining shared meaning through intersubjective exchange and in the rules of such exchanges (turn taking, adjacency pairs etc.), become radically altered as production and reception are separated. Liberal and critical media theorists differ in their reading of this separation and the power relations they see embodied in it. Some radicals suggest such a separation (with the concentration of ownership and control that goes with this) enables the distortion of media output in an ideological fashion.

So what of new electronic media? How can we approach people using the networked computers, the electronic mailing services, search engines, databases and so on? Networked computers enable dialogic communication, but also access to a vast array of information and information about how to get information. Unlike the telephone, much of the interaction is with machines, rather than through machines to people. To the extent that 'direct' person-to-

person email (either in real-time or when stored) integrates features of the letter, the telegram, the telephone and the answering machine, its originality may only lie in its speed, though this may have significant effects.

Conversation Analysis (CA) can be used to point out key differences between Human Computer Interaction (HCI) and intersubjective communication (or Human-Human Interaction). Failure to distinguish the two leads to confusion and frustration for the user, and, at an institutional level, it may have wider ideological significance. Ethnomethodology and CA highlight the importance of the orientation of each speaker to the understanding of the other. Communication relies upon meaningful rule following, as well as negotiation among the speakers over interpretations of both the rules of delivery and the content of speech acts.

HCI operates according to different principles. A machine cannot orient itself to understanding the intentions of the user, in the manner of partners within a conversation. A machine performs procedures upon command. The distinction between communication and command is crucial to this discussion, so some attention must be given to it. By 'command' we refer, in the first instance, to the limited sense of commands given to a computer. In this context the use of 'command' is based on a metaphor taken from interaction between sentient creatures. However, it should not be taken to imply the idea of 'domination', 'force' or 'imposition' which are principles concerning how people interact with other people. These must be distinguished from the principles relevant to interaction with machines devoid of intentionality (which is often, mistakenly attributed to machines). We shall demonstrate how a failure to distinguish between these principles can lead to misconceptions over the extent to which machines can substitute for people in educational contexts. Machines are ineffective and inefficient substitutes for humans in achieving certain educational goals.

The response to this may be to change the goals of education to match the functions that can be achieved in using computers instead of teachers. A conception of education in which it is thought that HCI can substitute for intersubjective communication between people or where HCI is taken as a model for instruction and learning, could indeed produce a very undemocratic and submissive form of education. In this regard, the literal sense of 'command' depending on power relations and dominance, as opposed to dialogical 'communication', becomes relevant.⁸ But rather than one human commanding another or a machine, the danger is that the 'instructing machine' commands the student!

Ethnographic study with an ethnomethodological orientation, reveals the key role of cultural networks in the formation of the skills (criteria of selection and interpretation) that enable information to be translated into knowledge. The democratic potential of new electronic media lies in their ability to enhance intersubjective communication between human beings and to

facilitate knowledge production, dissemination and negotiation. Dangers lie in the attempts to commodify these media. If communication is equated with command and if collective knowledge production is reduced to atomised information accumulation then the spread of new electronic media will reduce not increase the possible scope of students and their teachers.

As multimedia systems advance, the interface between telephone, computer, television, video, and audio reproduction is blurring, giving a large choice of combinations to those able to gain access (often through the ability to pay). With wide choice comes the opportunity to give the world access to information about individuals, for better or worse. What we suggest below is that it is necessary to make a number of distinctions, between conversation and command, knowledge and information, liberation and enablement, as well as between the cultural and technical networks by which 'communication' is effected, if we are to understand the possibilities and actualities of new electronic media. We start with a set of intermeshed relationships.

The liberation of unmediated media. Access and cultural resources: liberated vs. enabled end-users

Harry East and Yvette Tilson (1993) refer to the 'liberated end-user' of online databases in academic contexts. Until recently, the researchers using online databases took their search request to a librarian who then designed and carried out the search as quickly and as comprehensively as possible. Recently, the emergence of online annual single payment subscription services has meant the elimination of additional costs per search. This has given the end-user largely cost-free time online to make mistakes and learn to use the systems for themselves, without the mediation of information specialists. This has created talk of unmediated media! It has been generally thought, at least by those in higher education seeking to reduce costs (but not by East), that new electronic media could substitute for a large amount of expensive contact time with librarians and teaching staff. The liberated end-users should get on with things for themselves.

In this scenario, the liberated end-user is presented as being freed from regulation and subordination to information specialists and bureaucracy and at the same time freed to pursue their own 'ideas', without having to negotiate them with institutional gatekeepers. Such an idealised model of individuated activity fits neatly with an atomised picture of educational and academic activities. However, the communicative exchange involved in the process through which questions are formulated and knowledge is produced, maintained and modified, is not the same type of interaction characteristic of human computer interaction. Knowledge production is not equivalent to information retrieval. Were it so, learning would be reduced to a form of individualised problem solving that set about generating answers for pre-established questions for which the

methods of answering had already been prescribed. Education would become a system of learning procedures and command following. When they controlled searching librarians were bureaucratic gatekeepers (allocating and preserving limited resources), but much more besides. For all its potential benefits, new technology does not substitute for librarians, nor for the series of others that make up the field of communicative exchange within an academic cultural network, as Nardi and O'Day have found in an American research library (1996). The free market/instrumentalist conception of learning is doubly misleading in that it hides the non-market based conditions upon which the so called liberated end-user has been given supposedly 'unmediated' access and by ignoring the crucial cultural networks (of mediation) through which individuals acquire criteria of relevance that enable the translation of information into knowledge.

Academic Exchange

The academic library perhaps best exemplifies, at least in principle, the non-market ideal of free access to the means of intellectual production. The virtual library or library without walls, based on a variety of new media systems and services, is, at present, enmeshed in a series of struggles over the distribution of costs and benefits of facilities such as online journals, World Wide Web access and online bibliographic services. Conflicts between communication and commodification are manifest and we discuss them in the following paragraphs.

Online Journals

As mentioned above academic journal prices have risen radically in recent years. Technically, full-text online journals are cheaper for the publisher to produce than the production and distribution of paper copies. This is because fixed costs shift from publishers to readers who now need hardware and software to access the materials. The collective provision of such reader resources is something that the library is well suited to carry out. However, beyond technical questions of production, distribution and reception, the question of copyright and payment has inhibited the development of services. While services are emerging slowly they are small scale and often eclectic at present and questions of ownership predominate. In Britain the first serious attempt to produce electronic journal services are being heavily state-subsidised through the JISC's eLib (Electronic Library Programme⁹) and the recently announced JSTOR program (which started in the USA with funding from the Mellon Foundation¹⁰). Librarians we interviewed expressed concern over the dependency relations that appear to be inherent in existing electronic journal services. Unlike paper copies that the library take possession of and which

would not be returnable if a subscription was subsequently cancelled, electronic access to past materials would potentially only continue as long as present subscription payments were maintained. The centrality of copyright questions to the development of electronic services (as if people are not presently photocopying paper sources) reflects the increasing penetration of academic journal production and even editing, by the priorities of more commercial publishers.

The World Wide Web

The web also manifests the conflict between communication and commodification. With more and more of the telecommunications infrastructure located in private hands and with universities increasingly unable to subsidise services, the commodification of cyberspace moves on apace. The Web was originally designed as a medium for the transmission of scientific data (visual, numerical and textual) by a Swiss physicist at the European Centre for Particle Research. However at the present time the web is being increasingly commercialised both through the attempts by Microsoft and rivals to control the software used to access the web and by the increased penetration of advertising revenues in the organisation of search engines, right down to the priority placement of commercial sites in the listings gained by users when conducting searches.

Online Bibliographic Services

The example of BIDS has a revealing history. Originally a service set up by the British higher education communities' Joint Information Services Committee and based at Bath University, BIDS sought to provide a generalised bibliographic data service to the university sector that would avoid both the high variable cost of 'pay as you go' online services and the high fixed initial cost of CD-ROM services. Its mission statement is: 'to stimulate and enable the cost effective exploitation of information systems and to provide a high quality national network infrastructure for the UK higher education and research councils communities'. The freedom for the user at the point of use lies in the service's non-market based approach. Through a nationally negotiated arrangement the user is given the freedom not to pay each time they use the system. The liberation of the end-user could simply end up as the liberation of the market and the freedom of corporations to commodify academic communication in the name of the free and isolated net-surfing consumer. BIDS-ISI is an important example of non-market based principles in practice. Submission to pressure on the service to become more commercial would be unfortunate. This brings us to the next theme, academic communities and the enabled (rather than simply the liberated) end-user.

Academic Communities

The idea of the unmediated medium or the naively liberated end-user is easily dove-tailed into misconceptions over the nature of academic freedom and production in the particular, as well as over the relationship between information and knowledge in general. Our research revealed the central importance of cultural networks, both in relation to the acquisition of the skills to use new electronic media and in the ability to translate systems of information management into tools for knowledge production. These processes hinge upon the development of criteria of relevance by which searchers (using new electronic media or not) organise the information found to select materials to read. Put crudely, it is easy to generate enormous lists of possible things to read. The researcher must then use their discretion to choose which items to spend their time reading, remembering that the active choice to read one item is, implicitly, a choice *not* to read something else.

The frames of reference used in the selection process do not provide fixed and objective horizons. They are based on existing knowledge and represent the shared understandings that the participants bring to and modify through their interactions. These frameworks form the basis for new working hypotheses for both empirical and bibliographic research. The negotiated nature of interpretation, along with the normative orientation towards understanding may be seen in attempts to formulate problems and search criteria. Discussions of what actually constitutes the problem at hand, between researchers and librarians, between academics, between academics and their students, constitutes the heart of creativity within academia.

