A Comparative Analysis of the Role of Multi-Media Electronic Journals in Scholarly Disciplines

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Abstract

Scholarly practices differ considerably in the way they store, use and disseminate information. It may be hypothesised that they may also differ in their need for electronic journals and these journals may have different effects on scholarly practice. This brief study used secondary sources of information to compare the impact of electronic journals on different disciplines. An analysis of the literature is presented which describes the characteristics of disciplines in the natural sciences, the social sciences and humanities and in applied disciplines. The analysis examines the use of information in these disciplines and demonstrates the different roles that traditional journals play in different disciplines.

From the literature and with the assistance of domain experts who attended a workshop, a set of propositions were formulated about the implications of scholarly practice for electronic journals. These propositions were tested with reference to 14 disciplines by the examination of secondary sources of information about each discipline, through the literature, through inputs from eLib projects working in these disciplines and through interviews with academics.

As a result of the analysis it is proposed that there are some universal characteristics of scholarly activity which lead to general specifications for electronic journals and there are other characteristics which lead to differing requirements. There is a general requirement to have access to search facilities to locate relevant articles but the requirements to read full text on-line and to have advanced forms of multi-media within articles are more limited. The majority of disciplines would value an electronic full text service as a means of assured access to a printable document. Many disciplines would value an opportunity to link electronic journals with other electronic data sources and communication facilities. There is some evidence that it is the natural sciences which would find the most advanced forms of electronic journals of benefit and they are already the most advanced in the adoption of these services. However, there are sub-disciplines across the spectrum of the disciplines which have characteristics suggesting they would value the potential of multi-media, electronic journals. The report offers a preliminary causal model to characterise disciplines in terms of their likely use of electronic journals and the speed of uptake and presents recommendations for research and practice which will further the appropriate uptake of electronic journals in different disciplines.

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Contents

1. Matching Electronic Journals and Scholarly Practice. Matching Electronic Journals and Scholarly Practice;

Electronic journals are now appearing across a whole spectrum of scholarly activities. Inevitably there is greater progress in some areas than in others. There are a very wide range of forms that electronic journals can take and environments in which they are developed, for example:

- the amount and type of multi-media they incorporate
- the structure of material and the way it can be searched
- the way they support communication between scholars

It may be the case that all scholars need a similar kind of service from electronic services and we are witnessing the exploration of many ways of meeting this need before a level of maturity is achieved where we can select the particular forms that best meet the need. However, it seems much more likely that scholarly practices have a wide range of characteristics which will mean that different forms of electronic service will be relevant in different places. The purpose of this study is to explore the possibility that different scholarly practices will find different features of electronic journals of relevance and that the evolution of electronic journals in different scholarly areas will have a range of effects on the way practice emerges in the future depending on the characteristics of the discipline.

In formal terms we can state the null hypothesis as:-

electronic journals will develop in similar forms across all scholarly activities and will have similar affects upon all kinds of scholarly practice.

The alternate hypothesis is in two parts,

i. *different scholarly practices will need different forms of electronic journals*

ii. the widespread use of electronic journals will have different effects on the nature of practice depending on the characteristics of the discipline and of the journals.

2. Methods. Methods;

In an ideal world a systematic attack on these hypotheses would be undertaken by selecting a representative sample of scholarly practice and closely examining the differences in the way each practice engaged in its work in order to determine whether there were differences in requirements for electronic journals. This could then be followed by an examination of current and prospective usage to investigate the match with requirements and whether different effects upon the conduct of scholarly practice were emerging.

This project has modest timescales and resources and, as a result, should be regarded as a pilot study to test whether a fuller and more systematic investigation would be valuable. This study makes use of the fact that the eLib programme is developing electronic journals across an array of scholarly practices and it is possible therefore to examine within a short timescale the needs of these disciplines and impact to date. The aim therefore is to use secondary sources of information to ascertain whether there is a good basis for accepting the alternate hypotheses and, if so, to provide preliminary classifications and cause and effect models which could be subject to more systematic examination through the collection of primary data.

The research programme adopted can be summarised as:-

i. An examination of the literature for (a) the characteristics of different scholarly practices, (b) the characteristics of communication and publication in different scholarly practices and (c) the implications for the development of electronic journals.

ii. An analysis of the views of domain experts and relevant literature to develop a preliminary classification of factors in scholarly practice which will predispose disciplines to seek, develop and use different forms of electronic journals.

iii. Using the preliminary classification, an exploration of the nature of a range of scholarly practice through discussions with domain experts and an examination of the form of electronic journals being created in the domain. An exploration with domain experts of the impact of electronic journals upon the scholarly practice and what they consider possible in the future.

iv. A comparative analysis of the findings to refine the classification, report the major similarities and differences and assess whether there is support for the alternate hypothesis.

3. The Literature and Preliminary Classifications. The Literature and Preliminary Classifications;

The initial stage of the research was to examine literature relating to scholarly practice and to talk with domain experts to understand the different characteristics of practice which may influence the role and impact of electronic journals. The literature provided accounts of practice

in a very wide range of scholarly disciplines and, to a lesser extent, explored the kinds of communication common within different kinds of discipline. In addition, a workshop was held which was attended by domain experts, publishers and members of the eLib community developing electronic journals who represented scholarly practice ranging from chemistry and social science to archaeology and law. As a result of these enquiries provisional classifications were developed to define and relate two issues:-

1. What are the predisposing factors about the scholarly practice which will influence the expected use of electronic journals for research and scholarship, teaching and the communication of research results.

2. How do the particular predisposing factors relate to the design and provision of electronic journals?

3.1 Classifying Disciplines.1 Classifying Disciplines;

There has been considerable debate about the nature of scholarly practice much of it triggered by the sharp distinction made by C P Snow (1959) between the cultures of the sciences and the humanities. Most scholars accept this major difference but conclude there are many other distinctions of great significance. It is beyond the scope of this report to explore all the factors that contribute to the differences between disciplines. Our approach has been to (a) identify the major differences that appear to influence forms of communication between scholars (b) focus upon communication practices and (c) explore the implications for electronic journals.

There are many classifications of disciplines. Figure 1 below, from Moses (1990) offers four which are based on different, but closely related, dimensions - paradigm development, learning style, knowledge and the organisation of research.

	Biglan (1973): Paradigm development	*Kolb (1981):* Learning Style	*Becher (1987)*: Knowledge	*Whitley (1984):* Organisation of research
Chemistry	Hard-pure	Assimilator	Cumulative Atomistic	Low strategic uncertainty; Low task uncertainty
Engineering	Hard-applied	Converger	Purposive Pragmatic	Relatively high strategic uncertainty; Low technical task uncertainty

English	Soft-pure	Diverger	Re-iterative Holistic	High degree of strategic uncertainty; High degree of task uncertainty
Law	Soft-applied	Accommodator	Functional utilitarian	Relatively high strategic uncertainty; Relatively high task uncertainty

Figure 1

Categorisation of Disciplines (Moses 1990)

As Becher states (1989) "the ways in which particular groups of academics organise their professional lives are intimately related to the intellectual tasks on which they are engaged" (p.1). For the purpose of this report we will present our findings using Biglan's (1973) Hard:Soft, Pure:Applied classification which is presented in Figure 2. The classification is illustrated with examples of disciplines which may be assigned to a particular cell within the 2 x 2 matrix. It will be immediately apparent that this is a somewhat arbitrary process which may lead to debates as to where a given discipline should lie and as we shall see later, the allocation of some disciplines, and certainly some sub-disciplines, can be problematic.

	Hard (Concrete)	Soft (Abstract)
Pure (Reflective)	Physics Chemistry Mathematics Geography	History Social Sciences Psychology Political Sciences
Applied (Active)	Engineering Medicine	Law Library Studies

Figure 2

A Classification of Scholarly Disciplines [after Biglan (1973)]

The general properties of the disciplines in each category as described by Biglan, Becher and others are as follows:-

3.1.1 The pursuit of *pure* understanding in the *hard* sciences.1.1 The pursuit of pure understanding in the hard sciences;

The objective is the pursuit of understanding for its own sake, in this case in the natural or 'hard' sciences, which leads to the following characteristics (the first seven from Becher 1989):-

- Cumulative growth of knowledge. Scientists work within a currently agreed paradigm and add knowledge to the work of their colleagues. The characteristics of chemistry as described by Moses (1990) appear to be absolutely typical of this approach. As Becher states "scientists are prone to visualise themselves as standing on the shoulders of their predecessors and to locate themselves with reference to a moving frontier of knowledge" (p. 13). Pantin (1968) calls them 'restricted sciences' because the current paradigm restricts the variables and phenomena which are to be investigated.

- Accepted criteria for establishing or refuting claims to new knowledge.

- Agreement on the problems which are the next to be addressed.

- The break down of complex problems into simpler components (reductionism).

- An attempt to measure phenomena in precise and quantifiable ways.

- The production of strong explanations based on the systematic manipulation of a few controlled variables. The emphasis upon reduction, measurement and systematic manipulation creates the opportunity for reproduction of results by other scientists.

- The production of value free forms of knowledge.

- The rate at which knowledge advances tends to be rapid, and indeed in some areas the advance is explosive, as is currently the case in the field of macromolecular modelling as described by Hall (1996).

- Work tends to be executed by teams working together locally and, increasingly, collaborating across widely dispersed geographical sites. Such teams include academic staff, research staff and research students operating together within an agreed framework.

- Relationships with colleagues and informal communication play a central role in maintaining awareness of current progress and assisting with the identification of relevant material.

3.1.2 The pursuit of *pure* knowledge in the *soft* disciplines.1.2 The pursuit of pure knowledge in the soft disciplines;

In contrast to the natural sciences, the humanities and social sciences have an approach to the pursuit of knowledge characterised by the following:-

- The growth of knowledge by a recursive or reiterative pattern of development in which alternative paradigms compete as explanations of the same phenomena. "Academic work often traverses ground already explored by others". (Becher 1989 p.13). Pantin (1968) calls the social sciences the 'unrestricted sciences' because the scientists must follow their problems wherever they go. "..in humanities the study centres on the products of mankind's imagination, on ideas, on those matters for which no verification or replication can occur" (Fulton 1991).

- A diversity of criteria and a lack of consensus about what constitutes an authentic contribution. Taken to an extreme this can be manifest in an explicit rejection of the value of considering other people's contributions, as reported by Basker (1984) in a study of philosophers.

- A lack of clear boundaries between disciplines and no consensus about the problems that are worthy of study.

- An emphasis upon synthesis in order to capture the rich array of variables which account for a particular phenomenon. This holistic approach is in contrast to the reductionist approach of the natural sciences. An implication is that in the social sciences there are fewer opportunities for generalisation and reproducibility of results.

- Explanation often has to be examined from the value stance taken by the scholars.

- These approaches are adopted within a much more individual framework, often characterised by the notion of the "lone scholar". Even research students may be regarded as independent scholars, not necessarily subject to strong direction by the supervisor (Moses 1990).

- Scholarly endeavours are seen to serve both research and teaching objectives and the dichotomy between the two activities is much less apparent than it is in the hard, pure disciplines.

3.1.3 Applied Studies in the Hard Disciplines.1.3 Applied Studies in the Hard Disciplines;

As Becher comments, there has been much less attention paid to the characteristics of the applied disciplines, perhaps because they are accorded less status in the academic world. Many disciplines, of course, have both a pure and applied dimension. In the hard disciplines, the following are the characteristics of the applied field:-

- The aim is to "find ways of mastering the physical world" (Becher 1989 p.15), i.e. to apply knowledge and techniques to accomplish a practical end and be judged by how well the outcome works.

- Hard applied knowledge is amenable to heuristic, trial and error approaches (Kolb 1981). It may use the accumulation of knowledge and technique but it is not altogether a quantitative application. There may also be a qualitative judgement as in design engineering and medical diagnosis.

- There is a requirement to keep up to date with the latest developments in commercial and legislative practice. Ship design scientists, for example, (Wilson 1990), need to know of new developments and changes in regulations, and changes in the market which cause design differences.

- The community of scholars is as likely to be located in industry as it is in universities and indeed there will be cases where university researchers are physically located in industrial laboratories, as was reported by Hegarty et al (1995). In the industrial context the emphasis in outputs may be upon patents, products and processes rather than upon publications. Indeed career progression and reward systems may be different in the two kinds of institutions.

3.1.4 Applied Studies in the Soft Disciplines.1.4 Applied Studies in the Soft Disciplines;

The way in which knowledge is accumulated and used in applied fields associated with the soft sciences, such as law, education, social work and library studies, is presented by authors as a series of contrasts to other forms of scholarly activity:-

- Kolb (1981) says that it is built to a large extent upon case law rather than the cumulative data used in the hard, applied approaches. It draws upon complex holistic accounts which parallel the applied ‘problem’ because of the need to understand the interaction of an array of factors often crossing a number of disciplines.

- Symons (1996) reviewing business management concludes that the starting point, for research as well as application, is often a problem rather than a theoretical proposition. The particular requirement is the need for the scholar to integrate disciplines within, and sometimes across, the social sciences, physical sciences and the humanities.

- Becher (1989) concludes that in most fields currency of data is not a major issue; the issue is relevant to the problem in hand and many forms of application involve

reformulations and interpretations of past work. However, there are many specific areas where the practitioner has to keep up-to-date with the changing nature of the field, for example in legislation and perceived good practice. Moses (1990) reports that keeping up to date is a particularly critical activity in law where the latest legal changes and judgements may be of great professional significance.

3.1.5 Conclusions.1.5 Conclusions;

Although this classification produces some powerful ways of discriminating between disciplines nearly all commentators are careful to introduce caveats. They point out for example that there is much diversity within each of these categories; that the social sciences, for example, are very different from the humanities and that the study of mathematics is not like the study of chemistry. They also point out that there are many sub-disciplines within the major disciplines and that some of these straddle the major cells in this classification. Physical geography is, for example, a natural science whilst economic geography is a social science. Experimental and cognitive psychology are closer in aims to natural sciences whilst social psychology is a social science.

In this study we have found this classification of disciplines useful in helping to identify the major factors which characterise a discipline. Rather than place each discipline we study within the classification we have described it as a profile of these factors in order that its potentially unique characteristics can be examined in relation to the provision of electronic journals.

3.2 Communications and the Use of Information in Scholarly Disciplines.2 Communications and the Use of Information in Scholarly Disciplines;

In order to explore the relation between scholarly activity and the role of electronic journals we first need to explore how different areas of scholarship use pre-electronic forms of information and communication. We can make a broad distinction between the formal means of information storage and communication in the discipline and the many less formal ways in which scholars relate to one another. In the formal category we are including those mechanisms by which a discipline uses peer review and other quality assessment processes to judge whether material should be entered into the records and archives of the discipline. We include therefore peer reviewed journals, books and monographs. In the informal category we include all the mechanisms by which communication takes place that do not necessarily require exhaustive quality checks before they take place, for example, conferences, discussion groups, newsletters etc. In this section we will use the classification of disciplines to explore first the role of informal forms of communication and secondly the significance and form of the formal approach.

3.2.1 Informal Communications.2.1 Informal Communications;

It is perhaps to underplay the wide array of ways by which scholars communicate and maintain a sense of community to call it ‘informal’ but the important property is that it provides a forum for relatively unrestricted information exchange. As will be noted in the section below ‘formal’ ways of communicating are often highly restricted in the conventions and procedures they employ. Informal communication can take many forms; from personal communications with colleagues or within a select group, through

newsletters to discussion groups and full scale international conferences. Reports of work undertaken and in progress can also be prepared as research group reports are distributed to interested parties. A full analysis of the role these mechanisms play in fostering scholarly work is beyond the remit of this report. We will restrict ourselves to five comments which are pertinent to the differences between disciplines that may have relevance to electronic services.

1. In the 'hot' disciplines, i.e. those where it is necessary to keep up-to-date with the latest results, the time taken to publish peer reviewed papers is always too long and many informal mechanisms exist to circulate early results ahead of this schedule. This may be done through conferences but, in some of the natural sciences, it is often done through the distribution of 'pre-prints', early versions of what is intended to be published. This, to some extent, solves the conundrum of sustaining quality and achieving speed.

