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**User-Based Evaluation of Academic Digital
Libraries: case studies Social Science Information
Gateway (SOSIG), Art Design Architecture & Media
Gateway (ADAM) and the Electronic Journals Service of
the University of Patras, Greece**

Vol. I

By

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**This thesis is submitted in fulfilment of the requirements for the
award of PhD degree**

City University

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Abstract

The purpose of this study was to evaluate the use of academic digital libraries from a user-oriented approach. For this purpose, end-users were invited to describe how they perceive and make use of academic digital libraries. The study was focused on Subject Based Information Gateways (SBIGs) and Electronic Journals Services. Specifically, two gateways were examined: the Social Science Information Gateway (SOSIG) and the Art, Design, Architecture and Media (ADAM) gateway, and an electronic journals service: the Electronic Journals Service of the Library and Information Service (LIS), the University of Patras, Greece. The target group was the academic community: academic staff, research staff and students (undergraduate and postgraduate). The research methods used were online questionnaires, face-to-face interviews and transaction logs analysis (TLA).

Concerning the perception of academic digital libraries, users were invited: to provide the advantages and/ or disadvantages of electronic information over print, to compare the electronic and print version of a piece of information, to evaluate services or features as very important, important, or not important and to specify factors that would discourage them from accessing a digital library. Regarding the use of academic digital libraries, users were asked to specify: how frequently they use digital libraries, what reasons they use digital libraries for, what place they gain access from, what their preferred method of searching for information is, what their preferred method of storing and reading electronic information is, whether they use the support services provided, what types of information they want to be provided with and what the role of communication in a digital library is.

The study concluded that end-users seem to appreciate the implementation of academic digital libraries. However, there are still some disadvantages that might prevent them from accessing them. A typical user would access them from their office or home for a variety of reasons, such as: for writing up a term paper/project or a thesis/dissertation, writing up a paper for publication, e.g. journal article or conference/workshop paper, keeping up with progress in the relevant subject area, supporting a lecture or for personal reasons. Concerning their search behaviour, they would adopt a relatively unsophisticated, simplistic approach to searching and limited use of Boolean operators or other commands. Notwithstanding their low search abilities, they would be reluctant to consult the online help function that could support their searches. Sometimes, they prefer to ask a person rather than attempt to use the online help.

When they have identified information and want to read it, they print it out. But, when they want to store information for the future, they either print it out, or save it on disk. This information might differ in its formats, including electronic journals, reports and papers, digitised books, scholarly mailing lists and archives and educational software. Finally, some users would appreciate the opportunity to communicate with information scientists, authors, or other users who share the same interests with them. Some others emphasized the importance of the communication between users and digital library systems.

Chapter 1

Introduction

The idea of this research initiated from the importance of evaluating the use of academic digital libraries. An examination of published literature shows that the evaluation of the use of digital libraries is a vital issue for their implementation. They contribute to identifying and addressing specific issues and requirements for immediate or future action in order to create libraries that are useful and effective (Van House, 1996). In particular, evaluations are able to provide ideas regarding the services that academic digital libraries should offer to their end-users. For example, they provide information for searching or browsing facilities, for support services, for reading information in electronic format, for storing information for future use or for communicating with information scientists or other users who share the same interests. For this purpose, end-users have been identified as playing a vital role in these evaluations providing their personal experience and opinion on academic digital libraries. They are able to inform those who are responsible for creating digital libraries about a variety of issues, such as the searching or/ and methods that users should be provided with, the type of information that users expect to find in a digital library, the support services they prefer to have or the preferred method of storing information for future use.

The Electronic Library Programme (eLib) and the Digital Libraries Initiative (DLI), which are two leading research programmes in the implementation of digital libraries for the academic community in the UK and the USA respectively, have both shown an interest in users (Kelleher, Sommerland, Stern, 1996). Regarding the eLib study, in 1996 they published a paper in which they described a number of guidelines for the evaluation planning of the eLib programme. Specifically, they suggested that the contribution of users to the

development of digital libraries is an essential element. Their help is centred on a variety of issues, such as that of indicating their preference from among given design alternatives, testing the usability of a system, testing versions of systems which reveal major problems, and suggesting improvements that a system might offer in order to satisfy the information needs of its customers.

On behalf of the DLI, Bishop (1995a) – one of the leading members – states that:

'Results from user studies can help digital libraries designers and policymakers formulate appropriate goals, arrive at a more complete understanding of costs and benefits, design and allocate resources to both technologies and programmes that offer the best means of achieving goals, and assess the degree to which network policies and programmes have achieved their stated goals.'