The working of a cultural network must be radically distinguished from the relations of command and execution enabled by a technical network. While the principle of chance coincidence may lead a machine, in the exercise of a command, to generate results that trigger a connection in the mind of a user (between Foucault and goldfish, for example), a machine is only capable of following a command in the manner it has been programmed to do so. It cannot understand a question or, more importantly, know if what it has been commanded to execute is in fact what is **wanted** by the person typing the command. Technical networks cannot replace the cultural networks through which questions are formulated, discussed and negotiated, even if the technical network can be very useful in generating answers to certain types of questions. To assume that technical networks can replace cultural networks is to assume that the questions that need to be asked already exist and it is only necessary for those engaged in academic production to enact the procedures required for their calculation as technicians of information manipulation.

The equation of knowledge and information, the reduction of intersubjective communication to command, the failure to differentiate the

enabled end-user or researcher from the liberated end-user and the assumption that technical networks can substitute for cultural networks, are all characteristic of the current trend within higher education, at least in the UK, with regard to the introduction of new electronic media. The enabled end-user, in the light of our research, is someone who has access not only to the technical networks of information management and transmission, but is also a part of cultural networks through which they can negotiate questions, learn from others and generate the criteria of relevance by which information can be selected and integrated within knowledge production and application.

The UK now has possibly the largest percentage of people entering higher education in Europe, with a staffing level that has remained constant or in some institutions diminished during the 1990's, the very years in which UK student numbers grew most radically. Currently student: staff ratios in the UK are increasing and there is less time available for discussion and asking questions. In this environment, new electronic media are being used within the framework of the liberated end-user as described above, rather than as part of the enabled end-user model. Unless the misconceptions entailed in the liberated end-user model are understood and alternatives suggested, the economic arguments for replacing expensive human communication with new electronic search services, will continue, along with the commercialisation of education that is being carried through as its sub-text and driving force.

We now consider a single case from our data to help make the abstract discussion more concrete. The following extract is from an interaction recorded from a third year undergraduate (of public administration and management) who claimed to have last used the database (The Guardian and The Observer on CD-ROM 1995) the week before and felt that the search she had just performed was successful. See Online Appendix 4 for a key to the transcription notation.

Case 4

S= Computer System

U= User

1 S: (*Window opens with message*)

2 Type in a word or phrase (Maximum of 3 words)

3

4 Press ENTER to search the STORY TEXT index (13.00)

5 U: MATRIX MINISER<Backspace><Backspace>

6 S: (*Deletes ER*)

7 U: TER RESPONSIBILITY<CR>

8 S: SEARCHING (2.0) (*Window opens with message*)

9 All words in your phrase are in the index but they do not appear in combination. Press

10 any key to remove this message.(3.00)

11 U: [??] (6.00) <Backspace>*23

12 S: (*Deletes MINISTER RESPONSIBILITY*)
13 U: RESPONSIB(1.00)ILITY (3.00) MINISTER<CR>
14 S: SEARCHING....(*Window opens with message*)
15 All words in your phrase are in the index but they do not appear in combination. Press
16 any key to remove this message.
17 U: [??]
18 S: (*Message window removed*)
19 U: <Backspace>*9
20 S: (*Deletes MINISTER*)
21 U: <CR>
22 S: SEARCHING....
23 TOTAL STORIES SELECTED
24 4
25 Press SPACEBAR to View the Headlines
26 U: (3.00)<Spacebar>
27 S: (8.00)(*Displays headlines of search results*)
28 U: <Down><Down><CR>
29 S: (*Displays 3rd full record*)
30 A few words to the unwise
31 RICHARD MORTON-TAYLOR
32 1/6
33 U: (5.00)<PgDn>
34 S: (*Displays next screen of text*)
35 2/6
36 U: (5.00)<Esc>
37 S: (*Displays search screen*)
38 TOTAL STORIES SELECTED
39 4
40 Press SPACEBAR to View the Headlines
41 U: <Down>
42 S: Clear Selections (*highlighted*)
43 U: <CR>
44 S: (*Previous message removed*)
45 U: <Up>
46 S: Text Search (*highlighted*)
47 U: <CR>
48 S: (*Window opens with message*)
49 Type in a word or phrase (Maximum of 3 words)
50
51 Press ENTER to search the STORY TEXT index
52 U: IRAV<Backspace>
53 S: (*Deletes last character: V*)
54 U: Q(.) MINISTER (.)RESPONSIBIL(1.00)E<CR>

55 S: SEARCHING(1.0) (*Window opens with message*)
 56 All words in your phrase are in the index but they do not appear in combination. Press
 57 any key to remove this message.
 58 U: [??]
 59 S: (*Window closes*)
 60 U: <Backspace>
 61 S: (*Deletes last character: E*)
 62 U: ITY#<Backspace><CR>
 63 S: (*Window opens with message*)
 64 All words in your phrase are in the index but they do not appear in combination. Press
 65 any key to remove this message.
 66 U: [??]
 67 S: (*Window closes*)
 68 U: <Backspace>*23
 69 S: (*Deletes RESPONSIBILITY*)
 70 U: RESPONSIB(1.00)ILITY (3.00) MINISTER<CR>
 71 S: SEARCHING....(1.00) (*Window opens with message*)
 72 All words in your phrase are in the index but they do not appear in combination. Press
 73 any key to remove this message.
 74 U: [??]
 75 S: (*Message window removed*)
 76 U: <Backspace>*9
 77 S: (*Deletes MINISTER*)
 78 U: <CR>
 79 S: SEARCHING....
 80 TOTAL STORIES SELECTED
 81 6
 82 Press SPACEBAR to View the Headlines

The user's reaction to the system message in lines 9-10, 15-16, 56-7, 64-5 and 72-3 indicates that she has understood the system response to mean: 'All the words in your phrase are in the index but they do not appear in **this** combination'. Therefore her response is to enter the same words but in a different order. This generates the same message.

Knowledge of human conversations leads the user to suspect that the repetition of a conversational turn indicates she needs to rephrase or clarify what she wants. So, she changes the order of the words in an attempt to co-operate with the system. This indicates confusion between permutations (in which the order is important) and combinations (in which it is not). The user interprets the system response to indicate that the terms were entered in the wrong order, that the search is by permutation rather than by 'simple' Boolean searching. It would seem that the phrase: 'Maximum of 3 words' (see lines 2 and 49), leads the user to assume that the system *requires* three words, since throughout

this and her subsequent interaction with this database she enters three words rather than the 'word or phrase' which the first part of the system message requests. It would appear that the user believes that the more keywords she enters, the more relevant the results will be. In some ways this is true, but as trained or experienced searchers are aware, entering too-specific a search can frequently return no results at all as although, as the system states: 'All the words in your phrase are in the index but they do not appear in *this* combination'. A user familiar with Boolean search techniques would easily interpret this to mean that the words all occur in the index but they do not occur together in the same record. The experienced user's reaction to this would be to remove one of the search terms to widen the search. Unfortunately, the system design regards this as self-evident in its responses, so this particular user received the same message five times in just two searches and only by what seemed to be trial and error did she finally obtain a result. However, there is little evidence that she has learnt *why* the system responded in this way, as it appears from subsequent searches that she continued to believe that the more terms entered, the better the search and with no evidence that she has better understood Boolean operators.

This is significant for both system designers and those library/computing staff who have to support database systems. There is little evidence from our wider research that students or staff are keen to attend formal training courses (unless made a required part of their course/induction). It is also evident, from the responses received to the questions put to the recorded subjects (see Online Appendix 8), that some users are prepared to put up with, what they perceive as unresponsive or 'unfriendly' systems, if, for whatever reason, they are sufficiently motivated (by the need for the information, by course requirements, etc.). On the other hand, as much of our research shows, many less motivated users will simply give up, perhaps never to try again.

If the use of electronic sources is to grow in the way that national and local institutions avowedly hope them to, system designers must take what is known of the user's social and cultural background and context into account when deciding on the design of information systems. This may seem somewhat hackneyed to library/computing staff and system designers but unfortunately, it seems that it is still not considered as important to the use of electronic resources as our research would suggest.

This lack of sensitivity to the user's cultural and social networks and the contexts in which systems are used reflects the situation which was observed in the library/Computing Centre more widely, where information which appeared self-evident to staff was frequently not self-evident to the user. It is not so much that users don't know what to ask but that they don't know how to ask it in a manner that library staff comprehend and reciprocally, the advice offered by library/computing staff and the computer systems seems uncooperative and hence off-putting to users.

To conclude this section consider Theodore Rozek's critique of faith in computers as substitutes for human interaction in learning:

Out of curiosity, I recently asked a librarian if she had ever considered renting out space for advertisements in the card catalogue or its online version. She was first bewildered, then shocked. 'We would never do anything like that,' she said. That is the voice of public service. Some Web enthusiasts consider such structures a kind of elitist censorship. They might even regard the Dewey library catalogue system an infringement on the free flow of information. On the other hand I have heard no serious complaint that keywords on the web are now rented out. People who think that education equals information have no idea what either information or education is. The quality of the question is more important than the quantity of data that appears as an answer. ... and how do we teach kids to ask good questions?

(Rozek 1996, 14)

Related approaches: Human Computer Interaction and Conversation Analysis

Most computer software is designed to 'sustain episodes in which individuals or teams achieve some result interactively over time with the help of computing and/or communications equipment.' (Sanderson 1994, 253). Possible results include composing music, writing a manuscript, drafting and sending electronic mail, analysing scientific data, landing a plane, or, as studied in this project, using distributed bibliographic datasets.