2. In areas where lone scholars pursue their specialist subjects, networks, national and international meetings etc. are vital to keep the scholar in touch with the 'global village', the few people in the world who have similar interests.

3. In some areas the speed of development is such that publishing timescales are too long to be useful and the disciplines work primarily through referred published conference papers, for example, computer studies. This is an attempt to avoid long time delays but to achieve a level of quality control. The journals that exist in these disciplines often perform the role of archives, ensuring good work is properly and permanently stored, rather than the role of current scholarly news service.

4. There are some ways in which the formal and informal methods are used together. Overpressed academics who do not have the time to engage in formal searches of what is significant in their field can use the informal network to identify what is worth finding and studying in journals and books. This has the double advantage of saving time and effort and performing a quality check on the unknown material because it is recommended by respected colleagues.

5. In many of the applied disciplines the 'grey literature', i.e. everything that is publicly available but has not appeared in published journals and books, is deemed to be at least as important a source as the formal record. This is in part because it can be more up-to-date and in part because it can take forms - case studies, practical conclusions, 'hints and tips' etc. - which are useful for practitioners but not necessarily suitable for academic journals. Hegarty et al (1995), for example, in a study of applied engineers and scientists working in computer integrated manufacturing and waste management concluded that they sought articles where people were working along the same lines and this tended to be the grey literature. The formal literature was important but should not be given "undue emphasis".

3.2.2 The Formal Literature.2.2 The Formal Literature;

Each scholarly activity has a mechanism by which it publishes 'the durable manifestation of the research activity it embraces' (Becher 1989, p.82). There are several services the formal record performs:-

1. It is a public and permanent record of the achievements of the discipline. (Note that many informal forms of communication are transitory).

2. It is a peer reviewed, quality assured record which meets the performance criteria of the discipline. It may also be a record which obeys the specialist conventions and language of the discipline which facilitates swift communication with fellow scholars (and may make it impenetrable to other readers).

3. It is a statement of the current state of knowledge in the discipline.

4. It provides a place for authors to register their achievements by which means they may be assessed by colleagues for career progression, status in the field, serve as a means of attracting new recruits etc.

As we have noted above some of these services are more important in some disciplines than others, particularly the extent to which the formal record is the place to find the up-to-date statement of current knowledge. We should also note that in some disciplines the formal record is contained primarily in academic journals but in others, notably the humanities, the primary output is the book or monograph.

The role that journals take in a discipline and their content varies very much from discipline to discipline. In Figure 3 we have identified some of the major differences and have included some comparative figures for a number of disciplines. This table is incomplete because the sources of these figures only considered a limited number of disciplines. The data in Figure 3 is from Becher (1989) unless otherwise indicated. There is representation from most subject areas but none from the 'applied/soft' category.

Figure 3

Journal Practices in Different Disciplines

(Landscape, in separate document)

Becher reports that, in his sample of disciplines, the speed of publication is fastest in physics (between 9 and 12 months) and longest in modern languages where it can take up to three years. With some exceptions the speed of publication is fastest in the natural sciences in the 'pure/hard' category and slowest in the humanities. There appears to be some correlation between speed of publication and the length of articles and the frequency with which authors are expected to publish each year. In the natural sciences, for the most part, articles are short and publication is frequent, in the humanities and social sciences they are longer and less frequent. It is also the case that it is more common in the humanities and social sciences to publish books and monographs. This

simple dichotomy has, however, to be approached with caution. In some disciplines there are some areas which publish in books and infrequently published journals and others which publish frequently and concentrate upon short articles. Biology is an example where there may be very frequent publication of short papers but in an area like taxonomy monographs are common.

It is the 'hot' cumulative disciplines that can adopt the short, frequent publication strategy. They have to publish quickly to stay at the forefront of knowledge and, by adopting tight conventions and not repeating shared knowledge, articles can be kept short. In the social sciences and humanities there will be so few people adopting the same approach in the study of a topic that it will be necessary to present the context and rationale for the study as well as the conclusions which means the output will be books and longer articles.

There have also been attempts to measure the rate of change in a scholarly discipline. Burton and Kebler (1960) defined the 'half life' of a discipline as the period during which half of the currently available literature has been published. They found that in some fast moving subjects like physics this was only 4.6 years whereas there were slower changing subjects like geology where it was 11.8 years. The half life of journals in veterinary science, (in the ‘hard applied’ category), is said to be longer than that of the physical sciences although in mechanical engineering it is only 5.2 years. It is not possible on the basis of this data to claim a correlation between the category of a discipline and its half-life.

The issue of the half life relates to the broader topic of the 'scatter' found in a discipline. How widely and how far back in a discipline does a scholar have to go to master a subject? Stevens (1953) reports a study which demonstrated that 75% of the research literature in chemistry could be found in 20 to 25 journals in the previous 15 years, whereas 75% of the literature in history was in 150 journals published in the past 100 years. While the current figures may be different there is no doubt that the same kinds of differences exist.

Another variable upon which disciplines vary considerably is the extent to which articles are multi-authored. In the humanities, in subjects pursued by lone scholars, such as modern languages, this is rare but in the natural sciences, where teams or researchers are the norm, multi-authorship is very common (up to 80% of articles in chemistry). Again it is dangerous to conclude that this is a universal finding because there always seem to be disciplines or sub-disciplines that are different. In this case mathematics may be classed as a natural science but it is not an area for team work and multi-authored papers are less common than in other sciences.

The final variable concerns the content and form of the journal articles. In most disciplines they are reporting new work with just occasional articles reviewing other work in a subject. However, in subjects where new work is usually published in monographs and books, one of the major roles of journal articles is to provide reviews. Becher (1987) calculates that in history over 50% of journal articles are book reviews. In the humanities the form of the article is text with very little use of other media. In the natural sciences and some of the applied disciplines, however, the articles consist of a limited amount of text to explain and discuss a series of diagrams, charts, tables and

photographs.

It is clear from this albeit limited review that there are wide variations in the role that journals play in a discipline and the form that they take. These differences will be important considerations in the examination of the role electronic journals might play in each discipline.

3.2.3 The Author and the Reader.2.3 The Author and the Reader;

It is clear that the process of academic communication, especially when that communication is in the printed medium, causes academics to adopt two distinct roles; the 'author' and the 'reader'. Although the same academic may, at different times, occupy both roles, they have different needs of the publishing medium. Readers, for example, want to access up-to-date material which is relevant to their academic interest and to assess the validity of the material by, for example, studying the data that led to the article. The author, on the other hand, needs the article published as a sign of academic success and as a statement of ownership of ideas and results. Authors will be interested in the form they have to submit material, the likelihood of rejection, the 'impact ratio' of the journal, the speed of publication etc. The interests of readers and authors may also vary between disciplines and it will be important to examine the implications of electronic journals for these two roles.

3.3 Hypothesised Implications for Multi-media Electronic Journals.3 Hypothesised Implications for Multi-media Electronic Journals;

In order to derive possible implications for electronic journals a one-day workshop was held. The purpose was to consider what was happening to the development and use of electronic journals in a range of disciplines and from this to derive a preliminary classification of dominant characteristics and their implications. The workshop was held in April 1997 with representatives from academia, libraries, publishing and electronic journal development who had direct knowledge of developments in a range of disciplines including pure/hard (for example, chemistry), pure/soft (for example, sociology and archaeology), applied/hard (for example, engineering) and applied/soft (for example, law and information studies). From the records of the workshop (and the literature reported above) it was possible to identify a range of pre-disposing factors in the disciplines which might have implications for electronic journals. These factors and their implications are presented under six headings in Figure 4:

a) the phenomena that the discipline addresses

b) the nature of enquiry in the discipline

c) the role of journals in teaching

d) the kind of community of scholars that exists

e) what defines success in the discipline and

f) the extent of IT readiness amongst scholars.

This framework provided the basis for a structured and more detailed examination of 14 disciplines and sub-disciplines.

Predisposing Factors in the Scholarly Practice	Electronic Journal Implications
a. The phenomena under investigation	
The form in which it is most easily represented	Multi-media Options, e.g. video, graphs
The form in which theories are represented	e.g. computer simulations
The form in which data is stored	e.g. databases
b. The nature of enquiry and research in the discipline	
The life cycle of data/ideas -	Need to be up-to-date Need for a back record
Desk research vs field or lab research	Research via e-journals and other e- services etc
Dependence upon computer based tools to undertake research	Existence of relevant materials to incorporate in publications
Building on the research of others - re-usable data - transient or non-permanent data	e.g. ownership e.g. store as data for all to use
Who funds and owns the research	e.g. confidentiality, ownership
c. The nature of teaching	
Use of journals in teaching/levels of teaching	e.g. cost, access
- numbers being taught	Value of developing teaching materials

- access to secondary data	Value of teaching exercises
d. The nature of the scholarly community	
Dispersed community or big institutes	Value as a virtual communication medium
Dominant methods of communication	Journals vs conferences
Closed or open community	A few major journals or a very wide spread (access across journals)
Significant sub-disciplines and cross-disciplines	Different requirements of sub-disciplines
Quality control in the community	Refereeing and publication standards
e. Success Factors in the Scholarly Practice	
Journal articles as routes to success	Refereeing, speed of publication, recognition of electronic as 'real' publications
Frequent Publishing or major, landmark outputs	Time to publish
Singe-author/multi-author	
Ownership of results and data	Protection of copyright access beyond the journal
Commercial exploitation	
f. Characteristics of the Scholars	
Thinkers or communicators, problem analysts or problem solvers etc	Style of publication
Computer "literacy"	Ability to provide materials suitable for publication

IT preparedness	Availability of workstations etc.

Figure 4

Predisposing Factors for the Use of Electronic Factors

4. Methodology for the Research Sample. Methodology for the Research Sample;

In this study we examined 14 disciplines which are listed in Figure 5. There are five examples in each of the hard/pure and soft/pure categories and two each in the hard/applied and soft/applied. The selection of the sample was largely opportunistic, having regard for those disciplines where eLib projects are most active. Although the coverage of the range of disciplines is reasonable there are wide differences in the scale of discipline, i.e. some are sub-disciplines of tightly knit scholars with similar interests and others are wide ranging disciplines encapsulating very divergent fields of study. Where there is considerable divergence within a discipline we have sought to identify the different characteristics of its sub-disciplines.

In some instances we have access to substantial bodies of information, for example, in two cases we have the surveys conducted in the SuperJournal project (Communications and Cultural Studies, Molecular Genetics and Proteins). For a number of other disciplines we have the informed input of other eLib projects, for example, Archaeology. In other cases the sources of direct evidence is limited to a few interviews supplemented by data from the relevant literature.

Hard/Pure	**Soft/Pure**
A. Chemistry	F. History
B. Molecular Genetics and Proteins	G. Archaeology
C. Physics	H. Social Sciences
D. Geography	I. Communication and Cultural Studies
E. Sports Science and PE	J. Psychology
Hard/Applied	**Soft/Applied**
K. Civil Engineering	M. Law
L. Electronic Engineering	N. Digital Libraries

Figure 5

The Sample of Disciplines

For each of the disciplines we have sought answers to the following questions:-

1. What are the characteristic of the discipline that affect the role of traditional journals and what are the implications for the future role of electronic journals? These questions were guided by the framework presented in Figure 4.

2. What is the current use of electronic services in the discipline and what electronic journals are currently available?

3. Has there been any change in the way scholarly activity is undertaken as a result of electronic service availability (including electronic journals)? What expectations are there for electronic journals and changes in the scholarly activity in the future?

The different sources of data available to us means there is some unevenness in the data obtained for each discipline, for example, colleagues working on eLib projects were able to give a better account of the current state of electronic journals in their discipline and the benefits and problems associated with them than fellow academics in other disciplines who were not associated with electronic journal developments. In none of the cases can we claim to have surveyed a sufficiently representative sample of the whole field and our results are therefore suggestive rather than conclusive. However, in each area there is considerable agreement about the issues and current state of development. Each discipline is summarised in a separate appendix to this report and a comparative analysis of the results obtained is given below.

5. Results. Results;

5.1 The Disciplines and the Role of Electronic Journals.1 The Disciplines and the Role of Electronic Journals;

We have explored the characteristics of each of these disciplines and attempted to relate critical predisposing factors to the actual and potential role of electronic journals.

We have identified seven major factors which relate to electronic journals. Some of them produce more diversity amongst the disciplines than others. Each of these factors is explored below. A related set of issues concerns the degree to which each discipline is already using electronic services and this is explored in section 5.2. The results are drawn together in section 5.3 in the form of the kind of electronic journal service delivery profile appropriate to each discipline.

5.1.1 The nature of the material to be reported, journal conventions and multi-media.1.1 The nature of the material to be reported, journal conventions and multi-media;

Most of these disciplines, especially those in the soft/pure category, communicate their findings and express their knowledge in text forms with simple graphics and tables.

Current printed journals are regarded as providing adequate means of representation and there is little interest in moving away from the current form of journal article although there may be an interest in it being available in an electronic form. For some of the disciplines the current form of journal article embodies many conventions of the discipline which assure its quality and facilitate ease of understanding and assessment by members of the community. There is some fear that changing the nature of the article would destroy this shared culture and perhaps damage the quality of material reported.

A sub-group uses other modes of expression for the material in their research and in their communications and discussions outside of journal articles i.e. in meetings, conferences, in teaching etc. They could therefore use newer forms of multi-media (video, animation etc.) in journal articles. This sub-group is primarily drawn from the hard/pure and hard/applied subject areas but there are also sub-disciplines in the soft/pure area e.g. archaeology. It is thus dangerous simply to associate multi-media with the natural sciences and text with the humanities. A close look at the nature of the phenomena of interest to the discipline is necessary in order to determine the potential role of multi-media.

5.1.2 "Hot" cumulative disciplines as compared with 'cool', non-cumulative disciplines.1.2"Hot" cumulative disciplines as compared with 'cool', non-cumulative disciplines2 ;

Some subjects involve groups of researchers who together build a common body of knowledge. These are mostly sub-disciplines of the natural sciences but not exclusively. These sub-disciplines (to a large extent) share a common set of journals and are primarily interested in (relatively) current issues. These are the disciplines where journals play a prominent role in the communication of current results and where time to press is particularly significant. Of equal significance is the speed with which new material can be made available to readers which means that in these subjects there is considerable interest in whether electronic journals will offer faster publication and faster access. By contrast in most of the humanities lone scholars build their own individual interpretation of phenomena. They each engage with a different profile of journals and may have a considerable interest in backlists (for example Communication and Cultural Studies). The speed with which papers are published is of less concern than quality control procedures and there is less concern to pursue every new development. Indeed in some areas of the humanities, according to Basker (1984), recent material is treated as suspicious until there has been time to assess its significance and quality.

5.1.3 Access to the journals and research materials.1.3 Access to the journals and research materials;

All scholars seek easy access to relevant academic journals and to their research materials. All scholars report increasing pressure of duties and difficulty finding the time to keep pace with the developments in their discipline. A common feature across the disciplines therefore is a perceived advantage to being able to access material from the place of work. There is a wide perception that a major benefit of electronic journals will

be the provision of assured, continuous and instant access to relevant material. Amongst those who are familiar with full text electronic services there is also a widespread desire to avoid reading complex material on-line and the dominant wish is to use these services as an electronic document delivery mechanism which can then be printed for ease of study. This conclusion appears to be common across all areas of scholarly activity with the possible exception of specific sub-disciplines where advanced 'unprintable' forms of multi-media offer significant, intrinsic benefits to the scholars.

5.1.4 The role of journals in the discipline and implications for electronic journals.1.4 The role of journals in the discipline and implications for electronic journals;

The differences in the role of journals reported in the literature were confirmed by our respondents. In some disciplines they are the mechanisms for the sharing of up-to-date research results. In some of the physical sciences there is a widespread practice of distributing pre-prints to the inner circle of fellow scientists ahead of publication. In other disciplines it is international conferences which provide the opportunity to report up to the minute findings and the journals have a more significant role as the repository of the mature, quality assured, record of the discipline. In many of the humanities, individual scholars report their work in books and monographs and journals are issued less frequently than in science subjects. The implications of the different roles of journals for the provision of electronic journals are considerable.

- Where the journal is the major vehicle for disseminating up-to-date results (some of the physical sciences) there is considerable interest in changing the form of journals, introducing alerting services when new papers appear, developing easy to use search engines etc. The primary interest is in relatively current issues of journals.

- Where the role of the journal is as the repository of mature work in the discipline there is less interest in changing the form of the journal and a greater fear of diluting the quality. There remains a strong interest in access and a desire to obtain an electronic copy locally that can be printed for personal use. These disciplines include the humanities but also include disciplines where journals are not the main medium of communication such as computer studies.

5.1.5 Other electronic services.1.5 Other electronic services;

One of the striking results of the survey is that many disciplines are rapidly adopting electronic services as a normal part of scholarly activity although these developments may not have embraced electronic journals and multi-media (see 5.2 below). There is, for example, widespread use of e-mail and the internet to post early results, hold discussion groups etc. within a scholarly community. Many disciplines are mounting the common resources of their discipline for all to access. In many of these cases the material may have multi-media characteristics. Presentations to conferences and other meetings increasingly involve the use of multi-media.

Although these developments mean that academics will have experience of electronic services it does not follow that there will be an automatic adoption of multi-media

journals, because in some disciplines there appears to be a deliberate intention to retain traditional forms of journals whilst experimenting with more risky forms of communication in other settings. In these disciplines there is an interest in being able to access electronic forms of paper journals and to be able to make (sustainable and good quality) hypertext links from journal articles to results databases and other source materials. This route of development would lead to major uses of multi-media occurring outside the journal content rather than within it. For the academic this also has the advantage that the journal article can be studied on-line without major 'plug ins' and downloading problems and it can be printed.

5.1.6 The role of journals in teaching.1.6 The role of journals in teaching;

In many disciplines, for example, chemistry and physics, it is unusual for undergraduate students to be asked to study journal articles. Teaching uses textbooks and specially developed teaching materials. This is another area where academics are gaining experience of electronic services through the development and use of electronic teaching resources. It may not, however, translate to their use with respect to journals. In other disciplines it is quite normal to expect students as part of their training to study journal articles. In the social sciences and humanities students are expected, for example, to review articles in a field to learn the craft of critical analysis. These disciplines appear to be amongst the slowest to adopt electronic forms of their journals.

5.1.7 Authors and Readers.1.7 Authors and Readers;

Although we may be speaking of the same person the academic as author of a journal paper responds in a different way to the academic as reader of a journal paper. Most of the results above refer to the academic as reader. In theory the multi-media electronic opportunities for the author are considerable, a much richer environment in which to present and explain research results. And yet, the evidence of the survey suggests would-be authors are much more concerned about the difficulties and issues the electronic medium raises; will authors be expected to deliver articles in a multi-media form, will electronic papers be acceptable in assessment exercises, how will copyright be protected and plagiarism avoided, how will refereeing be undertaken and the conventions that assure quality be protected etc? Since journals cannot exist without authors these issues could constitute major blockages to the widespread development of multi-media electronic journals. In disciplines where there is no history of using electronic media or appreciation of its potential, for example in some of the humanities, these issues will be a barrier to progress with electronic journals. In other disciplines authors are already familiar with electronic media because they use it in research and teaching and may well use it for conference presentations etc. This is particularly true of the natural sciences. Even these authors, however, remain concerned about the quality control and copyright issues and may prefer to keep multi-media material outside the formal journal paper.

5.2 Current experience of electronic services and electronic journals.2 Current experience of electronic services and electronic journals;

In addition to considering the nature of each discipline we also explored the degree to which they were already making use of electronic services in general and electronic journals in particular.

Within the general experience of electronic services we have included the use of a personal computer as an individual work tool for text processing, calculating etc., the use of services to locate and retrieve information held elsewhere and as a communication service to other academics to send and receive messages both to individuals and groups.

There is a wide range of penetration of electronic services across the disciplines. At one extreme the personal computer is the principal work tool of the academic and the ability to use the many software packages, communication services and knowledge bases available to the discipline is essential to academic success. As Grefscheim et al (1991) report, it is essential to 'survival' in some areas of biotechnology. At the other extreme there are academics who do not have personal equipment and can achieve prominence in the discipline without reference to electronic services. They may find these services available in their library but will be able to operate by more traditional means if necessary.

In Figure 6 below we report our assessment of the current level of penetration of electronic services in general and electronic journals in particular in each of the disciplines examined. We have used a five point maturity scale widely used to assess the adoption of technologies and processes within organisations:-

- "Uncertainty" represents the point where most of the relevant population do not know of the new opportunity or see little relevance to their own work.
- "Awakening" is the point at which some members of the community are beginning to perceive potential benefits and are starting to experiment with the opportunities.
- "Enlightenment" is the stage when a considerable proportion of the community appreciate some of the benefits and there is a critical mass of interest leading to the creation of more substantial experiments and the beginnings of stable practice.
- "Wisdom" arises when stable services are beginning to be widely used across the community and in pockets are becoming normal practice.
- "Certainty" represents the point when use of the technology or process is such normal practice that successful practice depends upon competence in its use.

Disciplines

Penetration of Electronic Services	**Uncertainty**	**Awakening**	**Enlighten-ment**	**Wisdom**	**Certainty**
Hard/Pure					
Chemistry			√		√√, a, b
Molecular Genetics & Proteins				√	√√
Physics		√		√√	

Geography		√√,√	d		
Sports Science & PE	√		√√		
Soft/Pure					
History		√√,√			
Archaeology		√√,√			
Social Sciences		√	√√		
Com. & Cultural Studies		√√,√			
Psychology		√		√√	
Hard/Applied					
Civil Engineering	√	√√			
Electronic Engineering		√√,√	c		
Soft/Applied					
Law	√	√√			
Digital Libraries			√	√√	

Key:

√√ = All electronic services

√ = Electronic journals

a = Structural chemistry

b = Biochemistry

c = Photonic engineering

d = Geographical information systems

Figure 6

Penetration of Electronic Services in the Disciplines

In Figure 6 we have assessed all electronic services and electronic journals and in some cases we have made separate assessments of some sub-disciplines because there are examples of faster adoption than in the main discipline. Sub-discipline assessments relate to the provision of all electronic services.

The data demonstrates that there is widespread adoption of electronic services across this sample of disciplines. The personal computer is fast becoming the essential work tool of the academic and in many disciplines it is common practice to be in touch with fellow academics around the world by e-mail, in discussion groups and electronic conferences etc. It is also common in many disciplines to make use of shared datastores and to put early results and other information on personal web sites on the internet. It is natural sciences that are most advanced in their use of these services (but also including library science and its sub-discipline digital libraries). In some sub-disciplines, for example, biotechnology, these are now the dominant means of undertaking research. In contrast there are many disciplines that are just beginning to adopt these services, for example, most of the humanities and social sciences, and perhaps surprisingly, some of the engineering disciplines. Amongst the social sciences, psychology has made considerable strides in its adoption of electronic services.

In general the adoption of electronic journals is behind the adoption of other electronic services although there appears to be a close correlation, i.e. the adoption of electronic services in general is a good predictor that electronic journals will be under consideration. We made an attempt to assess the amount and type of electronic journal activity in each of the disciplines and encountered several methodological difficulties. What is an 'electronic journal'? What journals are relevant to what discipline? How do you make an assessment when journals keep coming and going? The difficulties were well expressed in the recent conference 'Electronic Publishing '97 held at Kent University, Canterbury. Rosenfeld (1997) reports that speakers' estimates of the number of electronic journals in existence varied from 750 to 12,000. The difference is in part accounted for by definition (when does a newsletter become a journal?) and in part by the short lived nature of many journals.

Despite these difficulties our evidence suggests there is a wide variation in the amount of activity across the disciplines. An examination of the electronic journal titles reported in library listings (see the appendices for details) showed that in some of the physical sciences, for example, physics and molecular genetics and proteins, there are over 60 titles whereas in law, history, and physical education and sports science the titles that are directly relevant are less than ten. We have made some attempt to establish the different types of electronic journal. The most common are the electronic versions of paper based journals supplied by publishers where the paper based version continues to exist. These journals contain peer-reviewed papers. At the other extreme there are many electronic magazines and newsletters which are not peer-reviewed, do not appear regularly and often disappear. There appear to be relatively few electronic-only, peer-reviewed journals and there are also relatively few that contain substantial amounts of 'unprintable' multi-media. Problems of definition make it difficult to examine the patterns of publication in different disciplines. It would appear, not surprisingly, that the wider the level of activity the more likely there are to be all the types listed above and it is the active communities who are exploring electronic-only journals which contain multi-media

5.3 Changes in Culture and Practice.3 Changes in Culture and Practice;

We asked our respondents whether they had detected changes in scholarly practice due to the existence of electronic journals and what they expected in the future. Considering the numbers of publications that are appearing they reported relatively little impact in most of the disciplines. We can explore what is happening and what might happen in the future by dividing the sample into the slow adopters and the fast adopters:-

5.3.1 The Slow Adopters.3.1 The Slow Adopters;

In disciplines like history, law, and geography there is very little sign that scholars are rushing to use the electronic journals that are available to them. In part these journals offer little benefit compared with the paper based versions which continue to exist. The main advantage would be access from the place of work but in many instance scholars do not have the equipment or the skills to exploit such opportunities. Any requirement for individual scholars to pay more (or twice) for electronic versions of journals is also a major reason for not trying the new services. There are also concerns about quality issues, for example, refereeing processes, peer judgements of papers published electronically, the quality of non-refereed material, the perceived dangers that anything electronic is 'here today, gone tomorrow' etc. Our respondents report their colleagues as relatively slow to change anything that is basic to the way research and scholarship is undertaken. Their views of the future were that although they could see considerable potential (in many cases including the potential of multi-media) they could not see rapid progress unless many of these barriers to adoption could be removed. The most likely route appears to be the gradual adoption of related electronic services where people can see specific benefits. This process is already underway in most disciplines and does seem to provide an infrastructure and a developing set of skills which electronic journals should be able to relate to and exploit.

5.3.2 The Fast Adopters.3.2 The Fast Adopters;

In some of the other disciplines, particularly in the natural sciences, there is a high level of activity and more sign that usage is beginning to grow. However, even in these situations, our respondents often report that usage of electronic journals is not widespread across their discipline. What they do report is that use of other electronic services is very common and in some cases essential to the research process.

Where people have the equipment and the competence, and there are a wide number of electronic journals available but they still do not use them, the main problem appears to be cost compared with little relative added value for the individual scholar. Added value could come from multi-media but there are two bottlenecks; first, authors cannot or will not provide multi-media material (in archaeology, for example, it has proved difficult to sustain a multi-media journal because of lack of material) and second, readers need additional equipment (and time) to receive, download and process such material. It may well be that progress can be made by examining where benefits could accrue because some of the benefits may not lie with the individual scholar. There is the case, for example, of a chemistry department which has stopped subscribing to paper-based journals and sustaining its own library and switched to subscribing to electronic versions of the journals. The main library of the University continues to stock the paper-based version so there is the saving in the Department and a 'fail safe' solution for academics who do not wish to use the electronic service.

In summary there is little sign of a culture change associated with electronic journals but more sign of an electronic culture change which is enabling scholars to work in 'a global village' through e-mail and the internet. Again the answer to developing the use of electronic journals appears to be to exploit the opportunities provided by the growth of

other electronic services.

5.3.3 Service Profiles.3.3 Service Profiles;

From this analysis it appears that the disciplines are predisposed to respond in different ways and at different speeds to the opportunities presented by electronic journals. In some cases, for example, advanced forms of multi-media offer real benefit whilst for others the text based tradition seems likely to continue. In this section we want to examine the implications of the different characteristics of the disciplines for the way a successful electronic journal service might need to be constructed. It is possible to identify a number of profiles of the forms of electronic journal service that might be provided and we have below tentatively identified the service that might be suitable for each of the disciplines.

Two characteristics of the possible service are the **scope** of what is delivered, for example, whether it offers a wide or narrow range of journals, and the **form** of delivery, for example, whether it is full text to be printed at the reader's location or whether it contains 'unprintable' multi-media which will have to be studied on-line.

Disciplines

	Scope										
Service Profile	**Common Cluster**	**Specialist Cluster**	**Current Journals**	**Back List**	**Inf. Services**	**Com. Services**					
Hard/Pure											
Chemistry	√		√	√	√	√					
Molecular Genetics & Proteins	√		√		√						
Physics	√		√	√	√	√					
Geography		√	√	√*	√	√					
Sports Science & PE		√			√						
Soft/Pure											
History				√	√						
Archaeology	√			√	√	√					
Social Sciences		√		√	√						

Com. & Cultural Studies		√		√	√						
Psychology	√				√	√					
Hard/Applied											
Civil Engineering	√		√		√	√					
Electronic Engineering	√		√		√						
Soft/Applied											
Law		√		√	√	√					
Digital Libraries	√		√	√		√					

* Sub-discipline only

Figure 7

Scope of Service Profiles for Scholarly Disciplines

5.3.4 The Scope of the Service.3.4The Scope of the Service;

An overriding concern of all scholars is that they should be able to gain access to the full range of information needed to pursue their scholarly activities. Before they commit themselves to the expense of acquiring a service and to the personal cost of becoming proficient in its use, they must be assured that it will meet a major part of their needs. To state the obvious, they do not want an expensive, difficult to use service that meets 10% of their needs so that they have to use many other services to satisfy other requirements. The match between their needs and the scope of the service is therefore very important to the take-up of that service.

Figure 7 provides profiles for each of the disciplines included in this survey indicating whether or not there is evidence that the discipline has a need for each aspect of the identified scope to be satisfied. The implications of this are discussed further below.

Common/Specialist Cluster: An important dimension is whether there is a reasonably stable cluster of journals which the members of the scholarly community (or sub-community) all wish to receive or whether each scholar, because of his or her specialist interests, needs to specify a separate profile of journals from a large number found across a range of disciplines. There are examples of reasonably stable clusters scattered across the classification of disciplines and they seem to be associated with sub-disciplines where there are quite well defined communities of scholars, for example, archaeology. There are, however, many examples, especially in the humanities where there are many specialisms with their own range of interests, some of which overlap to break down assumptions about the barriers between disciplines.

Current/Backlist: Another major determinant of the scope of the service is the extent to

which it is limited to issues of the journal in recent years. Here the distinction between the hard sciences and the soft sciences/humanities seems more clear cut. The cumulative character of the hard sciences means that the dominant concern is with recent knowledge whereas the re-interpretative character of the soft-sciences means the back catalogue is of considerable importance.

Links to other on-line services: The required scope of the service also affects whether the links within the electronic journal system are restricted to journals and related services e.g. abstracting services, or whether they extend to other kinds of information. An almost common requirement across the disciplines is that there should be links to other sources of information of value to each community. The nature of the source varies considerably, it may be to the specific raw data to which an article relates in the scientific disciplines, to a repository of common knowledge such as DNA sequences or to a common collection of materials stored electronically such as the images of artefacts from an archaeological site. When these links are built into a system it is not only supporting the study of the literature but the continuance of direct research on the phenomena of interest to the discipline. Another aspect of scope is the degree to which there can be links to other forms of communication between scholars, access, for example, to electronic discussion groups. In many disciplines the dominant mode of communication is not the journal and the link to these other forms of scholarly debate may be of considerable significance. As Figure 7 suggests these forms of link are more important in the soft/pure and the applied disciplines where the links between journals and other forms of communication are important.

5.3.5 The Form of Delivery.3.5 The Form of Delivery;

	Delivery								
	Search on-line	**Doc for Printing**	**Read on-line**	**Link to mm**	**Include mm**				
Hard/Pure									
Chemistry	√	√*	√	√	√				
Molecular Genetics & Proteins	√	√		√	√				
Physics	√	√							
Geography	√	√							
Sports Science & PE	√	√		√					
Soft/Pure									
History	√	√							
Archaeology	√		√	√	√				
Social Sciences	√	√							
Com. & Cultural Studies	√	√							
Psychology	√	√			√*				
Hard/Applied									
Civil Engineering	√	√							
Electronic Engineering	√	√		√	√				
Soft/Applied									
Law	√	√							
Digital Libraries	√	√	√						

* Sub-discipline only

Figure 8

Service Delivery Profiles for Scholarly Disciplines

The other dimension of service delivery is the form that it takes when it reaches the user. This is important because of the functionality it delivers and the ease of use of this functionality. Whilst there are many subtle variations possible in the form of delivery, for example, the kind of search that is made possible, this analysis focuses upon some macro distinctions which appear to be of major concern to users and to discriminate between the disciplines. The profiles for the individual disciplines are illustrated in Figure 8 and the implications are discussed further below.