All of these processes are sequential and therefore most of the investigations into what is happening at the user interface (i.e. the computer screen/keyboard/mouse/etc. plus the human user or users) have depended on observation of the interaction. With modern recording technology it has become much easier to record and preserve this for detailed microanalysis. Methods from a wide variety of disciplines have been used to analyse this data. Recently, Conversation Analysis (CA) has been used in a number of human-computer interaction (HCI) studies.

CA is a sociological method developed in the 1960's and 70's by the late Harvey Sacks (see Sacks 1974) and his colleagues, Emmanuel Schegloff and Gail Jefferson. CA set out to detail the tacit organised reasoning procedures which inform the production and recognition of naturally occurring talk. CA is a radical departure from previous forms of analysis in that the production of utterances and the sense they obtain, is seen as an accomplishment, the achievement of which is inextricably tied to the circumstances in which they are produced. A more detailed introduction to CA is given by Wooffitt (1990).

CA is one of the theories which grew out of ethnomethodology and is dependent on the recording of naturally occurring conversations which may then be replayed, transcribed and subjected to detailed analysis. Ethnomethodology emerged as a reaction against previous sociological methods in that the researcher makes few prior assumptions but uses the data to gain an understanding of what is happening in the interaction.

According to Graeme Hirst,

computational linguists are a vicious warrior tribe. Unconstrained by traditional disciplinary boundaries, they invade and plunder neighbouring disciplines for attractive theories to incorporate into their own. ... The latest victim of these attacks is sociology - in particular, a branch of ethnomethodological sociolinguistics called Conversation Analysis.
Hirst, (1991, 211)

This is confirmed by the inclusion of CA in a special issue of the journal, *Human-Computer Interaction*, devoted to the study of what Sanderson and Fisher call Explanatory Sequential Data Analysis (ESDA).

ESDA ... [is] any empirical undertaking seeking to analyse systems, environmental and/or behavioural data (usually recorded) in which the sequential integrity of events has been preserved. The analysis of such data (a) represents a quest for their meaning relation to some of research or design question, (b) is guided methodologically by one or more traditions of practice and (c) is approached (at least at the outset) in an explanatory mode.

(Sanderson 1994, 247)

Sanderson and Fisher include CA in what they call the 'Social Tradition' and use the term 'interaction analysis' to describe studies which are strongly influenced by ethnomethodology and 'situated action' theories and include the use of other ethnomethodological and ethnographic practices in addition to CA. In their terms much of our research used a type of interactional analysis.

Much previous research in HCI took ideas from cognitive science, in particular, the view that computer systems would be easier to use if they could infer the goals of the people using them. To do this the system has to second-guess its users; it has to discover what they are aiming to do. If they get in trouble, it also has provide further facilities to make their task easier or to help clear up misunderstandings (Luff 1990)

The cognitivist strategy is to interject a mental operation between environmental stimulus and behavioural response: in essence, to relocate the causes of action from the environment which impinges on the actor, to processes, abstractable as computation, in the actor's head. The first premise of cognitive science, therefore, is that people - or cognizers of any sort -act on the basis of symbolic representations. (Suchman 1987, 9)

This approach equates human mental processes with computational processes because both act on the basis of symbolic representations. So some cognitive scientists could claim that cognition is not just like computation but is literally the same. Therefore, there is no reason in principle why there should not be a computational description of the mind or why machines could not be designed which would behave like people. However, as Suchman (1987, 10) notes, there is general agreement that even state-of-the-art intelligent machines do not have the cognitive abilities of a normal five-year old child.

In their investigation of intelligent agents, Nardi and O'Day (1996, 31-34) identified several things which librarians can do which software agents cannot:

- 1 Speak and understand.
- 2 Read and understand content.
- 3 Make connections across diverse sources.
- 4 Access paper sources.
- 5 Acquire restricted material.
- 6 Assess quality of information sources.
- 7 Offer the human touch.

Although, it could be argued, that some of these skills are specific to information professionals (particularly nos. 5 and 6), most are common to the majority of human beings and all, our research would suggest, are important (if not essential) to satisfying information needs.

The aim of cognitive science was to design a machine which, as far as possible, interacted with the user like another human being. One of the problems with this approach is that it ignores the variety of contexts or situations in which the machine is used. As yet, the only truly successful 'intelligent machines' are industrial robots working in very controlled conditions carrying out relatively simple, repetitive tasks.

Until recently, HCI has usually focused on the single user carrying out experimental tasks on a personal workstation, often isolated from other users, other devices and sited in a laboratory or 'usability lab' (e.g. Prasse 1992, Nielsen 1995). This lack of investigation of the situation in which computer systems are used is one of the main reasons for the recent interest of interface designers in CA since it pays attention to the social context in which interactions take place. It aims to show that there is an organised structure to interaction by the rigorous and detailed examination of naturally-occurring interaction.

The premise is that if CA reveals how humans interact in conversation, then the findings of CA might be used to inform computer interface design, so that the machine would behave more like a human being or as Gilbert, et al suggest:

First, we may assume that interactional procedures and strategies which are grounded in everyday life are reasonably effective. Second, as

people are tacitly familiar with these strategies, they will have less difficulty communicating with computers which have been designed to capture the characteristics of these procedures.
(Gilbert et al 1990, 253)

Such changes parallel developments in library and information science research which has, until recently also been based largely on the use of quantitative methods. There is an increasing interest in the use of qualitative tools such as those used in ethnography and ethnomethodology (Barbuto 1991; Case 1988; Childers 1991; Mellon 1986).

Suchman was one of the first to suggest that ethnomethodological techniques, such as CA could be utilised for the analysis of human-machine interaction and the results used to inform the design of machines although her research was actually on the use of copying machines not computers.

Due to the constraints on the machine's access to the situation of the user's inquiry, breaches in understanding that for face-to-face interaction would be trivial in terms of detection and repair, become 'fatal' for human-machine communication. In particular, misconceptions with the regard to the structure of the procedure lead users to take intermediate states of the procedure as faulted outcomes. Because the intermediate state is non-problematic from the system's point-of-view, the system offers interactional impasse, the user finding evidence of trouble in her actions where in fact none exist. In the case of the garden path [as Suchman calls this], in contrast, the user takes an action that is in some way faulted, which none the less satisfies the requirements of the design under a different but compatible interpretation. As a result, the faulted action goes unnoticed at the point where it occurs. At the point where the trouble is discovered by the user, its source is difficult or impossible to reconstruct.
(Suchman 1987, 170)

Leading on from this work, Norman and Thomas (1990) strongly supported the idea that the results of CA should be used to inform interface design and some interface designers have already done this. CA is also now widely accepted as a legitimate tool for the analysis of HCI (Wooffitt 1994, Luff 1990, Monk 1995, Sanderson 1994, Gray 1993).

Understanding HCI as a communicative process

There are three main reasons that HCI is perceived by users as communication: the use of language in the interaction, the modelling of computer systems on the human mind and the perception of the computer as a social actor. Because the majority of the output of interactive computers is linguistic, either sound, or text, this interaction is often referred to as a conversation or dialogue. Some prefer the latter term as it implies only two participants. However, since most systems do

not restrict the number of people who might be involved in the interaction, perhaps conversation is a better all-encompassing term. For instance, in training classes a screen may be displayed to many participants who may as a group interact with the computer. Our research data show that often more than one person participates in online searching.

Much recent HCI research into interface design is devoted to using current descriptions of language and more particularly discourse or conversation, to inform design. Suchman (1987) mentions that Hayes and Reddy (1983) identified the one of the essential differences between human-human interaction (HHI) and HCI as the 'robustness' of the communication, in other words the ability of participants to react to unexpected circumstances. Whether this interaction can be referred to as a conversation is questionable and is the basis of some objections to the use of CA in HCI research. These will be considered later.

A further premise for the design of computer software is that human cognition is the same as computation and that therefore it should be possible to design a machine that could interact with people as a person would. Much of the earlier research in HCI is based on this premise. It is interesting to note that Card, Moran and Newell (1983), one of the standard texts on HCI devote the second chapter of their book to 'the human information-processor'. However, in recent years a number of leading computer scientists have started to question this approach to interface design for its lack of attention to the social context of computer use. (See Weizenbaum 1987 and Winograd 1987) However, this seems to have had little impact, as yet, on commercial software design since even as recently as 1995 two Microsoft employees, Dye and Graham (1995, 161) claim that 'an interface is a set of predictions about user knowledge and behaviour. Users know x and have these goals. If we give them these inputs, they will behave as we expect.'! Our research suggests that this ignores the wide range of behaviour which users display in the real world.

Social being

The greater reactivity of current computers, combined with the fact that, like any machine, the computer's reactions are not random but by design, suggests the character of the computer as a purposeful and, by association, as a social object.

(Suchman 1987, 11)

Nass, Steuer and Tauber (1994) found experimental evidence that individual's interactions with computer systems are fundamentally social and that this behaviour is commonplace. There is also evidence that users treat their computers rather like domestic pets, giving them names and excusing their behaviour, e.g. 'Oh, it doesn't seem to want to do that today', 'Computers always make me cry - they never do what I want them to'. Turkle describes further fascinating evidence of this phenomenon (1987 1996).

The idea that there is a form of communication between humans and interactive computing systems has been around for a long time. Interactive computing systems differ from earlier batch-processing systems which queued user commands and executed tasks some time after the user had entered them with no immediate feedback. Typically users fed in data and the commands to process it and then returned sometime later to collect the results. In interactive computing 'real-time control over the computing process is put in the hands of the user, through immediate processing and through the availability of interrupt facilities whereby the user can override and modify operations in progress.' (Suchman 1987, 10-11). Because the user's action is answered by a machine reaction, the term human-computer interaction or communication is now widely accepted.