On-line search: The first dimension concerns the ability to search relevant literature on-line in order to locate articles of relevance. Instant access from wherever you are to the literature of your choice seems a universal scholarly need. The burden of travelling to a library to use a wide variety of systems with no guarantee that the actual document will be available seems a major limiting factor in the search behaviour of many scholars. Electronic journals are seen as a way round this problem for all the disciplines studied. There were variations in the requirement however. In the 'hot' sciences, for example, the need for short timescales was very important and alerting services announcing new publications in relevant subjects was of importance. In the text based disciplines the search for relevant material could be based on abstracts and keywords but in some subjects viewing graphics and tables of data was very important in determining the relevance and value of the work. In these circumstances it was important to be able to browse the full version of the article on-line in order to determine whether it warranted serious attention.

Availability of Print Version/On-line Reading: The second dimension is whether a full document selected as worthy of study will be studied on-line or whether it will be printed for study in the more familiar paper form. As Figure 8 illustrates, a very common response is to want to be able to print the document for detailed study. The most common reason given is that it is difficult to read complex material on a small screen, to be able to navigate within in, annotate it etc. This conclusion is independent of the discipline of the scholar. There were signs in some disciplines that some scholars were prepared to study material on-line, in, for example, chemistry, archaeology and digital libraries. In two of these cases it is because of the significance of multi-media in the content of the articles; in the case of digital libraries it seems to be a product of the familiarity of the community with the electronic medium and perhaps a commitment to making it work.

Multi-media Links: One of the central issues for this report is the presence or otherwise of multi-media in the articles. The data suggests there are two issues to consider. Firstly, does the discipline see any role for forms of multi-media that go beyond the forms currently found in paper-based journals (text, graphics, photographs, tables) and, if so, where should these additional forms be located. For most of the disciplines examined, and especially those in the humanities, there was no significant demand for advanced forms of multi-media. It is nearly always possible to define multi-media that could add value but in these disciplines movements in this direction were viewed with suspicion. The requirement was for electronic versions of current journals perhaps with hypertext links to facilitate the search for relevant material in other journals and elsewhere. However, the total picture is more complex. In many disciplines there was a recognition that there were other forms of presentation that were of considerable interest, for

example, video for those concerned with the analysis of film and television and visual, perhaps virtual reality, representations of sites in civil engineering etc. However, our respondents did not see these materials being readily translated into useful contributions to journals. They saw problems getting material into journals without additional effort and problems retrieving and managing it at their workstations. Perhaps most significantly there were few cases in which respondents felt that the inclusion of multi-media content would add much value to articles as the basis for scholarly practice in research. There were specific exceptions in specialist sub-disciplines where information representing the object of study would be of significant additional value. Six disciplines saw a serious role for advanced forms of multi-media and in some areas, for example, chemistry, molecular genetics and proteins and archaeology, use is already made of multi-media in scholarly debate. These are disciplines where the nature of phenomena and the way they are represented lend themselves, for example, to the visual medium. There is a divergence of view within these disciplines as to whether these forms of representation should be within journals. In some cases, for example, chemistry, it is regarded as so intrinsic to the nature of the subject to warrant making it part of an article and overcoming any technical difficulties or problems of access that may result. In other cases, the material is regarded as of value but not intrinsic to the article and the preference is to use the facility of linking to other information sources which would lead to multi-media sources. This would give the reader the opportunity to decide whether or not it is worth engaging with the multi-media material. It is apparent that the decisions to include multi-media or to provide links are specific to the particular domain and task in hand. It would not necessarily follow that readers of a journal which included some articles which justified the inclusion of intrinsic multi-media content would want or expect that all the articles should include such content.

It should be noted that there is one situation where the soft pure and applied disciplines reported a potential benefit from the inclusion of multi-media content, which is where journals form part of the input in teaching programmes. In these situations there was said to be a case for adding multi-media content as an incentive to motivate and engage students! There appears to be no direct empirical evidence to support this argument, which is based on the view that incoming student cohorts have been brought up to expect visual and dynamic representations as primary information sources.

6. Discussion and Conclusions. Discussion and Conclusions;

6.1 Some Methodological Considerations.1 Some Methodological Considerations;

In Section 5 we have drawn some conclusions about the kind of electronic journals which would be of value in different disciplines. Whilst we believe the specific conclusions are of interest it is important to repeat (a) that they are the result of secondary and at times relatively superficial analysis of complex disciplines, (b) that not all disciplines have been examined, (c) that the evidence suggests that major disciplines have sub-disciplines with quite different characteristics from the parent and (d) that some of the assessments we have made of particular disciplines are based on partial and unvalidated data. We therefore consider that the specific conclusions should be regarded as propositions that need a more thorough test and that other disciplines be added to

provide a systematic examination across the spectrum of scholarly activity. Where we do feel the study has a contribution to make is in the analysis process and the classifications we have introduced. The initial set of questions linking scholarly practice and implications for electronic journals proved valuable when used to examine the 14 disciplines and the classification of forms of service delivery provided a revealing basis for comparison. On the basis of this systematic approach we feel able to comment on the hypotheses we advanced at the beginning of this report.

6.2 The Hypotheses Revisited.2 The Hypotheses Revisited;

The main hypothesis we sought to test was that different scholarly practices will need different forms of electronic journals. We draw the following conclusions about this hypothesis:-

6.2.1 Access.2.1 Access;

On some issues of utility and access there is no evidence of differences in requirements. All scholars need access to learned material in their field, and are frustrated by the lack of time they have to keep up-to-date and to find that which is relevant. They value services which give quick, easy and assured access to this material. There are many other demands upon their time so that they are task focused (their judgement of services will depend on the relevance of what the service offers them personally) and it has to be quick and easy to use. There is broad agreement that being able to search for and retrieve electronic journals from one's place of work is or would be valuable provided needs for personal utility and ease of use are met.

6.2.2 Multi-media.2.2 Multi-media;

There are differences between disciplines on the potential role of forms of multi-media not found in paper-based journals (and excluding hypertext discussed below). The role of sound, speech, animation, video etc. within electronic journals is seen as *one* of the following:-

- irrelevant in disciplines that are text based and as potentially damaging to the quality of articles if they are introduced for superficial reasons.

- of potential value because they could convey aspects of work not easily conveyed by conventional means but there are major reservations because of the difficulty to authors of generating the material and to readers of receiving and processing it. In such disciplines there are experimental forms but progress is slow because of these limitations.

- of major value and there are already fairly mature services available and more exciting developments planned because the nature of the discipline means the media offers much improved forms of communication.

The majority of the disciplines in this sample are in the first two categories. The disciplines with high potential for the use of multi-media are in the natural sciences but more in sub-disciplines than uniformly across whole areas, There are also sub-disciplines elsewhere which have a natural affinity with particular media and which also offer great potential.

6.2.3 Scatter.2.3 Scatter;

The problems of offering high utility to scholars are much greater in some disciplines than others. The 'scatter' of relevant material across journals and back in time is, for example, much greater in most humanities subjects than in the natural sciences. Whilst a service could offer a stable cluster of journals to scientists in the natural sciences a very different service would be necessary in the humanities with provision for custom building of the coverage.

6.2.4 Electronic Services.2.4 Electronic Services;

A major conclusion is that many disciplines are gradually creating a set of electronic services to support their scholarly activity. Electronic journals are seen by their potential users as one possible service and two kinds of requirement arise. First there is a need in many disciplines for hypertext links not only between journal articles but out of the journals to other information services, e.g. common databases, author web sites holding research data etc. Second, if such links are made, it may be preferable in some disciplines to keep multi-media out of journal articles and locate it in associated databases etc. This makes it possible to preserve the form, quality, length etc. of traditional journals which is a desire in many disciplines.

It is quite clear that in some disciplines electronic services are already indispensable tools of the scholarly process and that you have to be proficient in the use of these tools to be successful. There are other disciplines where such tools and skills remain low on the agenda of the successful scholar. We can confidently predict that the potential of electronic journals will be more quickly explored and realised in the former than the latter.

6.2.5 A Delivery Service for Printing.2.5 A Delivery Service for Printing;

For most of the text based disciplines and some of the others the most desirable form of electronic journal delivery system is one in which a paper can be found, its full text can be delivered electronically and it can be printed to create a personal copy which can be studied, annotated, passed on etc. This is the current level of expectation of many scholars which may be changed as more evidence emerges of other possible services of value to the discipline.

6.2.6 Sciences and Humanities.2.6 Sciences and Humanities;

At a superficial glance the differences we have identified are linked to the major division between the sciences and the humanities. We have been struck however by the way some disciplines do not match the characteristics of others in their category and by the many sub-disciplines, with very varied characteristics, which exist in each major discipline.

6.2.7 Cultural Change.2.7 Cultural Change;

We also hypothesised that the use of electronic journals will have different effects on the nature of scholarly practice. We consider it too early to make judgements about this hypothesis because there is relatively little take up of electronic journals to date despite a

very wide spread of available services. Our respondents have, however, offered speculations about the impact in various disciplines. Three comments may be made:-

- Each discipline has very deep rooted reasons for the way it is constructed and the way scholarly activity is undertaken. Fundamental change will only come when the scholars are satisfied it will be in the interests of the discipline. There will need to be a lot of experimentation before an agreed new direction emerges.

- The form of change will be determined from within the discipline rather than from outside sources and as such the directions of change might be quite different from one another.

- The faster changes seem to be coming from the development, often from within the discipline, of other electronic services and these may be seen as the leading edge of changes in scholarly behaviour because they provide ways of communicating and sharing within virtual, maybe global, communities which have not hitherto been possible. These developments could be seen as threatening the role of traditional journals because, for example, they provide faster more direct ways of communicating research results. However, on the basis of our examination of the disciplines that have mature electronic services, we believe there to be an increasing recognition of the other roles played by journals, for example, quality control and permanent archiving, and that the issue is what role the journal will play within the set of electronic services with which a discipline chooses to work.

6.3 Towards a Causal Model for the Adoption of Electronic Journals.3 Towards a Causal Model for the Adoption of Electronic Journals;

This study is only a first step in understanding a very complex subject. Scholarly activity is a very subtle and varied human, social and organisational endeavour and the potential of electronic services to support it is enormous. We recommend that further steps are taken to understand the implications of this technology for different disciplines and to this end we make two contributions. First the propositions above about how each discipline might take up the technology can be individually tested. Second we propose the following framework as a provisional causal model to predict the direction and rate of take up in different disciplines. In this framework we have reduced the scholarly activity to three pre-disposing factors each with two categories. These three factors appear to be the major contributors but there are others which we have ignored in this representation. As a result there are eight theoretically possible cells as depicted in Figure 9.

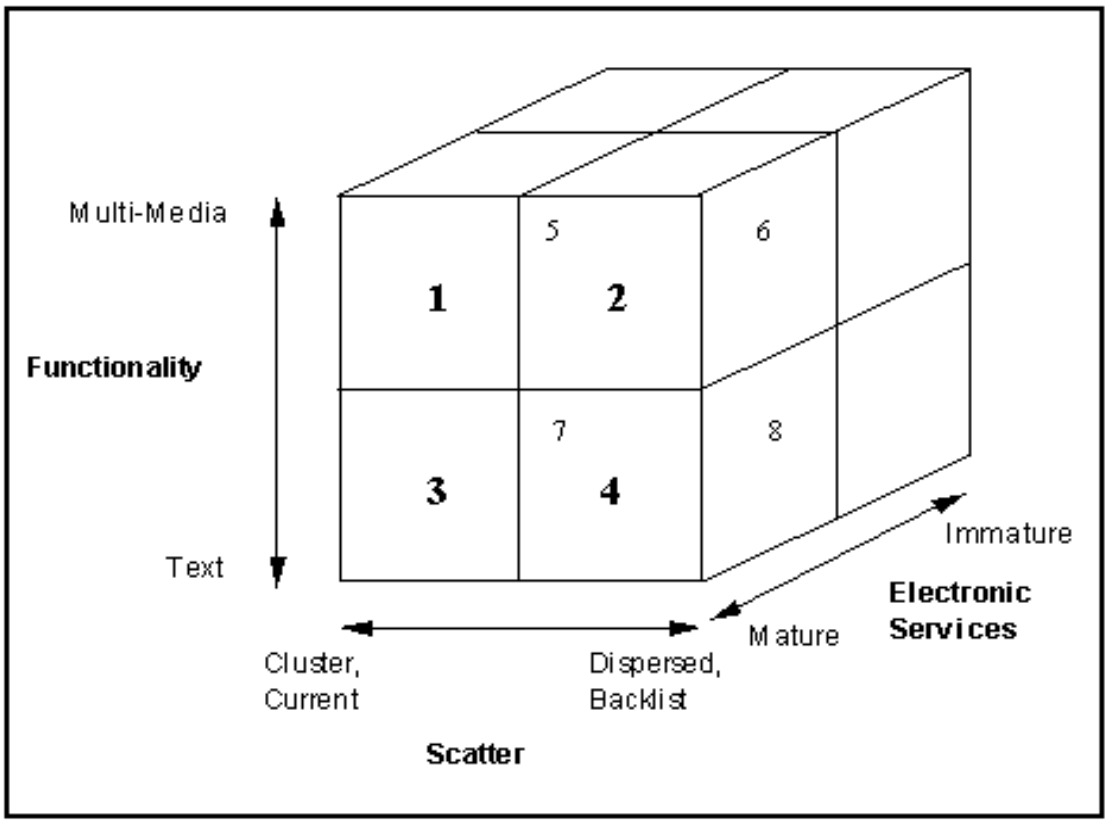

Figure 9

Predicting the Take Up of Electronic Journals

A brief description of predictions for each cell and where some of the disciplines might fit is presented below.

Cell 1 The Activists: The phenomena studied has recognised multi-media potential, the community uses a common cluster of journals and is already mature in the use of electronic services. This describes some of the sub-disciplines in the natural sciences such as molecular proteins and genetics and structural chemistry. It is the cell in which the fastest adoption of new forms of multi-media journals is to be expected.

Cell 2 The Experimentalists: The phenomena here also have multi-media potential and the community is familiar with the technology. However, the community is scattered so there is no easily defined target to which services can be delivered. The problem is to find a good business basis for delivering customised content to scholars. This might define some sub-disciplines in the humanities or application disciplines. The discipline offering the closest match in our sample is

archaeology.

Cell 3 Mature Traditionalists: The phenomena in this case are dealt with readily by current text dominated journals but the community is mature in its use of the technology and relatively tightly defined. This is therefore a community ready to make use of the electronic services but with little interest in multi-media although there may be potential for its use. The service they are likely to seek is traditional journal papers delivered electronically. This could be an area of very rapid take up because it has an active community and relatively few technical problems to solve in delivering the required service. The best example in the sample is the library and information studies community working on digital libraries.

Cell 4 The IT Competent Lone Scholars: These scholars are happy to work with text and are mature in their use of electronic services. They do not however belong to large communities with common interests. They are likely to respond well to electronic versions of traditional journals, especially if the delivery system is well integrated into the electronic services they already use. However, the problem of delivering a relevant service to such a variable population may delay take-up. Although not in our sample, astronomy may fit this description.

Cell 5 High Potential Laggards: In these disciplines scholars can imagine valuable contributions that multi-media could make and they operate within well defined communities with common interests. However, they have little familiarity with electronic services and would have difficulty making rapid progress with advanced forms of electronic journals. PE and Sports Science may fit this category.

Cell 6 High Potential Isolates: These scholars are perhaps the most difficult to help. They operate in an area with high potential for the use of multi-media but in a dispersed community so that each scholar's interest is different. They have no IT background to help them make progress and because their needs are idiosyncratic it is difficult to make a business case for specialists to develop services. Some parts of Communication and Cultural Studies, for example, the performing arts, have this potential.

Cell 7 The Untapped Communities: In this case there is a well bounded community with common interests but it sees no potential value in advanced forms of multi-media. It would be a candidate for the delivery of electronic forms of traditional journals and a cluster could be defined which would be relevant to a lot of scholars. However, the community has little familiarity with the technology and would need a lot of help to acquire facilities and develop skills. Law fits many of these characteristics.

Cell 8 Low Potential Isolates: This group will probably be the last to be reached by an electronic journal service. It deals in text and will see relatively little added value in an electronic journal unless the scholar could access all that is relevant from the work place. However it is a scattered community of lone scholars with widely different requirements and little familiarity with the technology. Provision of electronic access to all the existing but non-electronic resources that are currently used would be an enormous task. Some humanities disciplines such as history seem to fit this description.

Working with only three variables obviously does not do justice to the richness of scholarly activity but it does serve to show the different targets that academic communities present to those who are developing electronic journal services. It is interesting to note that it is easier to define sub-disciplines in relation to these characteristics because there is too much internal variation in the main disciplines.

It would be instructive to test this framework in relation to disciplines we have not examined. We are convinced following this survey that all scholarly disciplines can benefit from electronic journal services but that one common service approach will not be successful. One important task would be to develop strategies for the development of services to satisfy the needs and characteristics of the disciplines in each of the cells.

7. Recommendations. Recommendations;

In October 1997 we held a second workshop with academics and publishers to discuss the implications of this report and consider what policy recommendations might be appropriate. The workshop accepted that there were many differences in requirements for electronic journals between the disciplines and many differences in their states of readiness to exploit the potential of electronic services. The most general recommendation was that future electronic journal developments should be user-centred in order to understand the requirements of users in different communities, to offer services which meet these requirements and to proceed at a speed commensurate with the state of readiness of the disciplines. There was a feeling that the electronic journal movement to date had been driven by what is technically possible rather than by informed user demand. This is a common finding in many other areas of technology application. The recommendations below are offered within the framework of a user-centred approach which, because of the differences between the communities, could see the emergence of different kinds of service.

In the workshop we elaborated this theme under three headings, (a) research priorities, (b) the delivery of services to high potential communities and (c) the delivery of services to low potential communities.

7.1 Research Priorities.1 Research Priorities;

We conceived of this investigation as a pilot study to test whether a large scale, systematic

examination of the full range of disciplines would be of value. Although this study has identified many important differences and such a study would be of considerable value there are other research studies which should receive higher priority (see below). In view of this we conclude that a more limited study to test the perceived service requirements of different communities would be the best way to check the validity of the findings of this survey. It would be possible, for example, to construct profiles of the scope of service and states of readiness of different disciplines and test these with members of each community. This would serve to verify the differences established in this study and to identify whether significant differences existed between disciplines not covered in the survey. It would also clarify where there were sub-disciplines with profiles that differed from the parent disciplines.

If the development of electronic journals (which continues apace) is to be receptive to the characteristics and requirements of user communities we feel that top research priority should be given to user-centred, longitudinal, action research studies within a variety of different academic communities (perhaps matching the cells listed in Figure 9). Thus the development activities described below should each have an action research element to ensure that the wider community learns the lessons of success and failure. We recommend therefore that future research priorities for JISC and for funding bodies such as EPSRC and the ESRC should be:-

i. user-centred - to investigate the particular needs, states of readiness and drivers for take-up in different communities and to build services that meet the critical needs of each community.

ii. longitudinal - any research programme that seeks to understand the implications of a new service for a user community must track progress over a period of time to allow an opportunity for users to evaluate the possibilities and for new practices to emerge.

iii. action research - the research should both provide services that each community can use ('action') and should incorporate an evaluation framework ('research') which examines on a regular basis the outcomes of the action and feeds this information into the decision making process for the development of the service.

Much of this action research should focus upon readers of electronic journals but there are two additional foci which have emerged which deserve priority:-

i. Research on Authors

Electronic services will not grow unless authors have the incentive and the capability to provide electronic inputs. An important part of an action research strategy in each community will be an examination of the opportunities and barriers from the perspective of authors.

ii. Research on Related Electronic Services

An important driver in the development of electronic journals will be the form and extent of other electronic services in use within each community. Research is needed to explore the possible complementary relationships between electronic journals and other electronic services.

7.2 Services for High Potential Communities.2 Services for High Potential

Communities;

The communities in cells 1, 2, 3 and 4 are in a good position to adopt electronic journals if they are offered in a form which meets their requirements. The recommendations below identify the major service provision requirements to meet the needs of users in these four cells. The provision of these services would also provide the best possible vehicle for action research to test whether these are the critical requirements in each case. If the development of the services described is to be effective it has also to be user-centred in the sense that critical institutions in the communities lead, own or are closely associated with each development so that the need to meet user requirements is always paramount.

i. The delivery of radically different forms of journal article containing or associated with new forms of multi-media. The users in cells 1 and 2 are in the greatest state of readiness to welcome such developments. If these new services can be delivered effectively they could produce the greatest value added differentiation from paper based journals. The two issues that have to be addressed are, first, how to assist authors to produce such articles and second, which aspects of multi-media are best placed in the journal and which in associated electronic services.

ii. The delivery of electronic journals that are primarily text based but which have maximum value added over paper based versions. Cells 3 and 4 are best placed to respond to this kind of service. The value added that is sought is not other forms of multi-media but effective ways of utilising hypertext links to search the journal holding and associated electronic services and effective ways of studying articles on-line. The challenge here - perhaps the holy grail of electronic publishing - is to produce complex text based articles which users can study on-line and do not feel the need to print. The currency of the article and its assured access from the place of work are also significant features of a value added service.

iii. Creating a unique service. For the scattered communities which are in a good state of readiness to exploit electronic journals (cells 2 and 4) the challenge is to provide a relevant service when users have widely different needs - both in the range of journals and in the availability of the back catalogue. The challenge in this case may be to find cost-effective ways of delivering a unique service to each user which integrates on the user's behalf the offerings of a potentially wide array of publishers.

7.3 Services for Low Potential Communities.3Services for Low Potential Communities;

The cells 5, 6, 7 and 8 in Figure 9 represent communities which are currently immature in their use of electronic services. We have described them as low potential because they are communities which would not readily be able to adopt multi-media electronic journals in the short term. However, the analysis suggests that in the long term, there is potential value to these communities. The aim here is to create a migration path for the delivery services so that the users in these communities can move steadily towards the realisation of this potential. The path will vary with the circumstances of the community.

i. Local support structures for direct access. One of the dominant findings of this investigation is that the most sought after and common value of electronic journals is reliable, direct access from ones place of work. For many in the low potential communities

the lack of local facilities is a major barrier to the adoption of any electronic service and devoting resources to developing services the target users cannot access is unlikely to be successful. We recommend therefore the devotion of resources to providing all academics with direct access to networked facilities. In addition these users need local support from librarians and computer services for training and for selecting the services they will use.

ii. Integrating electronic journal developments with other electronic services. There appears to be a strong correlation between the adoption of electronic journals and the adoption of other electronic services. One way in which the take-up of electronic journals might be promoted would be to identify the kinds of electronic services that each community is beginning to find of value and deliberately develop electronic journals as an associated service.

iii. Experimental seeding in high value areas. A major problem in the low potential community is that there is very little appreciation of the potential value of electronic journals. Showing the wonders of the multi-media approaches used in other disciplines is likely to be counter-productive. It would be better for the community to find examples, perhaps not very advanced in technical terms, that would provide services of value to its members and to develop demonstration services that could serve to build interest and confidence. In the survey there were many examples of low potential communities where there was recognition of interesting directions that might be taken. In cell 5, for example, there are communities such as PE and Sports Science where there would be an interest in advanced forms of multi-media. There are also examples, such as Communications and Cultural Studies, where there are many possible applications but the active academics are scattered and have widely different interests. It is unlikely that services to these communities will be immediately cost effective and they provide the best cases for funded development of experimental services. Such services need to be owned by the institutions of the community and to have a dissemination and evaluation process built into the development of the service.

7.4 Conclusions.4 Conclusions;

The nature of the academic world is very diverse and it is no surprise that we have found many differences in the requirements for electronic journals. There are communities that are already well advanced but many others that are making the first tentative steps. It is our belief that progress across the entire academic community will depend upon recognising the differences between disciplines and developing services that match user requirements. We hope that the classifications and recommendations offered in sections 5, 6 and 7 are a contribution to this user-centred approach.

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Appendices

In the following appendices summaries are provided of the data gathered for the 14 disciplines examined. Each summary includes the sources of evidence, the main pre-disposing characteristics of the discipline that were identified, the current state of development of electronic journals and visions for the future. A summary of the assessments we made as a result of this data is also included.

Appendix A: Chemistry

1. Sources of evidence

Interview with

1. Lecturer, Department of Chemistry, Loughborough University

2. Research fellow, Department of Information and Library Studies, Loughborough University (ex Royal Society of Chemistry)

3. Telephone interview with a member of the CLIC Consortium Electronic Journal Project which is establishing a parallel electronic version of the Royal Society of Chemistry's journal, Chemical Communications.

Other sources:

Use was also made of the Royal Society of Chemistry Web pages:

http://chemistry.rsc.org/rsc/

Two specific articles from the following URL were used:

http://www.ch.ic.ac.uk/talks/mgs

(Rzepa, H.S., Whitaker, B.J. and Winter, M.J.(1994): *Chemical Applications of the World-Wide-Web System* and Rzepa, H.S. *The World-Wide Web Information System: Chemical Chaos or Global Scientific Enabler?*)

Literature-

Downing, G. 1988

Ellis, D. 1993

Moses, I. 1990

Olsen, J. 1994

Simpson, A. 1988

Thornber, C.W. 1990

2. Dominant characteristics of the discipline with respect to implications for electronic documents

i) Substances are usually represented visually

• Chemistry is very visual. A chemist will recognise a substance much more quickly from a visual representation than from a textual one. Chemistry papers will contain pictures, usually in the abstract and in the main body of the paper. Chemists will make a decision about reading an article by reading the abstract and looking at the graphics and captions. It is this MM content that has made chemistry a prime candidate for electronic publication. Rzepa et al (1994) list numerous ways in which chemistry is well placed to exploit electronic publishing media. For example:

- the presentation of molecular diagrams as two-dimensional mapped figures where further analysis of a scientific point can be made to closely associate with particular molecular features, without increasing the visual complexity.

- structural information can be associated with a so called MIME (multipurpose Internet Mail Extension) type and delivered in digital form suitable for user-controlled processing such as rotation, manipulation and analysis. (Previously, this was done by depositing e.g. molecular co-ordinate files in database archives to which general access may only be gained many months later). It is stated that a major advantage is the saving in transmission time of the compressed atomic Co-ordinate data compared with bitmapped 2D or 3D representations.

- remotely stored spectroscopic or analytical data could be linked to a published document. In theory, the remote data could reside directly on the spectrometer system itself.

- time dependent phenomena such as a moving image of the development of a flame front in a rapid compression machine can be recorded as a video animation in MPEG or Quicktime format and displayed.

-3D representations can be approached using a time-dependent rotation and the imminent introduction of cheap 'active' liquid crystal shuttered glasses for games consoles will enable true 3D perception.

ii) The data have continuing relevance

- Chemical data never goes out of date. For example, a melting point of a substance will be the same today as it was 150 years ago. For this reason, chemists often refer to papers that are very old. To help with this potential problem, there is a German system called Beilstein which will electronically search for any substance and give its structure. It will also cite any key reference that refers to that structure.

iii) Publications are read as much by the industry as by academics

- This provides a commercial component that is not present in many disciplines. There tend to be large research groups in chemistry, the pattern being that the research is done entirely by research students or short term research staff working on a particular project. Papers tend to be multi-authored. There is a need for some chemical data to be made available extremely quickly. DNA and gene structures are no longer published in paper form. They are put directly on to the WWW because there is such a need to have fast access to the information.

iv) Both formal and informal means of information dissemination are important

- There is a strong distinction in chemistry between "formal" publication in peer reviewed journals and other communication within the academic/industrial chemistry community. Chemistry conferences tend not to have published proceedings and are used for exchange of communication. There may still be formal lectures at conferences but these are not published. Sometimes, the extreme step of not allowing them to be published is taken in an attempt to ensure that people come to the conference and talk to each other. Other more informal means are electronic, e.g. discussion groups and authors web sites. These are becoming influential in terms of individual careers. An example was given of invitations to an author to contribute to books by editors who had read inputs to discussion groups.

v) Use of information technology is considered to be essential

- This is a community which is very computer literate and has been used to Information Technology for a number of years now. It will not be held back because of a reluctance to use the technology. A peculiarity of chemistry publication is that the whole chemistry community world-wide is Macintosh-based because of software that was until recently the industry standard (Chem-draw).

3. Service Delivery (Likely Requirement)

(Factors relevant to chemistry in bold)

a. Search on line, no full text requirement

b. Search on line, electronic text delivery for printing

c. Search and read full text on line

d. Significant unprintable MM, new forms of journal article*

* for some sub-disciplines

4. Service Scope

a. Cluster of journals common to community*

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

(although this is largely taken care of by existing electronic databases)

d. Reach beyond journals (databases, source material, etc.)

e. Communication services

* clusters sometimes common to sub-disciplines

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals: 1. BUBL — The BUBL Information Service (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals (http://www.edoc.com/ejournal/).

Twenty nine electronic journals were found using these sources under chemistry but it is likely that even more electronic journals are read by chemists, e.g. that may be listed under general science. Chemistry is split broadly into organic, inorganic, physical and analytical (which may be seen on its own or may be incorporated into physical or inorganic). Then there are subsections within each of these. As far as journals are concerned, there is little difference in use between the sections although organic, being tied closely to the pharmaceutical industry does have more commercial drive.

Chemical Abstracts is increasingly electronic. Within five years it was predicted that there will not be a hard copy of Chemical Abstracts. It abstracts every paper in the world. At the moment it is very expensive to access on-line but a system of CD- ROM production may be the way they will go.

There are many electronic journals in chemistry but most if not all of the highly regarded peer reviewed journals have paper equivalents. There is still a desire, despite the technical ability within the discipline, to 'flick through' paper journals. Relevant articles can be spotted 'by accident' through this activity.

Reviewing is increasingly done electronically and there is more opportunity now to submit electronically. This has only happened relatively recently and some journals still require camera ready copy. It was not long ago when all the drawing in chemistry was done by hand. Electronic submission and reviewing has speeded up the time from submission to publication. One personal example was given of submission to publication in less than a month and that was in a significant refereed journal.

6. The future of electronic publishing in the discipline

The chemistry community is one which does seem to be ready to take on the challenges of electronic multi-media publishing. Although it is at the moment being championed by a relatively small number of enthusiasts, the fact that the community generally is very well prepared to make full use of the available technology means that the chances of success in chemistry are higher than in some disciplines which also use visual data.

There are likely to be more electronic publications in chemistry, both influential refereed journals and other less formal publications.

The example was given of a chemistry department which has recently closed down its departmental library. The department now subscribes to electronic versions instead. The paper journals are still available in the main university library but are not duplicated in the department.

The hope within some parts of the community is that multi-media will indeed influence the nature of scholarly practice in chemistry, by speeding up research and dissemination of results and by allowing a more creative research environment through the provision of 'active' information.

Chemistry is a discipline pushing at the frontiers of electronic publishing. The nature of the data, the characteristics of the scholars, the nature of the research process and the interest from industry all seem to create an environment, particularly within biochemistry and structural chemistry, which is encouraging (and in some instances actually driving) the production of electronic multi-media publications. Even those scholars not at the "enthusiastic" end of the spectrum seem to be welcoming the speed of publication, the ease of access and the enhanced visual presentation that is becoming a reality in chemistry journals.

Appendix B: Molecular Genetics and Proteins

1. Sources of evidence

Data is available from the Focus Groups and Baseline Questionnaires from the eLib SuperJournal Project.

	Focus groups	Questionnaire
Cambridge	n = 6	n = 32
UCL	n = 9	n = 20
Oxford	n = 8	n = 10

The scholarly domains which are associated with the eLib SuperJournal MGP (molecular genetics and proteins) cluster include biology, biochemistry and medicine, with specific disciplines within these fields being identified by individuals participating in the research.