Some objections to the use of CA in the analysis of HCI are expressed by Button (1990) and O'Connell (1990). Button denies that HCI can be described as natural conversation. He states, CA is not a list of rules describing the way conversation works but a tool for analysing the way society works. Therefore computer systems which are designed using the 'findings' of CA produce merely a 'simulacrum of conversation'. But this is not to say that CA may not be a useful tool to help understand how HCI works.

As Greatbatch et al. note:

It is possible that we will witness a growing interest amongst scholars from various disciplines in drawing on Conversation Analysis and cognate approaches to explore aspects of 'interaction' between human beings and computers over the next decade. Part of the drive towards such approaches inevitably derives from the growing concern with more conventional forms of Requirements Analysis and more generally with their apparent inability to avoid difficulties and occasionally disasters, when technologies are deployed in the real world organizational settings. Indeed, whether it is an official investigation into the introduction of Computer Aided Dispatch into London Ambulance Service or the Taurus system into the London Stock Exchange, it is interesting to note our attention is drawn to the fact that the original design of the new technology in various ways failed to take into account the work and communicative practices of the people who were expected to use the new systems.

(Greatbatch et al. 1993, 219)

Methodology and methods: Terminal Behaviour

One of the aims of the project was to collect data that was, as far as possible, 'natural' or 'real', i.e. not influenced by experimental method. Many analyses of user behaviour rely upon data collected in 'usability labs' (e.g. Prasse and

Tigner 1992, Nielsen 1995) where volunteer users (sometimes paid) carry out a set task or series of tasks on the system being studied. The problem with this type of data collection is that the users who volunteer are likely to be relatively confident about their use of computer systems and therefore unrepresentative of users in general. There is some evidence that users in this type of experiment try to co-operate with the researcher and produce the behaviour which they believe s/he wants rather than their usual behaviour. Our aim was to attempt to collect 'everyday' interaction to investigate what those who use bibliographic databases are doing.

To do this we wanted to record interactions at a publicly accessible terminal. At the University of Kent there are networked public PCs in many buildings on campus but it was decided to look at those in the library since this is where the equivalent printed versions might be consulted and where help and advice on the use of databases is available.

In retrospect, our practical problems in attempting to log usage mirrors the type of problems reported by many of the subjects of our research. We therefore include the details as a case study to demonstrate how small, 'insignificant because practical' problems can cause delay, frustration and in cases other than our own, the abandonment of fruitful avenues of research. The problems which we experienced in finding out who had the expertise (and authority) to assist us, can be completely off-putting to undergraduates with more pressing deadlines.

The Templeman Library is the UNIVERSITY OF KENT University library. It is responsible for running both stand-alone CD-ROM workstations and the networked CD-ROM-ROM server. We approached the library's automation team to ascertain what logging methods were technically possible. We had been hoping that it might be possible to mirror interaction on any PC using the network on the network server and then record what appeared on the screen. Unfortunately, this was not possible using the existing software, so the possibility of loading other network management software, such as *Timbuktu* or *PC Anywhere*, was investigated. For a variety of practical and administrative reasons this was also not possible.

We had also hoped to be able to record the interaction as a log file, i.e. all screen input and output would be recorded to a text file, which could then be used to inform the transcription of the video recordings of the screen. The automation staff tried to help us but could not suggest alternative methods and referred us to the computing service for advice.

The Computing Service had introduced a central helpdesk through which all enquiries on computing must pass. So we contacted the helpdesk for help. In common with our research findings concerning users of the library's enquiry desk, we experienced some difficulty initially in obtaining understanding of what we wanted and were referred to two different members of the department

before being advised that Audio–Visual Services (AVS) had recently acquired a machine that allowed the capture of VDU output to videotape.

We then approached AVS with a view to making a trial recording. This was arranged for 7th February 1996. It took some time for the AVS staff who came to set up the equipment to obtain a satisfactory output, partly because there was only one member of the team who was familiar with the new machine and the equipment had not been used for this particular type of recording before. However, eventually the recording was set up

Recordings were made of all interactions on this PC during that day until 5.00 p.m. In addition to recording the interaction with the computer, the user's behaviour (gesture, use of other materials, such as reading lists, etc.) at the terminal was recorded by a video camera to find out what users were doing when they were using the databases. The PC which was recorded had access to networked CD-ROM–ROMs, the library OPAC, the British Library OPAC, BIDS-ISI, the web via Netscape and local Unix machines (generally used for access to email).

Unfortunately the first day's recordings were not successful. Moreover, during that period only one use of a bibliographic database (apart from the library OPAC) was observed. Other pilot recording sessions were carried out on 20th. March and 16th. and 17th. April 1996 which again did not produce the required results. Eventually most of the technical recording problems were resolved and recordings were made¹¹.

While the recordings were being made a researcher was present to make observational field notes and to approach database users for permission to use the recorded data and interview them if they agreed (See Online Appendix 6 for field notes). Somewhat to our surprise, none of the users who were approached refused permission to use the recording of their database search.

Longitudinal study

Subjects were later contacted by email and asked to attend a second interview in order to find out what they had done with the results of the database search which had been recorded. For example, we asked whether they had tried to find the references they had obtained, if they could find these in the library and whether they subsequently used them in their work. Where the purpose of the search had been to provide references for a piece of academic work, they were also asked to provide the bibliography of that work. Subjects were also asked more general questions about their awareness and use of bibliographic database services and libraries. Only four of the recorded cases took part in the longitudinal study.

Results of HCI recordings at Kent

In 35 hours of recorded data and observational field notes during which 34 users used the recorded machines, only 7 users were using CD-ROMs or

online bibliographic services. Of these, 5 were final year undergraduates, one a taught Masters student and one a member of staff. This accords with the ethnographic and focus group findings that undergraduates do not generally use these services until their third year and that staff and postgraduate students tend to carry out searches from their department or office. The only staff member who was recorded admitted that he usually searched *PsychLIT* from his office but that he had had to visit the library to use *Medline* (which is not available via the campus network). The services used on the recorded machines was:

	Number of users
OPAC	23
CATS ¹²	4
Email	5
Web ¹³	1
Kentel ¹⁴	1
Bibliographic databases	6

The total uses are greater than the number of users since some used more than one service during the recorded session. It is a widespread belief amongst the library and information community that the purpose of bibliographic searching is to find articles on a particular topic. However, one of the interesting aspects of the cases investigated here is that this was only true of 5 of the 7 recorded subjects. One of the other two was a student who was looking for book reviews of the titles on her reading list so that she could read these to save her having to read the texts themselves. She was soon to sit her end-of-term examinations on this course and said she did not have time to read the complete texts. Although this appears to be regarded as a illegitimate use of a bibliographic database by some librarians, academics, and possibly database providers, if the stated purpose of a library service is to serve its users' needs then their real practical needs should not be ignored. The other subject, who was not using the database to search for a particular topic, wanted to find out what had been published by an academic colleague who he had been asked to introduce when the visitor gave a forthcoming seminar to his department.

After each recording session, copies were made of the tapes to avoid loss of data when making the transcriptions. The recordings were then viewed in conjunction with the field notes to locate the case studies which had been identified. These sections were then digitised (using *Avid VideoShop* for Macintosh) to simplify the process of transcription.

The interaction was transcribed using a modified version of the transcription notation used for Conversation Analysis developed by Gail Jefferson given in Atkinson and Heritage, (1984)¹⁵. Any transcription of recorded data is influenced by the transcriber. As Psathas and Anderson note that 'there is not and cannot be, a "neutral" transcription system. The presumably 'neutral' presentation of the details of produced

speech/action would be the actual, embodied and situated original spoken production' (1990, 75).

One level of transformation is the recording of such interaction by video or audio tape recording. The quality of the recording, the location of equipment and the time of recording all affect the retrieval and analysis of the data. The transformation of these recordings into a written format, a transcript, involves another selection process. Whether pauses and other brief events are perceived and the accuracy of the transcription depend upon the vigilance of the transcriber. In our transcriptions a pause has been recorded where the transcriber was aware of a pause in the interaction. The length of the pause was estimated and recorded to the nearest second (or in a few cases, half second). Because it was not possible to record a log of the keyboard input there were some keystrokes which were not identifiable from the video recording since the output did not appear on the screen but effected a command. For example, in Case 4 the following interaction was recorded:

S: (*Window opens with message*)All words in your phrase are in the index but they do not appear in combination. Press any key to remove this message.

U: [??]

Since the system will respond to any key on the keyboard, unless the chosen key could be identified from the remote camera, it is not possible to tell which key the user chose. However, in general this has little significant effect on the interaction.

One of the problems with the video recording of digital data is that the screen resolution of a video recorder is much less than that of a VDU, cable length also contributed to the loss of clarity in the video-recording of the screen display which sometimes made transcription very difficult. In these cases the search was carried out again on the same database by the researcher to check the accuracy of the transcription.

In the transcriptions, system responses are only recorded if they appeared on the screen long enough to be perceived by the transcriber. In some cases the system response was so fast that individual system responses, which are perceptible when the system response is slower, merely flashed across the screen. These screens/messages were not recorded in the transcription unless they appeared long enough for the transcriber to be able to discern them, since we believe that if the transcriber could not discern them then neither could the recorded subjects and therefore whatever text appeared on these screens would be unlikely to have an effect on the user's input. We note that the rapid display of unreadable screen information may well have a deleterious effect on the user's interaction.