No individual interviews were conducted and the coverage of the issue of scholarly practice is therefore restricted to the topics covered in the baseline questionnaires and focus groups and material available in the literature which has been reviewed, the most relevant of which is Grefscheim et al, 1991, which deals with biotechnology.

2. Dominant characteristics of the discipline with respect to implications for electronic

documents

i) Progress in the field is rapid and incremental.

- Speed of delivery is highly valued. The ability to cut out the three week delay associated with transmission of a printed journal from the USA was cited as an example. This is one reason for the positive attitudes towards electronic delivery in this field. All the MGP cluster respondents convey strong positive attitudes to the delivery of electronic journals and most of them are reading electronic journals already. Out of the questionnaire sample of 62, only nine people said they "never" used them. The dominant theme of the benefit is one of "access". The library is viewed as taking up a lot of the scholar's time (although it may be viewed as supportive and well provisioned). Being able to gain access at one's desk is cited as an immensely beneficial property of e-journals. The fact that one can rely on the material being available is a related advantage when comparing on-line access with access to journals on open library shelves.

ii) The community is very computer literate

- All the MGP cluster respondents have personal access to network facilities and frequently use on-line facilities, both databases containing source material, such as the Protein Data Bank, and bibliographic databases, used to do literature searches. This is not surprising given Grefscheim et al's finding in 1991, that, while not all the scientists in the biotechnology sample were particularly computer literate, those studying molecular genetics required computer literacy "for survival".

iii) Visualisations of the subject matter are important to the research

- The participants in the focus groups made frequent references to the importance of visualisations of the subject matter which they deal with. Aspects which are important include colour, precision of illustrated dimensions and location of markers, presentation of dynamic information and 3-D graphics. At present these visualisations are handled in different ways which affect the apparent merits of printed and electronic formats. For example the print journals produce good quality colour material which "doesn't photocopy very well" and there is both optimism and doubt about the possibilities of obtaining good quality colour reproductions on-line.

As has been indicated, material relating to basic structures and sequences is already held on databases and for some journals there is a requirement that it should be available on these databases at the time of publication. This situation prompted the respondents to focus on the advantages of automatic linking between the journal article and the relevant data source, which might in such instances be made available at the author's website.

Another example was cited of journals where the subject matter was actually dynamic in character and the journal issues a video in support of the printed material at regular intervals. In some of the published articles the material in the video is the main source of information, with the printed text being very much in a supporting role. Clearly this provides an example which would offer enormous advantages if provided by an on-line electronic journal including all the relevant material in one common framework.

iv) This community still has a preference for paper as the medium for reading literature

- Notwithstanding the generally favourable attitude to electronic journals the respondents in the questionnaire and focus group samples did not anticipate transferring all their journal reading to the computer. They still use photocopies or print out the electronic articles if they wish to read in detail. Overall there was the same reluctance to read text on-screen as has been reported elsewhere. Disadvantages included the discomfort from reading on-line, lack of portability and poor provision for annotation facilities. At the present time this group wish to be able to print out full-text (and, where appropriate, fully illustrated) copies of those journal articles which they wish to study in depth. The group does include people who feel that this situation may not persist, even if they are unlikely to change their habits!

3. Service Delivery (Likely Requirement)

(Factors relevant to this discipline in bold)

a. Search on line, no full text requirement

b. Search on line, electronic text delivery for printing

c. Search and read full text on line

d. Significant unprintable MM, new forms of journal article

4. Service Scope

a. Cluster of journals common to community, current journals only

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

d. Reach beyond journals (databases, source material, etc.)

e. Communication services

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals: 1. BUBL — The BUBL Information Service (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals (http://www.edoc.com/ejournal/).

Sixty-five titles were found in this area and there are certain to be more which could be of relevance to this scholarly community. Despite the specialist nature of the discipline it has extensive links with other research areas in both pure and applied science, which would extend the range of journal titles of potential interest by a considerable amount. A wide range of electronic services are available to this discipline and they are being used.

6. The future of electronic publishing in the discipline

This discipline area is clearly dependent on multi-media for the pursuit of its research objectives, is highly computer literate and foresees immense advantages to be gained from further developments in electronic journals, including the further addition of multi-media content. It is perhaps worth noting that there is little enthusiasm for the gratuitous inclusion of multi-media content and that given the existence of centralised sources of data, these users express a strong desire to be able to pick and choose which material they access and store. As regular users of network facilities they are already sensitive to issues associated with loading on the network and the time taken to down-load files. They will not want unnecessary duplication of existing materials and will focus on the benefits of access to high quality information delivered at the earliest possible opportunity.

Appendix C: Physics

1. Sources of evidence

Interview with

1. Senior lecturer, Department of Physics, Loughborough University.

Other sources:

Literature-

Ellis, D. 1993

Ehikhamenor, F.A. 1990

Neumann, L. (http://anshar.grainger.uiuc.edu/dlisoc/beckman-sum.html)

2. Dominant characteristics of the discipline with respect to implications for electronic documents

i) Up to date information is very important

- Pre-prints of journal papers are used extensively in physics, particularly within some sub-disciplines. Pre-prints of papers on their way to being refereed by quality journals are submitted to pre-print archives which run a well-used service which has come to be relied upon heavily.

ii) Variations between sub-disciplines are important

- There are some distinct sub-disciplines within physics which means that when concerned with the implications for electronic services, it is not sufficient to treat all areas of physics homogeneously, e.g. the pre-print archives which are used heavily in some areas of physics, e.g. theoretical physics and particle physics, do not cover other fields such as experimental surface and solid state physics. The community within a sub-discipline seems to be fairly cohesive though with prestigious publications recognised fairly universally.

iii) Back issues of journals are frequently referred to

- Although physicists need to have access to up-to-date information, they also need to be able to refer to older journal papers (from 1950s onward).

iv) Information technology is expected to be used

- The physics community is familiar with IT and expects to use it for moderate information retrieval tasks. There is not a block to using technology. However, advantages are still perceived in going to a library. Currently, this is to browse as most of the electronic library databases only hold recent journals. With time and electronic access to back issues, there may not be such dependence on conventional library facilities.

3. Service Delivery (Likely Requirement)

(Factors relevant to physics in bold)

a. Search on line, no full text requirement

b. Search on line, electronic text delivery for printing

c. Search and read full text on line

d. Significant unprintable MM, new forms of journal article

4. Service Scope

a. Cluster of journals common to community, current journals only

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

d. Reach beyond journals (databases, source material, etc.)

e. Communication services

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals: 1. BUBL — The BUBL Information Service (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals (http://www.edoc.com/ejournal/).

Sixty-two examples of electronic journals were found under the heading of physics from these sources. There are some electronic versions of paper journals and electronic only refereed journals are beginning to be produced, e.g. Mathematical Physics. Currently, there seems to be some reluctance to move away from the paper format for full papers although very extensive use is made of pre-print services in some areas of physics, e.g. the Los Alamos electronic pre-print service. Authors, titles and abstracts of pre-prints are available free and full papers can be paid for. These papers are not refereed but on their way to a refereed journal and the assumption is that quality is high in general given the stringent guidelines of the archive services themselves.

Less formal electronic publications seem to be used for presenting multi-media information, e.g. simulations, for example authors own WWW pages.

6. The future of electronic publishing in the discipline

Change is likely to be slow. The pre-print services already available contain alerting services and are searchable (although not always satisfactorily). Any electronic publications in the future will need to provide substantial benefits to what is already in place before existing habits will be changed. There will be a need not only to provide the most up to date literature but also some material which is much older (from 1950s).

Although there could be multi-media elements to publication of physics papers, these tend to be provided through

less formal media than the refereed journals. Many electronic versions are available but few electronic only journals. There does not seem to be the impetus to push hard from within the discipline for unprintable multi-media publications.

Teaching may be influenced by electronic publication but at least in the short term only through the less formal routes (e.g. authors own WWW pages, discussion groups etc.)

Appendix D: Geography

1. Sources of evidence

Interview with:

1. Head of Department and Senior Lecturer at Department of Geography, Loughborough University.

2. Reader of Historical Geography, Department of Geography, Loughborough University.

2. Dominant characteristics of the discipline with respect to implications for electronic documents

(i) The subject area is large and diverse.

- The subject area is made up of several different sub-disciplines, these can be divided into physical and human geography at a macro level, but many further research areas exist, e.g. Coastal Zone Management, Local Area Studies, Geographical Information Systems (GIS). There are a small number of core journals to most of these areas, e.g. Transactions of the Institute of British Geographers, however each area has it's own specialist titles. This would suggest that electronic journals may be well suited to the smaller sub-disciplines, especially 'alternative agenda research', due to shortage of published titles and the relative ease with which electronic journals can be set-up and at low cost by groups of academics.

(ii) The sub-disciplines have different requirements with respect to publication

- Different sub disciplines in geography have different requirements, e.g. Mapping is important in physical geography disciplines. Geographical Information Systems (GIS) is a fast moving field where one of the important criteria is speed of publication. In other areas speed of publication is less critical, e.g. in historical geography areas.

(iii) There are strong cartographic requirements in some of the geography disciplines, these are already provided for in printed journals

- Maps, charts and graphs are regularly published in the printed journals, therefore Multi-media is unlikely to be the driving factor behind the success of electronic journals. However electronic journals could provide additional functionality over traditional printed maps that may be important, e.g. hypertext links.

(iv) The subject area is gradually experiencing increased use of electronic journals and some tangible benefits are recognised by academics.

- 'At my desk', ease of use and convenience of access are likely to be the critical success factors in this domain. Other factors such as additional functionality of multi-media, possible reduced costs of printing photographs that are often prohibitive in printed journals, are perceived as of secondary importance.

3. Service Delivery (Likely Requirement)

(Factors relevant to Geography in bold)

a. Search on-line, no full text requirement

b. Search on-line, electronic text delivery for printing

c. Search and read full text on-line

d. Significant unprintable MM, new forms of journal article

4. Service Scope

a. Cluster of journals common to community, current journals only

b. Specialist cluster, perhaps defined at user level

*c. Back-list significant

d. Reach beyond journals (databases, source material etc.)

e. Communication services

*** This factor may be significant in some sub-disciplines, but not in others.**

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals in Geography: 1. BUBL — The BUBL Information Service (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals (http://www.edoc.com/ejournal/).

Eleven current electronic journals were identified in both the human and physical areas which included journals in the following sub-disciplines: Geographic Information systems, Oceanic Physics, Generative Anthropology, Coastal Science, also some highly specific journals. In addition interviewees reported the journal, Transactions of the Institute of British Geographers, general in scope, but a highly significant version of the printed journal. The Times Education Supplement was also reported as a source of research papers by one interviewee.

6. The future of electronic publishing in the discipline

Academics in Geography have readily adopted the use of computers and IT services. The use of e-mail for alerting services and mail lists is fairly widespread and there are many Internet users. The general view of interviewees was that electronic journals would inevitably become more popular in academic research and teaching in Geography. They felt however that the growth rate would not be as rapid as in some of the traditional 'hard/pure' sciences. The evidence for this initial slow rate of growth is found in the relatively small numbers of electronic journals currently available in this discipline. It was felt that electronic-only journals would become more popular amongst the smaller sub-disciplines, where the potential readership is too small to set up traditional printed journals. In addition, the advantages of relatively quick and easy set up by groups of academics may facilitate the route of electronic-only journals. There was a strong view however that multi-media would not be the initial push behind electronic journals, although it may add to functionality later on.

Appendix E: PE/Sports Science

1. Sources of evidence

Interview with:

1. Lecturer in the Department of PE and Sports Science, Loughborough University.

2. Lecturer in the Department of PE and Sports Science, Loughborough University.

2. Dominant characteristics of the discipline with respect to implications for electronic documents

(i) The study of human movement in context is important in certain sub-domains.

- The requirement to study human movement lends itself to representation via multi-media, especially the use of video, e.g. in teaching.

(ii) On-line databases are an important resource in this subject area.

- Electronic journals could be linked to established on-line databases to provide a useful tool.

(iii) There is relatively little electronic journal activity in this subject area

- Currently there are very few electronic journals available. The subject area is at a less advanced stage compared to other subject areas. Reaching critical mass in electronic journals will require more interest from academics to get involved in using Internet-type technology and increased resources to cope with the demands of providing on-line access to students, due to relatively little establishment of electronic journals in subject area.

(iv) Up-to-dateness of material is important

- There are delays in publishing currently of around nine months in the established journals. Access to up-to-date journal material, especially from the desktop is important in research.

3. Service Delivery (Likely Requirement)

(Factors relevant to PE/Sports Science in bold)

a. Search on-line, no full text requirement

b. Search on-line, electronic text delivery for printing

c. Search and read full text on-line

d. Significant unprintable MM, new forms of journal article

4. Service Scope

a. Cluster of journals common to community, current journals only

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

d. Reach beyond journals (databases, source material etc.)

e. Communication services

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals in PE/Sports Science: 1. BUBL — The BUBL Information Service (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals (http://www.edoc.com/ejournal/).

Only four electronic journals were identified in this search, in the areas of sports marketing, coaching science, swimming, and a general Sports Science journal. One of the interviewees reported an electronic version of a printed journal in his area of interest (Disability & Society), but was encountering difficulties gaining access to the necessary reader software. This interviewee also reported communication where he had tried, unsuccessfully, to encourage a publisher to provide an electronic version of a particular printed journal. The discipline is at an early stage of uptake to electronic journals, very few academics in the discipline are using them.

6. The future of electronic publishing in the discipline

Whilst standard e-mail and database services are used on a regular basis, academics in this subject area are generally not very Internet literate. There is only a small amount of Internet presence on research groups in the department where the interviews took place, nearly all of this is provided by one 'enthusiast'. It was felt that the increasing popularity of electronic journals would depend on increased resources, both staff and student access, and increased awareness and motivation in the discipline. Certain pre-disposing factors would suggest that there is a growing future for electronic journals in the discipline, particularly where multi-media could provide benefits in addition to the convenience and ease of access benefits.

Appendix F: History

1. Sources of evidence

Interview with:

1. Project Director - Electronic Seminars in History (eLib), Institute of Historical Research, University of London

2. Project Director: Electronic Reviews in History (eLib), Institute of Historical Research, University of London

2. Dominant characteristics of the discipline with respect to implications for electronic documents

i) The discipline is strongly text oriented.

- The discipline is primarily concerned with the location, analysis and interpretation of texts (books, articles and archive material). Publication in books and academic journals is a major objective but there is no clear demand for advanced MM. Images and possibly hypertext and animated maps.

ii) The discipline is large and active.

- There are considerable numbers of historians (particularly in the USA). Although they are split amongst many 'period' SIGs a large number of supporting electronic journals (electronic version and electronic only) have appeared.

iii) IT/ Internet usage is growing.

- Although history has been slower than many other academic areas the discipline is increasingly using the Internet and other IT resources. Increased usage will improve the potential demand for electronic journals.

iv) There is considerable interest in the back catalogue.

- Historians are likely to be as interested in older material as in recently published material. This reduces the attractiveness of electronic version journals which do not have a significant back catalogue collection.

v) Access to electronic archives is limited but highly valued.

- The study of archival document collections held all over the world is central to the discipline. Moves to increase the number of digitised collections would be a major advantage, as would links to these collections from electronic journals.

3. Service Delivery (Likely Requirement)

(Factors relevant to history in bold)

a. Search on line, no full text requirement

b. Search on line, electronic text delivery for printing

c. Search and read full text on line

d. Significant unprintable MM, new forms of journal article

4. Service Scope

a. Cluster of journals common to community, current journals only

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

d. Reach beyond journals (databases, source material, etc.)

e. Communication services

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals: 1. BUBL — The BUBL Information Service (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals (http://www.edoc.com/ejournal/).

Ten electronic journal titles in history were found from these sources. There are many electronic newsletters and discussion groups supported by e-mail but much fewer electronic refereed journals. There are other 'reviews' only journals like 'Reviews in History' but there are also many electronic versions of standard academic/peer reviewed history journals. It is not clear that there are any electronic-only titles which have the same level of authority as established print titles. It was estimated that only 15% of the current e-journal titles are 'significant' and these would all be electronic versions. There are a great many electronic-only titles appearing in North America.

While there is a significant and growing role for electronic journals there appears to be limited demand for multi-media content - the emphasis is still strongly geared towards text, tables and simple graphics. The requirements for electronic journals are more connected with providing improved access to existing journal titles for academics. The issue of subscription cost is seen as important and anything which reduces this will be welcomed.

6. The future of electronic publishing in the discipline

The most likely point of origin for electronic only journals is seen as the ‘new' university departments. These departments need to raise their profile quickly in order to attract funding. They are often in interdisciplinary 'humanities' subject areas which have few traditional journals which serve them specifically. It is thus easy to justify

the resources spent on creating and supporting a new title. They are also less hidebound by tradition and have staff who are more computer literate. In contrast the established departments in traditional universities are seen as being relatively slow to adopt IT and e-journals.

Within the discipline, the continued growth and eventual dominance of e-journals was seen as inevitable. This may be accompanied, or even caused by major changes in the financial basis for academic publishing. The role of the publisher and their commercial involvement in academic journal publishing was questioned. The role of multi-media content was less clear. While exciting opportunities were readily identified, especially for teaching, there appeared to be no strong demand.

Appendix G: Archaeology

1. Sources of evidence

Interview with

1. Managing Editor of Internet Archaeology (eLib), Dept Archaeology, University of York

2. Dominant characteristics of the discipline with respect to implications for electronic documents

i) The discipline is primarily concerned with the discovery, analysis, description and cataloguing of artefacts. Detailed documents containing text, images, maps and databases are produced and they themselves become an important resource in the research process.

• The discipline is well suited to the full use of digital journals containing a wide range of MM facilities and functions.

ii) The discipline is small with around 1000 active participants in the UK. These people are scattered and are clustered into special interest groups ("Period Groups").

• Electronic Journals would need to address specific topics but would not attract a large readership. The cost of providing and supporting the journal would need to be minimal and be the labour requirement would almost certainly need to be minimal. Subsidy via an academic institution or funded agency would probably be necessary.

iii) The discipline is not geared towards the traditional academic route to career advancement (academic journal publishing).

• Many practitioners work outside the university system. However, there is still a demand for opportunities to publish their own work in 'respected' publications. Electronic journals may be more successful if they are not cast in the traditional academic mould

iv) Speed of publication is not a critical issue.

• The complete excavation and reporting of sites may take many years to complete. Because of the slow 'pace' of the research process there is considerable interest in 'work in progress'. This has resulted in a high level of conference attendance. There would appear to be a role for electronic journals that contained current news.

v) The community of archaeologists is distributed thinly.

• Access to library resources and colleagues is difficult - especially when working on remote field sites. Electronic access to electronic MM journals, databases and communication would considerably improve information access and help integrate a scattered community

3. Service Delivery (Likely Requirement)

(Factors relevant to archaeology in bold)

a. Search on line, no full text requirement

b. Search on line, electronic text delivery for printing

c. Search and read full text on line

d. Significant unprintable MM, new forms of journal article

4. Service Scope

a. Cluster of journals common to community

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

d. Reach beyond journals (databases, source material, etc.)

e. Communication services

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals: 1. BUBL — The BUBL Information Service (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals (http://www.edoc.com/ejournal/); eLib project information.

The following electronic publications were identified from these sources in archaeology:

Journal of Anthropological Archaeology, Journal of Archaeological Science, Against the Grain, Internet Archaeology, British Archaeology, Current Archaeology (magazine/news service).

There are a number of e-mail delivered newsletters (listserve) but few 'significant' titles - there are very few peer reviewed electronic journals. However, there are few archaeologists in the UK (approx. 1000). A number of societies are putting 'extracts' up on the Web.

Many authors are not looking for academic 'respectability' just opportunities to talk about work in progress due to the discipline's very long 'activity cycle'.

Internet Archaeology may be the only major electronic-only title. Assemblage is primarily a Web journal but they have 'printed' their first issue and have circulated it as an 'advert' - presumably because they are finding it difficult to get papers. It seems that the demand for e-journal publications may still be limited. If there are no papers then there are no journals. Internet Archaeology has struggled to generate sufficient articles. They had hoped to publish 20 papers a year but have managed only 12 and turned down a number of small articles.

6. The future of electronic publishing in the discipline

The future for electronic journals was seen very positively by those in the field although the vision was limited by the low numbers of readers/authors involved and the consequent absence of commercial interest. Multi-media is seen as a significant development and this is likely to be an important feature of electronic journals. Growth is likely to be limited by skills and resources. Low key operations provided by academics and enthusiastic 'independents' are likely to predominate as now.

Appendix H: Social Sciences

1. Sources of evidence

Interview with

1. Managing Editor Sociology On-line, Dept Sociology, University of Surrey
2. Lecturer, Department of Social Sciences, Loughborough University

2. Dominant characteristics of the discipline with respect to implications for electronic documents

i) The area is large and diverse.

- The area is made up of a large number of sub-disciplines, many of which have strong overlaps with other disciplines - especially the humanities. However, individual researchers often have difficulty gaining local access to the specialist titles that they need. This suggests a strong demand for electronic journals (especially electronic versions) but spread amongst a large number of specialist titles, each of which may have a limited circulation.

ii) The disciplines are often text oriented and ‘academic’.

- Printed texts typically contain: text, tables, graphs and simple graphics. Most authors may not wish to generate more than this. However, some specialist areas (discourse analysis and media studies) may well benefit from MM opportunities in electronic journals. The problems of technical competence, labour cost of production and copy-right fees are appreciated. With one or two exceptions MM is unlikely to be a significant requirement in social science electronic journals

iii) Speed of publication is rarely critical.

• The ongoing nature of some debates in the journals suggests that access to the back catalogue and effective searching may be more important than rapid publishing.

iv) There are significant differences between approaches in the UK and USA.

• In the USA there is a strong empirical interest compared with the more theoretical tradition found in the UK. This may act to limit the potential readership for electronic journals to a particular 'tradition'.

v) Access to suitable equipment is limited.

• In the past access to IT has been limited. PCs are becoming more common but the distribution of MM capable computers may well continue to be limited.

3. Service Delivery (Likely Requirement)

(Factors relevant to social sciences in bold)

a. Search on line, no full text requirement

b. Search on line, electronic text delivery for printing

c. Search and read full text on line

d. Significant unprintable MM, new forms of journal article

4. Service Scope

a. Cluster of journals common to community, current journals only

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

d. Reach beyond journals (databases, source material, etc.)

e. Communication services

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals in social sciences: 1. BUBL — The BUBL Information Service: (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals via LU Web pages: (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals: (http://www.edoc.com/ejournal/).

Thirty eight electronic journals were found in the areas of social sciences/sociology. Where electronic journals are appearing, their numbers are not perceived to be very great - especially electronic-only ones. Few titles were volunteered by the interviewees.

Internet access and usage is growing quite quickly in academic departments but there is still a core of older traditionalists who lack IT expertise/inclination.

6. The future of electronic publishing in the discipline

There is likely to be a growth in the usage and demand for electronic journals in the social sciences but this would seem to be mainly for electronic version journals rather than electronic-only. This increased usage is likely to be related to a continual increase in Internet orientation and an appreciation of the convenience of on-line access.

For those involved in teaching there will be significant advantages in being able to direct students to electronic journals rather than have them all try to access the single bound copy in the library.

Multi-media is relevant to a few specific areas within the social sciences (media studies, discourse analysis, data modelling etc.) but the importance of multi-media should not be over-estimated. It is unlikely to be a key factor in the success or failure of electronic journals. The generation of multi-media content was perceived to be time consuming and expensive (especially copyright fees for images and film excerpts). The decision to include multi-media content in articles was also seen as critical for 'editorial' reasons - poor quality multi-media would undermine the perceived quality of the article and journal. If the multi-media was not central to the paper then it would only distract the reader.

Appendix I: Communications and Culture Studies

1. Sources of evidence

The data from three Focus Groups and 27 respondents to baseline questionnaires from three Universities in the SuperJournal project (over 50 respondents in total) were examined plus literature from studies of humanities and social sciences relevant to these disciplines.

2. Dominant characteristics of the discipline with respect to implications for electronic documents

This is a sub-discipline concerned with understanding human communications and cultural issues in society. It draws upon major disciplines in the humanities, e.g. history, and the social sciences, e.g. sociology.

i) Scholarship in this field is about detailed study of the relevant materials and assembling a view, or perspective, that adds to or is different in kind from other approaches. It is not about accumulating knowledge, does not build upon other work in direct ways, cannot be tested directly and is not time dependent.

- Articles tend to be fairly lengthy and may be monographs rather than journal papers. Knowing that a paper relevant to your interests has been published is much more important than getting the current issue of a journal as early as possible.

ii) The source data can be in many different forms and may be historical. It is not generated in a laboratory but is often available in various kinds of record, many of them textual. In some research the work may be to re-interpret source data from a different perspective.

• Most of the data is text but in some specific areas it may be moving images or sound records for scholars of mass communications, or of musical notation and sound for music etc. The potential for multi-media in journals is not high although the subject of research in some cases may be easily represented by, for example, video or speech.

iii) Scholars tend to work alone and be very specific in their interests. They search for specialist information related to their work and are not primarily concerned with keeping abreast of progress across the field. Their interest is likely to be in a few journals and they do not share the definition of relevant journals with many other scholars.

• There is no evidence that a general purpose cluster of journals could be defined that would serve the needs of a large number of scholars It is more likely that specific journals will be defined by specialist users who will also be as interested in the back list as current issues of journals.

iv) This discipline makes careful analysis of source materials and of other publications. One of the problems is locating these materials in libraries, museums etc. There is enthusiasm for having access to more of these materials from one's place of work.

• A valued service would be delivery of specialist materials on-line to the place of work. It is likely they would then be printed for study since these scholars do not wish to undertake their detailed examination on-line. People in this discipline have no great hopes of obtaining this service because there is unlikely to be enough demand to make it worthwhile creating electronic records of past materials.

v) Most scholars make use of some form of electronic technology, normally restricted to text based activities. Very few currently access electronic journals or have sophisticated local facilities.

• Offering advanced multi-media would cause difficulty because users will not have the facilities or expertise to use them. It is also unlikely these authors will be in a good position to generate advanced multi-media content for electronic journals.

3. Service Delivery (Likely Requirement)

(Factors relevant to this discipline are in bold)

a. Search on line, no full text requirement

b. Search on line, electronic text delivery for printing

c. Search and read full text on line

d. Significant unprintable MM, new forms of journal article

4. Service Scope

a. Cluster of journals common to community, current journals only

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

d. Reach beyond journals (databases, source material, etc.)

e. Communication services

5. The current state of electronic publishing

Many of the electronic journals in this field are offerings from publishers rather than from scholars in the discipline. Electronic versions of ten journals are provided by publishers to the universities participating in the SuperJournal project. They are electronic versions of the printed works with little additional multi-media at present. There is little evidence of scholars making major use of electronic search techniques. They prefer to use their colleagues to identify specialist sources and if they can obtain an electronic version they quickly revert to printing. They depend upon original sources and are very suspicious of any pre-processing by others.

Other sources examined 1.Loughborough University Pilkington Library: listing of electronic journals

http://info.lboro.ac.uk/library/elisting.html, 2.WWW Virtual Library: Humanities, Peer Reviewed

http://www.edoc.com/jrl-bin/wilma/hpr.

Communication and Cultural Studies is a loosely defined area of study and 55 electronic journals were identified ranging from those concerned with communications e.g. KINEMA - The Journal of Film and Audiovisual Media, to those concerned with Cultural Studies e.g. Cultural Interaction and Post Meodern The majority are electronic versions of published journals but 13 are electronic only

6. The future of electronic publishing in the discipline

There is very little expectation amongst scholars that electronic publication will have a major impact in this area. Their hope is for easier access although they are concerned about additional costs that might fall on them as individuals. In some specific areas, there are hopes for multi-media but more to give access to source data than to study other author's conclusions. The major hope is to have more assured access from the scholar's place of work but there are very low expectations because people are, by and large, lone scholars and they may want to go back into past issues quite a long way. They cannot think this will be a viable service for anybody to offer.

Appendix J: Psychology

1. Sources of evidence

Interview with:

1. Reader in Psychology in the Department of Human Sciences, Loughborough University.

2. Dominant characteristics of the discipline with respect to implications for electronic documents

(i) The subject area is inter-disciplinary by nature

• There is a requirement to communicate with other subject areas, to access their research results and also to disseminate to them. Communication services are likely to be important.

(ii) There are important differences between the sub-disciplines

• Certain sub-disciplines may be well suited to the use of multi-media electronic journal to illustrate various aspects of their work. Printed journals currently contain graphs, figures and tables. Multi-media may be important in certain sub-disciplines. Video, e.g. in developmental psychology, audio, e.g. in audition, and photographic images, e.g. in the neurosciences may provide new methods of illustrating research work.

(iii) Prestige is an important factor in publishing in Psychology

• Academics in Psychology are principally interested in publishing in recognised, established journals. The history of a journal is an important factor in defining prestige, electronic-only journals do not yet have the history behind them to be considered prestigious, unless they are versions of the printed journal. Electronic journals could be slow to reach critical mass in certain areas of this discipline, especially those sub-disciplines where multi-media is unlikely to be perceived as important.

(iv) Time to publication is very long in the established journals

• Currently there are quite long delays in publishing in the established journals, it can take up to 1.5 years. Electronic journals could provide a means to decreasing publication time and thus increasing efficiency of communication between academics and other subject areas.

(v) Electronic versions of printed journals are already available and becoming more popular

• Academics in this subject already have on-line access to a number of titles via the IDEAL system (Academic Press), covering the behavioural sciences area. Electronic versions of printed journals are becoming more popular because academics are able to access research articles from their desk and print off copies of important articles.

3. Service Delivery (Likely Requirement)

a. Search on line, no full text requirement

b. Search on line, electronic text delivery for printing

c. Search and read full text on line

*d. Significant unprintable MM, new forms of journal article

* This factor may be significant in some sub-disciplines, but not in others

4. Service Scope

a. Cluster of journals common to community, current journals only

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

d. Reach beyond journals (databases, source material, etc.)

e. Communication services

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals in Psychology: 1. BUBL — The BUBL Information Service (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals (http://www.edoc.com/ejournal/).

Twenty-seven electronic journals were identified. The sub-disciplines covered were: cognitive psychology, environmental psychology, experimental psychology, social psychology, human behaviour, organisational behaviour, mathematical psychology and a number of highly specific journals and general journals. The interviewee mentioned one further electronic journal core to his interests and noted the use of the IDEAL system (The Academic Press Online Journal Library), which made available several electronic versions of journals in the behavioural sciences, and was an important resource for electronic journals.

6. The future of electronic publishing in the discipline

It was felt that there would be a steady uptake of electronic journals in Psychology; there are many available already. Currently, in the more significant printed journals the time to publication is relatively long (around 1.5 years), it was felt that electronic journal publishing may help to reduce this time, and that would be one of the advantages. Multi-media may provide some useful functionality in certain sub-disciplines, although not in all. Computing services have been steadily adopted, many academics regularly use communication services, e.g. mailing lists, however use of the Internet is gradual, with the feeling amongst some academics that it is used only by fanatics. There will be little serious usage by others in the discipline who are slow to take on new methods of working.

Appendix K: Civil engineering

1. Sources of evidence

Interview with:

1. Lecturer, Civil Engineering Department, Loughborough University

2. PhD student, Civil Engineering Department, Loughborough University

Other sources:

Literature concerning the engineering disciplines:

Bishop, A.P. 1995

Gomersall, A. 1991

Moses, I. 1990

2. Dominant characteristics of the discipline with respect to implications for electronic documents

Civil engineering breaks down into number of sub-disciplines:

- Building services
- Soil mechanics
- Water
- Structures and materials
- Construction management
- Highways and transport

The data presented here come mainly from construction management.

i) There is a need for the visual presentation of information

- Construction engineering is very visual. Attempts are made to give as real an experience of the site under discussion as possible so potentially, multi-media would provide additional opportunities to do this. Case studies are used extensively and visual cues used where possible. Traditionally these have been mostly in the form of still photographs. Virtual reality is just starting to be used for case studies. More and more CAD is being used with 3-D visualisation for design work. Flow-charts and models are also used for illustrating theoretical points.

ii) There is little 'pooled data'.