The importance of Errors

As Jakob Nielsen observes, 'In user testing we often learn more when the user makes an error than when he or she merrily breezes along in the interface.' (Nielsen 1995, ix). This is true in much HCI research as communication breakdowns are likely to frustrate or irritate the user and/or reduce the effectiveness of the task (see Reilly 1987). In this analysis of the HCI data particular attention has been paid to pauses in system or user response and to evidence of breakdowns in communication. However, attention has also been paid to the overall outcome of the recorded bibliographic search(es). Subjects were asked what they were looking for and to evaluate the success of the search they had performed. These have then been compared with the search strategies of a professional librarian using locally available resources.

An outline of the research strategy

Shadowing at the library enquiry desk

From the end of February to May 1996 some time each term time week day was spent in the UNIVERSITY OF KENT library, behind the enquiry desk, focusing on the kinds of questions 'researchers' ask when in the library and the attempts by library staff to answer their questions. This work, helped form our understanding of the forms of communication between researchers and library staff and to recruit library staff for the focus groups.

The ethnographic interviews

Ethnographic interviews were held in the three departments being studied in each of the three university sites. The interviews used a short series of questions to assess the extent to which postgraduates, researchers and members of academic staff use, comprehend and evaluate electronic bibliographic data services to their activities. Clearly, the extent to which a department has networked terminals, free standing CD-ROMs it runs for itself, the provides training for its own students and staff, as well as the general attitude towards such things within the discipline/department affects the relevance and meaning of any apparently straight forward set of questions. In order that the results of the survey could be understood in a comparative framework, the questions were standardised across the three departments as much as possible once the idiosyncrasies of each department were taken into account. A question relevant in one context became meaningless in another or its meaning altered significantly. So the design of even a simple five or six question inventory required a significant degree of openness. It should also be noted that our interpretation of the survey results needed the accumulated ethnographic knowledge. The

emergence of criteria of relevance and significance in the course of the research, rather than a fully pre-emptive and structured set of questions is typical of ethnographic research.

The aim of ethnographic interviewing was to gain a comprehensive span of coverage (of academic staff, researchers and postgraduates) within the three departments. An initial set of questions was drawn up to cover the general themes that the research team felt were likely to be important. These were then piloted at UNIVERSITY OF KENT with students (mainly graduates) from departments other than those selected for the main study (see Online Appendix 2).

The questions were organised so as to begin with an open series of prompts that asked the respondent about the 'search pathways' they used to find things to read in relation to their work, firstly in relation to their latest or present piece of work and then in more general terms. After this the questions were structured to focus upon particular features of searching activities. The questions moved from more general ones concerning whether they used any computerised services (and if so from which) to specific questions about online services and CD-ROMs, networked services, Web, and email). Finally, interviewees were asked about training and learning about the services they had used.

The subjects were asked to describe their searching strategies and routines before asking any questions (which could have been leading) about the uses and usefulness of new (and older - such as library computer catalogues) electronic services. Interviewees could easily bias their responses towards what they perhaps considered to be the most 'sophisticated' and 'professional' searching tools. We sought to avoid this bias.

The purpose of such semi-structured interviewing was to accumulate a general sense of how a wide range of members of a particular population view or respond to a set of open ended questions. The interviews acted to build up the sense of priorities that were then used in later focus group interviews with staff and graduate students. These in turn acted to form the agenda for another series of focus group interviews with undergraduate students.

Focus group research

The advantages and disadvantages of focus group research are discussed by Goulding (1997). We took them to be an important complement to the other types of research we undertook. Discussions with students and staff across the range of departments, showed that many in the social sciences and even more in the humanities, felt that they are inferior and backward with regard to computing. This feeling (whether it reflects the reality of the situation or not) is expressed in situations involving members of natural sciences, social sciences or humanities in the form of either an unwillingness to make a fool of oneself by talking at all or in the exaggerated rejection the relevance of computer-aided search systems to the work of the

non-natural sciences. It was concluded that by structuring the groups departmentally we could avoid or reduce such exaggerated perspectives.

Power and status hierarchies affect the contributions people make and don't make. The question was whether in discussion of the use made of and the perceived usefulness of bibliographic datasets, members of different academic disciplines would distort the dynamics of group interaction more than the differentials of status and perceived differentials of competence among the internal hierarchy of departments.

Compatibility does not necessarily imply homogeneity. In the recruitment of focus group participants one variable can be held constant while varying others. Options open to us were to maintain relative homogeneity in status by having three groups of academics, researchers and postgraduates, with each hierarchically homogeneous group made up of members of different departments. Alternatively, as was the case in most of the focus groups that we ran the hierarchy was left variable and we recruited groups from within individual disciplines (principally the departments already surveyed).

In addition to the focus groups made up of members of staff/graduates in the three selected departments we also held a fourth group of members of the library staff. The design of each focus group was based on the results of the ethnographic interviewing and the material generated from the research into question negotiation carried out in the library enquiry desk. Each focus group consisted of between 8 and 10 members (although the chemistry group became larger and philosophy and economics smaller). Smaller groups have a tendency to be dominated by one or two individuals, while larger groups can be too large to involve fully all the members. The optimal length of the focus group interview is around ninety minutes, though this will involve a significant amount of preparation on the part of the moderator in the formulation of non-directive questions that will both facilitate open discussion and at the same time enable the research agenda to be addressed.

Chapter 2

The research context

The universities and departments studied

The intention was to choose departments that would give a cross-section of academic life. Hence we decided to select one department in each of the faculties of Humanities, Social and Natural Sciences. The first step was to conduct a limited contextual scene setting ‘trawl’ across the spread of departments within the university, mainly focusing on research students. The selection could not be fully representative as the number of variables that might be of significance (size, history, research rating, sciences/non-sciences etc.) was too great to enable truly a representative sample of departments. One department was chosen from each faculty principally on the basis of size to give some spread over the broad disciplinary divides. They were Economics in the Social Sciences, Philosophy in the Humanities and Chemistry in the Natural Sciences.

The ethnographic research was conducted within three universities (Imperial College, London; Greenwich University; and the University of Kent) and in three departments (except at Imperial where only one of the faculties was represented). Focus group interviews were conducted with members of the library staff at the University of Kent, with staff and graduates from the chemistry department and with members of staff and graduates from economics and philosophy together. Individual and group interviews were also undertaken.

Different libraries, (departmental, multi-site, and central), different sites

The three universities in the study had markedly different sets of library arrangements. Imperial College combines a central library with departmental libraries. Although some departments have their libraries located within the main library building (making them little more than subject areas within a single library), the chemistry library is located within the department’s main teaching and laboratory building. It is next to the departmental coffee shop, so the space is central to the formal and informal routines of departmental life.

Greenwich University is a multi-campus institution which includes campus libraries. Chemists and philosophers (along with others in the faculties of natural sciences and humanities in general) share the Woolwich Island campus library (the largest in the university), while economists share the Avery Hill campus library with most of the social sciences, teacher trainees and sports

scientists. Economists at Greenwich face a number of disadvantages in terms of their geographical relationship with related library facilities. Their campus is divided by a large park that separates their departmental teaching and office building (as well as the main cafeteria area) from the library building. In addition, the business and management related books, periodicals and CD-ROMs are located at the Riverside campus library, which is a lengthy bus journey from Avery Hill. The economists share a library with sociology, psychology and law within the social science faculty, but not with those whose bibliographic needs were closest to their own. What all three institutions and all departments had in common was a lack of faith, (and enthusiasm) among undergraduates for anything but the most rudimentary and temporally-contained forms of mediation between themselves and the things they had to read. Even the use of the library OPAC was something that undergraduates did only with reluctance and almost always in the simplest form. The Greenwich multi-site library system required patience, know-how and faith in ordering materials from other locations within the university system which meant its economics undergraduates had the most difficulty finding things to read.

At the University of Kent all departments share a single four-storey campus library set in the middle of the university grounds and detached from the science laboratory buildings and the colleges. In addition to the main Library, there were small college-based libraries. However, these were in decline and were not used by most students or any of the staff interviewed (they have since been closed). The chemistry department has a periodicals library which holds incoming library journals for a month as well as duplicate (though incomplete) sets of both *Chemical Abstracts* (on paper) and *Beilstein*. Philosophers and Economists did not have any equivalent.

These distinctive forms of library provision combined with differing resource levels (IC being the best resourced and Greenwich the least) provide a different set of circumstances at each site. However, the different practices of and provisions for academic library users (from undergraduates to academic and research staff, across the different universities and in the different departments) within the three different library systems outlined above, is only a part of the full picture of their bibliographic search strategies and resources. Whether it is course readers for undergraduates, or photocopied reading lists, the searching of external databases, actually visiting other libraries, or other sources of bibliographic material, the traditional Alexandrian ideal of the university library as a repository of all known knowledge is being challenged.

Chapter 3

Using Information sources in Academia

An ethnographic perspective

Where do formal training and learning occur?

There are two separate questions each with a different answer. Training does not necessarily occur where learning occurs. This has significant implications for the provision of IT training and attempts to raise awareness of IT. This may be the responsibility of the library and/or computing service staff. However, they do not have a role within the everyday life of those most likely to benefit from their knowledge.