- The only example that could be provided was a database of 'cost indices'. These are provided by the Building Cost Information Service and there is an electronic version paid for by subscription. These give raw data on prices and are analysed in different ways. The analyses can appear in journal publications. (It is interesting to note that this department has ceased its subscription to this electronic service because of lack of use.)

iii) Ownership of published material is an issue.

- There was concern about the ease of cutting and pasting other's work into one's own when it is available electronically.

iv) Use of IT is not particularly advanced

- Civil engineers do not seem to be very IT-oriented. There are electronic conferences using the

internet which provide multi- media material and a discussion forum but it was stated that the organisers generated all the material that was mounted from work provided by the authors; the authors themselves wouldn't have the necessary skills. It was said that IT usage is being encouraged in the discipline but that there is still a degree of resistance. The individuals interviewed said that although they would consider using an electronic version of Construction Management Economics (their key journal) there are still issues which act as barriers to use of electronic journals, e.g. having to go through Acrobat to get a printed version. There were also concerns about copyright and ownership of material, response times and the quality of search engines.

3. Service Delivery (Likely Requirement)

(Factors relevant to civil engineering in bold)

a. Search on line, no full text requirement

b. Search on line, electronic text delivery for printing

c. Search and read full text on line

d. Significant unprintable MM, new forms of journal article

(It is possible that in time, there could be a requirement for d because of the benefits from enhanced presentation of site case studies but this is likely to be some way into the future.)

4. Service Scope

a. Cluster of journals common to community, current journals only

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

d. Reach beyond journals (databases, source material, etc.)

e. Communication services

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals. : 1. BUBL — The BUBL Information Service (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals (http://www.edoc.com/ejournal/).

Thirteen electronic journals were found which are likely to be used by civil engineers from the above sources.

The interviewees were not able to identify any electronic journals of relevance to themselves. Their key journal was

Construction Management Economics and they were aware that the abstracts for this journal were available electronically. They were not however aware that the journal itself was available in electronic form. (At the end of the interview, they were informed and said that they would definitely investigate the possibility of subscribing although they thought they would have to make a choice between the paper and electronic version - they would not be allowed to subscribe to both.)

The WWW was used as a source of information both for research purposes and for teaching.

6. The future of electronic publishing in the discipline

The main benefits of e-journals were seen as being:

- ease and convenience of access
- potential for incorporating multi-media representations of case studies (sites) and of theoretical models.

It was felt that theoretically, if sufficient funding were provided, there may be enough motivation within the domain to improve the visual stimulus and provide electronic case material. It was thought however that this may not find its way into the formal journal arena but appear in conference presentations and less formal publications. For example. the Institute of Building already publishes an electronic newsletter and a paper journal which is not refereed. It was felt that the main motivating factor at the moment would be instant desk-top access but there was an awareness that the benefits just might not be great enough to sacrifice the subscription to the paper version of a journal.

Journals were said to be very important in civil engineering research (but not in teaching) and the main target group is probably postgraduate students as in this discipline most of the research is conducted by them. The main problems seemed to be awareness of what was happening electronically and in IT preparedness generally.

There were seen to be potential benefits in the production of visual (including moving and 3-D) images for presentation of building site case studies but this was perceived as being somewhat futuristic. The main concerns were that the IT skills were not readily available.

Ease of access was likely to swing any choice between paper and electronic versions of a journal in favour of electronic.

Appendix L: Electronic engineering

1. Sources of evidence

Interview with

1. Senior Lecturer, Photonic Engineering, within the Department of Electronic and Electrical Engineering, Loughborough University.

Other sources:

Literature -

Bishop, A.P. 1995

Gomersall , A. 1991

Moses, I. 1990

2. Dominant characteristics of the discipline with respect to implications for electronic documents

(Electronic & electrical engineering breaks down into sub-domains. Photonic engineering (or optical engineering) is one of these. Most of the data presented here refer to photonic engineering rather than electronic and electrical engineering more generally. The discipline is concerned mainly with lasers, imaging and sensing and makes use of the latest technology in these areas. It relies heavily on computing.)

i) Optics theory is very dependent on the visual image.

- The theoretical models are demonstrated visually and graphical simulations are produced.

ii) The relationship between academic and industry-based photonics engineers is important

- There is a commercial aspect to photonics and the discipline varies somewhat depending on whether or not the work is at the "high value" end (e.g. telecoms). It seemed to be acceptable to present a "glossy image" if working at the high value end (e.g. to provide professional conference presentations using powerpoint, video and simulations etc.) but there was the feeling that this could be counter-productive in many of the other sub-disciplines. The perception was that the multi-media could detract from the content even though the content itself concerned imaging and that even now, at conferences, academics may present by writing on a blackboard. There needed to be a clear distinction in these areas (e.g. bio-medical optics) between the commercial engineers and the academics.

iii) Time for research is a highly valued commodity

- Researchers in the field are highly skilled in electronic graphical representation, the research itself being in the field of imaging. They expect to use IT every day in their work. The nature of the data and the methods of research enquiry demand it. This however is unlikely to encourage the submission of multi-media papers as the desire of the researchers is to use these skills and the time they have available on the research itself rather than in the production of 'flashy' dissemination media.

iv) Quality is more important than quantity

- The aim is to publish in the highest quality journals. The **number** of papers published is less important. Appearance at the main international conferences is expected in addition to quality journal publications.

v) Recency is an issue

- Photonics is a fast moving discipline and there is a need to keep up to date.

3. Service Delivery (Likely Requirement)

a. Search on line, no full text requirement

b. Search on line, electronic text delivery for printing

c. Search and read full text on line

d. Significant unprintable MM, new forms of journal article

(It is possible that certain sub-disciplines could have a requirement for unprintable MM under specific circumstances, e.g. those at the 'high-value' end of the commercial market).

4. Service Scope

a. Cluster of journals common to community, current journals only

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

d. Reach beyond journals (databases, source material, etc.)*

e. Communication services

* It was stated that there can be a requirement for code for example

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals: 1. BUBL — The BUBL Information Service (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals (http://www.edoc.com/ejournal/).

Nine electronic journals were found from these sources likely to be used by photonics engineers. The Optics Society of America have recently launched an electronic only journal (Optics Express) which was known about by the interviewee. It was thought that as it was from a recognised society well regarded for its quality journals and because this one (as with the paper journals) is to be peer reviewed, it was expected that it would be an influential publication.

Many of the paper journals are already held on-line but that service has to be paid for. The author and title are available free but not the full papers. The perception was that readership of the electronic journals would not be very high and this in itself created a block to authors submitting to them. If individual departments did not have to pay and access was good, then things could be different.

6. The future of electronic publishing in the discipline

Change is likely to be slow. There are potential benefits to the photonic engineering from multi-media publications but there are considerable barriers, mainly in the form of academic tradition and the culture within the discipline. Quality of research is the priority and the community would need to be convinced that this would not be threatened. Other issues are implications for authors (in terms of time and effort although skill is not an issue) and cost for individual research groups.

Photonics engineering does not seem to be typical of engineering disciplines. It crosses domain boundaries and to a certain extent takes some of its tradition from physics. Journals are important to the scholars working in this field, both as authors and readers. There is some fragmentation in terms of the commercial pulls and pushes on the subject and there is a difference regarding the form of dissemination in the "high-value" (e.g. telecommunications) as opposed to "low-value" (e.g. bio-medical) end of photonics. It could be extrapolated from this that possibly, journals in for example telecommunications optics engineering are more likely to successfully embrace electronic multi-media.

Appendix M: Law

1. Sources of evidence

Interview with:

1. Project Director - Journal of Information, Law and Technology (eLib), CTI Law Technology Centre, University of Warwick

2. Dominant characteristics of the discipline with respect to implications for electronic documents

i) The discipline is document oriented. It is largely concerned with the identification of specific texts and their critical interpretation.

- While the use of IT and the Internet may not be universal there are strong advantages in moving towards the general use of electronic documents, particularly with respect to searching and retrieving specific texts. Electronic journals would form one such document type.

ii) The rate of adoption of IT has probably been slower in academic law than in other comparable areas.

- IT has not penetrated as far into the profession as it has in other areas of academic and professional life. The editorial policies of academic law journals are highly conservative and the 'style' of the articles is formal. This may result in a slower uptake for electronic journals compared with other disciplines.

iii) There are important, established on-line database of legal documents.

- The linking of electronic journals to on-line databases (e.g. Lexis) would provide a powerful tool for academics and professionals. Subscription agents would, however, need to devise appropriate means of fee collection for service usage.

iv) There is a marked separation in the activities of academic and professional lawyers. While they have over-lapping interests they use separate journals.

• Successful electronic journals may need to appeal to a wider, combined readership and incorporate other 'added value' items of content (court reports, discussion forum, professional affairs etc.). This is the 'model' pursued by JILT.

v) The inherent emphasis on documentary analysis has lead to a strong bias towards the printed word.

There would appear to be little advantage in the consideration of including multi-media content in electronic law journals. One exception would appear to be the use of hypertext which would allow representation of a text and multiple commentaries and interpretations.

3. Service Delivery (Likely Requirement)

(Factors relevant to law in bold)

a. Search on line, no full text requirement

b. Search on line, electronic text delivery for printing

c. Search and read full text on line

d. Significant unprintable MM, new forms of journal article

4. Service Scope

a. Cluster of journals common to community, current journals only

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

d. Reach beyond journals (databases, source material, etc.)

e. Communication services*

*professional practitioners more than academics?

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals in Law: 1. BUBL — The BUBL Information Service (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals (http://www.edoc.com/ejournal/).

Nineteen electronic publications were found from these sources. More are appearing, especially in the United States

and Australia. However, most of these are electronic versions of printed journals and there are even more non-refereed, non-original journals.

The distribution of these journals is not even throughout the discipline and perhaps not surprisingly the strongest interest lies in the Law/IT area, as with JILT. A lot of this is due to the computer literacy found in people interested in this area. However, there is now increased usage of the Internet and electronic journals are likely to spread throughout the subject area .

JILT has been successful with gradually increasing numbers of submitted articles and readers. However, the development (and success) of other titles may be more modest. The profession is inherently conservative and the (inevitable) growth of electronic journals at the expense of printed titles may be slower compared to 'younger' disciplines (i.e. the sciences).

At present only a small number of the new electronic journals are 'good' in terms of editorial policy, quality of articles and electronic design. But these are as good as the printed journals.

JILT has been preparing a business plan for 'life after eLib' and has received a degree of interest from commercial publishers. They are trying to develop a 'new' type of journal format (Electronic Bazaar) which includes original academic articles, comments, book reviews, current issues, news items etc. This is in an attempt to appeal to academic lawyers and practitioners and this is not possible in print because of the cost of page space. Currently only the larger law firms are likely to subscribe to the more academic journals.

The legal profession has made significant moves towards building on-line databases, e.g. Legal Information Network (LINK) which offers a range of added value services. However these are largely commercial services and it is not possible to make direct links into them from electronic journals.

6. The future of electronic publishing in the discipline

There appear to be opportunities for further expansion in the provision of electronic journals within academic law but this may be constrained by the rate at which the profession (rather than academic lawyers) embrace the Internet. At present the few electronic titles that have been launched have been created through the efforts of enthusiasts working in academic departments (i.e. labour subsidised). The involvement of commercial publishers seems negligible. JILT has attempted to break the mould of the academic law journal by incorporating a wider range of items - many of which are more likely to be found in a professional journal or newsletter. This strategy may well make the journal more attractive to a wider audience - particularly among the professional lawyers (presumably the majority).

The opportunities for incorporating multi-media content seem to be modest at present. Law has developed a number of on-line legal databases which are valued and well used. An obvious added value service for electronic journals would be to build links direct to these services. However, these services are largely commercial and access/charging arrangements would need to be developed.

The inclusion of images, animation, video and computer simulations as a means of representing court room evidence is a possibility but this would require the development of significant technical skills by authors. The generation of this material is not part of the authors' normal activities and it seems unlikely that the effort would be considered worthwhile.

Another opportunity for multi-media developments concerns professional skills training. Court room technique is a (surprisingly) small component of a lawyer's training and interactive video within a computer based learning package would be one way of teaching the necessary skills. However, the market for journals addressing this very specific area is likely to be small.

Appendix N: Digital libraries

1. Sources of evidence

Interview with

1. Lecturer: (Electronic Journals and the Internet), Department of Information and Library Studies, Loughborough University

2. Academic Services Manager (Responsible for electronic journal provision), Pilkington Library, Loughborough University

3. Reader and Journal Editor (Journal of Digital Information), Department of Information and Library Studies, Loughborough University

2. Dominant characteristics of the discipline with respect to implications for electronic documents

i) The discipline is 'young'. Electronic journals are an emerging sub-division of digital libraries and both are subsumed within library science.

- The sub-discipline is new, comparatively small and has little 'history'. There are few dedicated print (or electronic) journal titles as yet but the field is seen as important and likely to grow quickly. The prospects for new titles would appear to be good but possibly only in the long term.

ii) The discipline is self referential.

- Electronic journals would seem to be a 'natural' means of communicating knowledge about electronic journals. Almost by definition, interested individuals will be Internet /IT oriented and (presumably!) positive to the concept of the electronic journal.

iii) The discipline, as with Library Science in general, is not very 'academic'.

• Conferences, workshops and professional journals are often perceived as more important than refereed journals. A new 'traditional' electronic academic journal might struggle to gain submissions and readers.

iv) The content of the most journal articles, papers and research in progress is text, tables and simple graphics.

• There would appear to be very limited demand for MM content in a new electronic journal.

v) The distribution of those interested in digital journals is international but thin and patchy.

• Communication amongst participants is a critical issue. Reading and contributing to electronic journals would help unite and strengthen the field.

3. Service Delivery (Likely Requirement)

(Factors relevant to digital libraries in bold)

a. Search on line, no full text requirement

b. Search on line, electronic text delivery for printing

c. Search and read full text on line

d. Significant unprintable MM, new forms of journal article

4. Service Scope

a. Cluster of journals common to community, current journals only

b. Specialist cluster, perhaps defined at user level

c. Back-list significant

d. Reach beyond journals (databases, source material, etc.)

e. Communication services

5. The current state of electronic publishing

The following sources were used to search for the current availability of electronic journals: 1. BUBL — The BUBL Information Service (http://bubl.ac.uk/); 2. Loughborough University: Electronic journals (http://info.lboro.ac.uk/library/ejournals.html); 3. The World-Wide Web Virtual Library Ejournals (http://www.edoc.com/ejournal/).

There were 28 journals identified from these sources in the field of information science. There are very few refereed electronic-only journals (the substantial list owes more to the fact that the respondents are specifically interested in electronic journals per se) so it is difficult to claim that they are spread evenly throughout the discipline. In fact there would appear to be a cluster within the electronic publishing sub-area. One estimate was of 15-20 electronic version journals in the discipline with a similar number of established newsletter type journals.

In addition to the formal constituted journals there have been a very large number of e-mail based journals which have existed since before the Web. Many of these are discussion or news oriented.

6. The future of electronic publishing in the discipline

It is likely that electronic journals will increase in number in this area because (i) of the interest of those engaged - they are by definition oriented towards Internet usage and dissemination - and (ii) a host of 'time is right' reasons. Electronic journals will also help bring a disparate field together but this is more a function of the Internet rather than electronic journals per se.

The growth in academic, refereed journals may well remain modest because of the lack of an academic tradition in IS. There also appears to be little reason to expect a growth in multi-media content. Multi-media is not relevant to Information Science teaching or research. Hypertexts are the possible exception but there has been little enthusiasm so far for developing these, probably as a result of the very heavy cost of production.

One respondent was keen to raise the issue of information over-load. They claim to rarely check the Web pages of electronic journals because of the time cost of doing this. In contrast they were more likely to look at material actively pushed into their e-mail box. This may indicate that if electronic journals continue to grow in numbers then intelligent alerting services will be critical.