The training sessions (with small turn-outs) held in the Templeman Library at Kent were indicative of this. The library staff sought to promote regular training sessions for students, undergraduates and graduates. Due to the radical expansion in student numbers undergraduates are no longer given introductory library inductions in the beginning of their first year. Library staff found themselves fighting a losing battle in the first weeks of a student's university life against the multitude of distractions that fill freshers' early days. Sessions were advertised at different times of the year and aimed at different audiences (faculties and levels of study). Posters were put all around the campus and yet turn-outs for these library-led sessions were depressingly small. Interestingly, sessions organised in law and chemistry, where the departments were involved in the organisation and publicity of the sessions and where the training was integrated into coursework, were attended by almost all the students concerned. Being inside the routine horizons of the students attention, rather than outside its scope was critical.

The Imperial College Chemistry Departmental Library displayed a far greater degree of integration with the department, although it would require a far wider research programme to tease out the factors: funding, academic culture in the sciences and the nature of the library's relationship with the department.

Assumptions of self-evidence by the service professionals

Assumptions of shared meaning and self-evidence act to exclude by assuming that there is no barrier to entry. Knowing how to continue but not knowing that the choice is anything other than self-evident leads to frustration amongst those 'in the know' when encountering the 'uninitiated'. In the same

way, not knowing how to continue induces anxiety and distress in ‘non-initiates’ when faced either with machines that don’t seem capable of answering simple questions or enquiry desk staff who don’t seem to realise how much their attempts at explanation assume prior knowledge of what the enquirer is asking for.

One of the first things that was noted in visits to the Templeman Library to shadow librarians on the enquiry desk and to observe users in the Catalogue Hall, in January 1996, was a trivial instance of assumed self-evidence that, in its simplicity, provides an excellent illustration of the issue. Over the 1995 Christmas break the library computer catalogue (CATS) was superseded by an integrated library management system produced by DS called Galaxy 2000. There was an array of false starts and user disorientation was intense for a period. Here we consider two examples.

The programmers had used the TAB/indent key to enact the command to move between fields within search modes (such as between author and title fields in the author/title search mode). The screen information gave the instruction to press TAB to change fields. However none of the machines in the library had TAB written on this key. Instead, they had the arrow →| sign. This produced a wave of enquiries and no doubt an even greater number of confused individuals. In the end, pieces of paper with the word ‘TAB’ written on them were sellotaped to all the →| keys in the library. To the system designer, the equivalence of TAB and →| must have been as self-evident as ‘A’ being the capitalisation of ‘a’ would be to a literate Latin script reader. We should not underestimate the power of a single bad experience with a database in putting someone off, perhaps forever. As some of our respondents demonstrated, a failure years ago continued to justify present-day avoidance in the absence of alternative impressions.

The second instance of an assumed self-evidence was in the use of the instruction SEND to be equivalent to pressing the END key when sending recorded data from the library OPAC to one’s own email address. This was all the more problematic as use of this facility was much more likely to be used outside the library, so making help-seeking more difficult.

Seeking help and the development and promotion of instruction are crucial areas. The negotiation of meaning between the respective partners in the process requires the overcoming of the paradoxical relationship between what the user *knows they need* and what *they need to know* in order to find it. Often this process is complicated further when the process of negotiating *what you need to know* to find *what you know you need* changes your sense of what you were looking for in the first place! Learning how to ask a database the ‘right questions’ raises interesting questions itself about the formation of criteria of relevance. This is well-illustrated by the different modes of learning to use various electronic databases.

Philosophers in the Computing Lab

An interesting instance of the disjuncture of taken-for-granted modes of shared understanding was recounted by a member of staff from the Philosophy Department at UNIVERSITY OF KENT and then elaborated by others. It concerned the attempts made by the university computing service to give a better service to members of the Humanities faculty. As the computer service's funding was based on a per-capita student basis, it was criticised internally for focusing its resources towards engineering, maths and sciences, while nationally JISC (Joint Information Systems Committee), was placing a greater emphasis on computing skills development for the humanities and social sciences.

The Computing Service laid on a series of classes for staff and research students from different departments, including philosophy. They soon became extremely frustrated at the apparent incapacity of the philosophers to keep up with their class plans or to remember material from one class to the next. The drop-out rate in the courses was also a source of embarrassment to both the computing service and the department.

It seemed that when the instructors from the computing service could not explain something to a philosopher using their own technical terminology they would use metaphors. The problem was that the metaphors were themselves very often drawn from the field of computing and so tended to assume the very prior knowledge of the field that the philosophers were lacking.

The computing service has since developed liaison officers to try to establish the needs of different departments' staff and research students, however, it is still the case that computing staff find it hard to understand the closure that their language effects on those whose subject is not computing. In interviewing the philosophers, it was remarkable to find that most staff and research students who claimed to use networked computers said that when they had problems they went to see the member of staff who first relayed this story, rather than go anywhere near Computer Services. When the researcher (M.D.) pointed out the extent to which other members of the department saw him as a computer expert he was quite shocked as he admitted he felt his basic know-how was not a good basis on which to train a department. Nevertheless, his ability to speak to philosophers in their language about computing, despite his non-expertise, made him a far better source for them than the experts.

Access: Departmental cultural networks

An important finding of our research was the role of departmental cultural networks in the development of the use of electronic bibliographic databases and the perception of their usefulness. The importance of departmental interactional networks (and their comparative strength or weakness) raises questions of how and where to provide services, as well as training. 'Horizons'

of experience, communication and interaction, the routines of everyday academic activity and shared understanding, need to be understood if provision is to be effectively targeted.

Reading lists, core texts and readers

Elaborated reading lists, designed to guide students' reading, are one way to encourage access to material without students needing to grapple with anything more complex than an author/title search on an OPAC. It should be noted that all the UNIVERSITY OF KENT students included in the data logging study were using reading lists or looking for references given to them by their tutor. In order to cope with heavy demand on central texts, the teaching and support staff may place them or additional copies of them (especially in the case of journal articles), in a short loan collection. This is widely believed to benefit the students, in that it saves the time and trouble of locating the reading list items and allows more students to access a given text at the appropriate time. Moreover, it also has the advantage (to the library) of rapid circulation of resources and may generate an income for the library from photocopying (so rendering the library an information broker rather than a lender). Such advantage to the library is at the direct expense of the user. As long as a blind eye is turned to the copyright implications of student photocopying from books the library can maintain such a policy. Facing up to the copyright implications of multiple replication, libraries (one of those studied being a case in point) may become copyright/ publication mediators - compiling course readers and dealing with original publishers. These may then be marketed internally or even more widely, as commercial publications beyond that institution's own student population.

Alternatively, devolved departmental budgeting may encourage the production of readers compiled by academic staff (often turning a blind eye to copyright) and sold to students on their courses (with a departmental subsidy). In other words, intense pressure to devolve budgets and to save money, may lead departments to withdraw from generalised library provision and to focus their resources in the production of their own student readers and handouts. At the same time encouraging students to buy essential texts for themselves, something that reduced library budgets already make almost essential.

In this context, electronic bibliographic services seem to have little to contribute. Departmental subscriptions to such services as *Chemical Abstracts* online or even individual subscriptions to such services (paid from research budgets), encourage the use of such services by those who have access. However, this is usually restricted to (relatively) small numbers of postgraduate researchers and academic staff. Since these services are of most use only to such groups, this may not seem a great problem. But this is to accept the status quo and to ignore both the way that bibliographic tools can increase access to existing library resources and that being

able to use these tools is a useful skill for students to acquire. Spoon-feeding in the form of readers does not promote independence of thought.

Undergraduates

Across the three sites and in the three different faculties, certain features of bibliographic searching behaviour were common to the undergraduates interviewed. Central to this was the limited use of electronic services especially in the first two years. While most undergraduates had used OPACS, even this was very limited in frequency and in the type of searching options used. Author/title searching was about as far as most students managed to get and it was only occasionally that students mentioned options such as keyword searching, course code searching etc. The combination of the reliance on reading lists and buying core materials mitigated against undergraduates needing to learn to use such options and the absence of compulsory courses for first years ensured that many did not even know such additional facilities existed on what was seen as simply an author /title searching device.

Use of bibliographic CD-ROMs was also very limited. As most undergraduates did not use journal articles in their first two years, except those given out by lecturers or which were photocopied and placed in the short loan collection, this was not really very surprising. Although it is possible that if such students knew how to use bibliographic CD-ROMs effectively, they might have become more keen users of their libraries' journal collections. A small number of the chemists at Greenwich that said they used bibliographic CD-ROMs in their final years. The only regularly-used CD-ROMs (at least in the university libraries - excluding games and other home-based CD-ROMs like encyclopaedias) were those of newspapers. The following extract sums up the general mood.

Interviewer: and have any of you since I last spoke to you, been using the journal catalogues, the CD-ROMs for instance?’

I got on the computer.

Interviewer: Yeah, right. For what things?’

Generally, using it to find easier access to the library and that.

Interviewer: and that’s searching for books on the catalogue?’

Um

I tried to use the CD-ROMs , but it was completely useless, I mean I was looking for drama reviews and you put it into the CD-ROMs and it comes out with all these reviews, but they are not necessarily in the library and they don’t tell you whether they are or they aren’t, so it was like well this is great, I might as well go and look...

Interviewer: So as I mean, as a strategy, its easier for you because you know the field, to go actually straight to the journals?’

No, no, not really, but the CD-ROMs are pretty useless, I mean when you think that this article is not here, its in America or Swansea of something, I mean they don't say whether they are here or not, its just a load of suggestions which you can't read anyway.

True.

Interviewer: Has anyone else had experiences with the CD-ROMs ?

'No's

Of all the undergraduates interviewed, only three UNIVERSITY OF KENT chemistry final year students had learnt how to use BIDS-ISI.

Who uses, who doesn't and where?

Perhaps our clearest empirical finding was that it is usually graduate students (and above) who used electronic bibliographic databases (apart from library catalogues)! Undergraduates were unlikely to use such searching devices at all in their first and second years of study, while final year students tended to only do one or two such searches using either online or CD-ROM databases when they were beginning their theoretical or practical project based dissertations. The consequence of this was that those who use the services tend to be the same people who have access to networked computers in personal or shared offices/research laboratory offices, rather than only via public access terminals such as are available to undergraduate students in the library, computer centre, or in the colleges. It should come therefore as no surprise that services which are used widely on the campus they are not necessarily highly-used in the library itself. The library is providing or at least servicing the provision of many such services, but it is not where those services are most often used.

Scope of Use: the library enquiry desk and training seminars

One feature of academic communities is the discursive horizon within which communication is intense and beyond which is it more irregular and less attended to. This was highlighted when the library attempted to run training seminars for electronic resources. The courses were advertised extensively around the campus but each session was only attended by a few individuals. The problem lay in the fact that the courses were not integrated into any departmental routines and so were not being talked about amongst either staff or graduates. Conversely, when interviewing graduate students about training courses they had attended, almost all claimed that these courses had been recommended to them either by their supervisor or by other graduates. Attention to such patterns of communication is a vital consideration when designing training courses and in publicising and organising them. As will be considered later, there are significant differences in the level of discursive integration within different departments and these significantly effect the use of bibliographic databases and learning to use them.

Chapter 4

After the academic library

Beyond universal truth, access, discipline

Fragmentation of knowledge production and information seeking (and in the sources of such seeking) was evident even within traditional paradigm science departments, such as chemistry. Its intensification was also in evidence in those fields that never achieved such a position. This parallels what Lyotard (1984) refers to as multiple pragmatics or multiple truths; the move from 'it is true' to 'it works'. The question is 'what is the question'? Chemists, perhaps most of all, felt that increasing commercial dependence ensured that 'he who pays the piper called the tune'. As the choice of sources one could consult widened (if software, hardware and running costs were available) so too the parameters of the questions to be asked in research were restricted. This is consistent with the desire for rapid turnover, so answers to questions can be turned into technical solutions to commercial problems. Lyotard's postmodern turn, where truth becomes a multiple series of practical solutions for small scale problems rather than a grand narrative may well describe the end of the library as universal repository, though the consequences may be less positive than he suggests. (See the earlier discussion on 'command', above)

Library, computer centre, department, team or individual.

Who is responsible? Who knows? Who communicates? Who cares?

As the use of networked services moves beyond the walls of the library, as departments and individual researchers access services from other providers, issues of responsibility for provision, training and co-ordination of services become more complex and prone to ambiguity. Librarians interviewed expressed concern over both the control exercised by computer centre staff over uses and access policies for the basic infrastructures on which library services depend. They were also concerned about the pressures on library staff to train users on the hoof, in the basic computing skills necessary to conduct database searches and to then transfer derived materials either to paper, floppy disc, or another machine. Skills the librarian may feel should properly be taught by others. Likewise, academic staff (mainly in social science and humanities fields) expressed concerns over both the failure of computing services to provide training for their students and, where training did occur, over how well it was taught, given the needs and levels of understanding of their students and staff. Computing staff expressed frustration

at 'unrealistic' demands being placed upon them. Finally, academic departments and libraries manifested numerous areas of breakdown and dislocation, (for our own experience of this see above), over allocation, training and co-ordination of needs and services. As the traditional boundaries between library, computer centre and department break down, the cultural horizons in which librarians, technicians and academics become more problematic. Integration is not the automatic consequence of fragmentation. It is essential that the bridges are built to resolve these disjunctions.

Allocation and ownership of resources

As new electronic databases expand, so the demand pull from non-undergraduate researchers and staff draws a greater proportion of budgets towards the provision of journals and document delivery services. This means that libraries are unable to meet traditional expectations about availability of material on paper for undergraduates. Universities under pressure both to take in more undergraduates and at the same time to increase their research profiles in a time of reduced budgets are being forced to make radical choices. Greater demand for undergraduate reading materials has led to the suggestion that undergraduates become better trained in the art of finding related materials using electronic means or, by contrast, to encourage them to focus more upon the contents of course readers and primers. Whilst the former suggests the need for more computer competence and training, the latter removes it. Where there is a conflict between allocating resources for the provision of undergraduate teaching materials and increasing research materials, undergraduates are often the losers.

Another key issue to be addressed in relation to ownership and access to electronically held information regards archives of past material. As one librarian interviewed pointed out:

You can't guarantee an archive, because even as an advocate of the network I would not recommend changing to electronic only because at the moment no-one guarantees that they will be around in ten years time or what their policy is if you stop paying for them...

None of them, as far as I'm aware, guarantee to let you go on looking at things that you once subscribed to but then stop.

Unlike paper copies that once bought are located and controlled locally, online services retain the control centrally and so render local users dependent upon them for continued access. There is the potential for an accumulation of control by corporate providers in relation to dispersed users unless local providers act collectively to negotiate rights of access that protect the end-user from unscrupulous abuse of information control. Again the spirit of public service provision and citizen rights to information require a coordinated strategy and the dissemination of local strategies and experience.

At the other end of the chain there is the question of how new information systems can be introduced effectively to the everyday practices of potential end-users. Anthropological and sociological research into relations between experts and non-experts has shown the centrality of cultural networks in the effective integration of technical innovation within the community practices of non-experts. Medical micro-sociology (Lupton 1994 and Arksey 1994) details the cultural space in which patient-doctor interactional breakdown can take place, while medical anthropology (e.g. Pearce, c.1993, Agar 1996 and Blerkom 1995) has highlighted cross-cultural breakdowns between one culture's medical technology and local cultural knowledge. We suggest that parallels can be drawn between the findings of such studies of lay-expert interactional breakdown and those found in studies of relations between members of university academic departments (both staff and students) and the information technology and bibliographic systems providers who seek to serve them. The 'barefoot doctor' (see Werner 1993), as mediator between local knowledge and external techno-medical discourses, closely resembles the growing class of 'technology officers' being appointed in UK university departments to liaise between academic knowledge producers and information managers (in both library and computer centre).

Rapid expansion in the student population in British higher education has occurred in parallel with an equally rapid and potentially radical, expansion in the availability and use of computerised databases and electronic forms of mediated communication. While basic levels of computer literacy among the incoming student population is, in general, higher than either previous student entrant groups or the non-students within the current age cohort, computer competence displays very wide variance across the student population. Qualitative research into 'library anxiety' (Mellon 1986) demonstrated, prior to present debates about the virtual library, the misconception of seeing university students (as a sub-set of the general population self-selected for academic ability) as naturally and necessarily immune to a range of blind-spots, fears and even phobias in relation to the radical expansion of bibliographic materials and methods needing to be 'mastered' on entry to university. Disorientation and isolation in a big library may be as nothing as new generations enter or skirt around the edges of, the 'library without walls'. Work by Robbins and Holst (1990) and East et al (1995) have shown the value of focus groups and ethnographic interviewing in the conduct of research into bibliographic systems use and barriers to such use in general, while Squires et al (1993) and Barry (1995), in ongoing research into 'assisted information systems in academic research', have shown the crucial importance of face-to-face intra-departmental interaction in the acquisition and development of online bibliographic competence beyond a small minority. As such, decreasing staff: student ratios (from teaching staff to library and information technology support staff), combined with declining students to library

'stock' (in particular for core texts per student) will not be evenly or automatically offset by increasingly 'self-directed' students, able to make up for declining face-to-face communication with academic, library and other staff, as well as for diminishing relative bibliographic resources, by means of electronically mediated online databases (David 1996). The findings of the Follett Report (Joint Funding Council 1993) into the implications of new information technology for bibliographic services in British higher education rightly pointed to both the radical potentials and the need for new and innovative strategies to realise them.

Textbooks and the future

As one of the philosophers at Kent pointed out, while the ideal of university education, at least in the humanities, had been the cultivation of the students' ability to direct their own quest for knowledge but pressure on resources, both in terms of library stock and in staff-student interaction time, has forced a shift towards courses geared to core texts. The elaborated reading list, far from being an invitation to explore the diversity of the field of debate, had become a means of helping the student to at least find something to read. Distributing photocopies of key articles was the only way to ensure that students got materials, even if it did not ensure they read them. However this was expensive for the department. Putting things on short loan meant students did not have to use any computer catalogues and could get materials in a reasonably short period of time, but this then cost the student quite a lot of money to photocopy, as the items were often restricted to the library and even if they could be removed, were only available for a few hours.

The development of course readers at Greenwich represents at least one logical solution to this conflict of budget constraints and growing student populations, though it does so in such a way that the student is expected to foot the bill. The academic library may, if such readers become more generally used in conjunction with core textbooks, come to specialise in the provision of single copies of more specialist works (including the full texts of the works from which the tracts within readers derived). The provision of multiple copies of textbooks may cease to be seen as within its remit. The academic library might then function to supplement undergraduate core reading, while at the same time providing basic reading materials for more specialist research work, itself to be supplemented by inter-library delivery services (electronic or otherwise) for the most specialist journals and other materials not provided 'in-house'. This would involve greater use of electronic searching and ordering services by researchers (including final year undergraduates). Such a future would reinforce the generally peripheral nature of such systems for undergraduates prior to final year dissertations (and not all undergraduates choose these).

Moreover this development is inconsistent with the 'ideal' of the undergraduate as 'independent learner'. However, such a 'self-directed student' is precisely the student that is required to educate themselves at a time of growing class-sizes and shrinking staff-student interaction time. In the following section on the relationship between the seminar and the computer (between cultural and technical networks for undergraduates) some of these tensions emerging in the research will be discussed in greater detail.

Implications of the detailed study of usage

Although half of the cases recorded as part of the data logging study reported satisfaction with their recorded search session immediately after carrying it out, only one subsequently located and used the references found in her academic work. The reasons stated for an unsuccessful search illustrate beliefs about electronic sources which appear common to many users.

- Familiarity vs. relevance
- Currency of electronic sources
- Inclusiveness of coverage

To illustrate the first point, one of the students in our study complained that she could not find any articles on the subject she was searching for (equity), in the ASSIA Plus database. She commented that 'it's usually very good but I couldn't find anything'. However, an experienced database user would know that ASSIA (*Applied Social Science Index and Abstracts*) is not the most appropriate database to use for this subject. The student would almost certainly find plenty of relevant articles on one of the legal databases which were available in the Law Library. Her comments imply that she used ASSIA because she was familiar with its search procedures rather than because of knowing its coverage.

It appears that users frequently believe that electronic sources are necessarily the most up-to-date source of information. A masters law student was looking for news report from the previous month and was somewhat disappointed not to find it on the *British Newspaper Index*. She was presumably unaware that this CD-ROM is only issued quarterly and so ironically, in this case, she would have better advised to use a printed source which is issued weekly, the *Clover Newspaper Index*, which was available in the library in question.

It also seems that a majority of users, tend to search a single database (which they are familiar with) and do not use a variety of sources. Dependence on a single database suggests a lack of awareness of the varying coverage of databases. Many believe that electronic sources cover all the relevant material. But databases are selective in their coverage and so for good coverage, particularly in the social sciences and humanities, searchers would be

well-advised to use a variety of sources to ensure a more inclusive search. Only one of the recorded cases used more than one database in their search.

Although most cases described their searches as successful, only one went on to use the references found directly in academic work. This was sometimes because the journals cited on the database were not immediately available in the university library. As one interviewee suggested,

CD-ROMs should indicate if the library holds that particular issue and what the classmark is. The library should do this. 'Once I had to get some articles for an essay and when I checked on OPAC the library didn't have any of the articles I'd found on the CD-ROM.'

Chapter 5

Conclusions and Recommendations

It is with no small amount of satisfaction that we are able to conclude that this project has demonstrated that social factors must be taken into account more than they have been in the past across a range of areas concerning the use of electronic bibliographic resources. Increasing attention is being given to those in the humanities (the creation of the Arts and Humanities Data centre with JISC funding during the term of this project is symptomatic of this). The exponential growth of use of services such as BIDS-ISI has been among the relatively computer literate constituencies of science and social science. With the advent of datasets such as the Periodicals Contents Index (available in UK via EDINA) a new set of problems is posed: that of promoting such services to users who not only are relatively computer-illiterate but also whose social networks are disconnected from both the computer centres and the libraries who are jointly concerned with the use of these services.

Such disconnections must be actively addressed and tackled in a variety of ways: we would suggest that apart from attempting to run training sessions outside their traditional arenas of library/computer centre, more attention is paid to informal or semi-formal communicative channels. One significant finding from our study was that one member of staff was regarded by all his colleagues as their primary source of IT support. Not only was he horrified when he learnt of it, but he had never been aware of it until given the feedback from our preliminary results! It is not inappropriate to draw a parallel from third world health-care promotion and to consider the possibility of creating 'bare-foot IT specialists' on the model of 'barefoot doctors'. Such people could be given some training and would act as a bridge between the IT professionals, who are separated from their clientele not only physically but also socially - they may actually be perceived as speaking a different language! Bare-foot IT specialists, by contrast, must be recruited from among the target groups/subject specialisations - it may well be possible to use such a strategy to provide bursaries for doctoral students or postdoctoral researchers, although the suggestion raises delicate issues to do with the erosion of professional standards.

A different feature that emerged from our survey data concerns the importance of informal communication channels: broadly speaking science departments are more tightly knit as an unintended consequence of laboratory work. This is reflected in the science departments having more communal areas in which colleagues, staff and research students socialise and exchange information. By comparison arts and humanities departments lack tea-rooms and the sociality that occurs there. But there are situations where informal

interaction occurs and it would not be impossible for IT professionals to participate in them – it is common for a research seminar to be concluded in the college bar, for example! That the suggestion sounds far-fetched is evidence of the scale of institutional and perceptual change that we are suggesting will have to occur.

Managers of IT provision must encourage their staff to socialise with their target audiences, not occasionally but as a routine matter of course, as part of their jobs not out of the goodness of their hearts.

Turning now to the fine-grain analysis of real searches by researchers as they go about their normal business there are two important conclusions which have implications for the designers of interfaces (as well as networked computer systems more generally) and the organisation of work space in libraries and computer centres.

It has been well documented for more than a decade that users are prone to getting stuck in a blind alley and going round and round in circles. If the designs of systems were changed to include not just the immediate command being issued but also the buffer of the previous few commands (where identifiable sessions exist) then at the very least it would be possible to prevent the system issuing the same instruction three times in a row, encouraging the user to dig themselves further in the mess they are in (or to misdiagnose the problem at issue). A different but related problem is that users get bored when machines do not respond speedily (for whatever reason). They may well miss something that flashes across the screen because they have pressed the return key several times to check that the machine had not frozen. Attention to the details of sessions - the buffer of previous commands, the time delays between command and response present possibilities for the design of systems. Computer systems should be designed to work in the way that users already take them to be working. Interpersonal conversation is the most important model for this.

All too often discussion of HCI focuses on the computer and the user. But the reality of actual usage is that often more than one person is using the same computer to do the one operation. This observation has important implications for the design of work space and the hardware that is placed in it. Not only is it important that monitor screens are readable from a wider angle than currently possible, but the talk between the colleagues using one computer should not disturb those elsewhere. This is being addressed in the design of some new libraries (as reported in the 1997 ELVIRA conference).

So our conclusions may be summarised as follows: communication flows are of critical importance. For instance, tea-rooms provide the opportunity for casual, unpremeditated, transmission of skills and knowledge, hence they offer important institutional opportunities! Even more important is to recognise that the way in which interactions are taken to be communications and hence are perceived to be relevant and topical. This forms the basis of an injunction to both IT professionals and to the systems that some of them design: the professionals need to be able

to talk to those lacking their own technical background and interests. The systems must be able to take into account the immediate history of the interaction - so they don't keep repeating themselves. Also, recognition needs to be given that it is often not so much a human-machine interaction as one machine interacting with a team of people. The existing predicament is perceived by many users as off-putting. Both the language of the professionals and the interactive styles of the machines must change in order to reduce the social distance between users and their machines.

Notes

- ⁱ It would be interesting to assess the relationship between the declining book: student ratios and the strategies adopted by departments and individual undergraduate students: whether to adopt standard textbooks, or to use increasingly self directed searching for new sources via electronic databases.
- ⁱ It would be interesting to investigate whether postgraduate seminar leaders (not to mention the undergraduate students they teach) know who their subject librarian is, where they are located in the library, and whether they exist at all. Equally, one wonders whether students (under and postgraduate) know who their departmental library representative is.
- ⁱ Upgrading from connection to the present JANET wiring to connection onto a fibre optic system has been contracted out from the university sector (under the Joint Information Systems Committee) to British Telecom. While this has enabled radical expansion of the bandwidth, and so of the speed of information transfer, the service is not universally available, due to the high cost of connection. SuperJANET has to be opted into. As the additional bandwidth enables faster access to large documents, SuperJANET makes it possible for large numbers of users to access full-text graphic journal services, and other bulky materials, at a reasonable speed. Relations between bandwidth of superhighway routes, local network infrastructure and alternatives that may by-pass the need for expensive infrastructure upgrades will create an uncertain future for those trying to make financial commitments for future needs within present constraints but in the anticipation of future possibilities.
- ⁱWe note that in 1998, as this book goes to press, this issue is being addressed.
- ⁱ Inspired by the programme of ethnomethodology (see Atkinson and Heritage (1984) and Garfinkel (1967)).
- ⁱIn many cases this has led to a wilful disregard of all talk of social structure, or of relations of power, and domination which could not be identified within the specific detail of observable communication. Our use of ethnomethodology, and other methods means we are able to take the wider context into account.
- ⁱ See, for example Habermas 1987, 130.
- ⁱ In what follows we will endeavour to distinguish the different senses of the word 'command', so as to avoid confusion. Other terms could have been used in

place of command (such as ‘instruction’ and/or ‘order’), but they would have the same problem of multiple meanings. All of these terms have been applied metaphorically, and are based on aspects of intersubjective interaction.

ⁱFor more information on the eLib programme see URL: <<http://www.bubl.bath.ac.uk/elib/about.html>>

ⁱFor more information on JSTOR see URL:<<http://www.jstor.ac.uk/>>

ⁱDetails are available in online appendices.

ⁱ CATS was the name of the previous Library catalogue (both the software and the database). This was simply a catalogue and not an integrated system. It could not therefore display items on loan, borrowers records, etc. At the time of recording both systems were running in parallel although CATS was no longer being updated. However, some students and staff still preferred to use the older system because they were familiar with it.

ⁱ World Wide Web via Netscape - This was only available during the recording on 24.4.96. After it was discovered that the recording would fail if Netscape was used, a note explaining that it could not be accessed from that PC was put on the machine.

ⁱ Kentel was the old text-based version of University of Kent’s campus-wide information service (CWIS). It is no longer available. The CWIS is now on the Web.

ⁱSee Online Appendix 4 for details of the notation.

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