Similarly, an earlier but prominent piece of research in the area of digital libraries was the ELINOR project of De Montfort University (Ramsden, 1998). It was the first project to build a working electronic library for use by students in a UK university. The ELINOR project also showed a great interest in users and evaluations based on their experience. It is an attempt to fill some gaps in knowledge regarding the attitudes, activities and problems of users. Then, this data would indicate priorities for improvements to digital libraries and/ or for incorporation in libraries.

This study is focused on Subject Based Information Gateways (SBIGs) and Electronic Journals Services. Both have been identified as research areas of the broader study in the development of academic digital libraries. Although today there is more than one definition of what constitutes an academic digital library, this study identifies that digital libraries have the following characteristics:

- Information provided is in digital form.
- Information is organised.
- Information is able to be searched and browsed. End-users are provided with some other value-added services, such as online help or alerting notices.
- Information is not entirely bibliographical or exclusively pointers to other material, but it must contain some full-text material in a variety of formats.

- Provision of information is permanent.
- Information scientists or professionals are responsible for selecting structure, offering intellectual access to, interpreting, distributing, preserving the integrity of, and ensuring the persistence over time of collections of digital works.

The interest in researching the use of electronic journals arose from the belief that electronic journals are an innovation with implications more profound than the simple replacement of one mode of transmission by another. Some people claim that electronic journals represent the pattern for future use; they are able to revolutionise scholarly communication (Harnad, 1992; Odlyzko, 2002). For example, research on the implementation of electronic journals was initiated in the UK academic environment in the belief that they are able: (1) to release valuable space used to store back runs of journals, (2) to help to make scholarly communication and the publication of new research findings quicker and more flexible, and (3) to enable much more flexible searching and analysis, as well as selective use of journal contents (Joint Funding Council's Libraries Review Group, 1993).

However, it is important to look into the end-users' use and perception of currently available electronic journals and their expectations for future use (Liew, Foo, and Chennupati, 2000). The way they use electronic journals and - most importantly - how they value them is a major factor in determining the ultimate failure or success of electronic journals (McKnight, 1997a; Pedersen and Stockdale, 1999; Baldwin and Pullinger, 2000). Success in their dominance as the primary medium for scientific journals cannot occur until these electronic documents are seen as superior to the print format. They should offer services or features that are better than print journals. Finally, the fact that electronic journals are the offspring of print journals implies that users could compare the two versions. They could provide the advantages and/ or disadvantages of each format and indicate which one they would incline towards and for what reasons.

This research has examined the use of the Electronic Journals Service of the Library and Information Service (LIS) at the University of Patras, Greece. The interest in studying a Greek service derived from the fact that in Greece there is no research based on user-centred evaluations of electronic journals. In addition, the decision to study this specific electronic

journals service of Greece is based on one more fundamental reason: during the period that this research was in progress, the electronic journals service of the University of Patras was a new service. Therefore, the target audience was being familiarised with online information resources. In this case, the research could provide an overview on how ‘fresh’ users obtained data, whether they faced any difficulties or which services they preferred.

Regarding the concept of Subject Based Information Gateways, it was popularised in the UK Electronic Libraries Programme (eLib) (Dempsey, 2000). The eLib was responsible for implementing and introducing digital libraries in the UK academic environment. They noted that the traditional information environment, human intermediaries, such as publishers and librarians, filter and process information so that users can search catalogues and indexes of organised knowledge as opposed to raw data and disparate information. Subject gateways work on the same principle - they employ subject experts and information professionals to select, classify and catalogue Internet resources to aid search and retrieval for the users. Users are offered access to a database of Internet resource descriptions, which they can search by keyword or browse by subject area. They can do this in the knowledge that they are looking at a quality-controlled collection of resources. A description of each resource is provided to help users assess its origin, content and nature very quickly, enabling them to decide if it is worth investigating further (Desire Project, 2000; Kirriemuir and Ferguson, 1999).

When this study started, information gateways were a new area of research. An examination of published literature showed that there were no studies on the use of information gateways based on user experience. However, in order to optimise the gateway service it is important to gain a better understanding of end-users’ behaviour and requirements in relation to subject gateways. Then, they will be able to meet the needs of their target audiences (Heery, 2000).

1.1 Aims and objectives

The primary aim of this study is to evaluate the use of academic digital libraries by means of a user-centred approach. Then, this data will be valuable in determining whether their use conforms to the previous findings found in the literature review and whether it differs from what has been discovered about end-users.

Two types of academic digital libraries, Subject Based Information Gateways (SBIGs) and Electronic Journals Services, will be examined in this study in order to identify similarities and/ or differences in their use. Questionnaires, interviews and transaction log analysis (TLA) are the methods of research used in order to provide qualitative and quantitative data, thereby creating a more comprehensive picture of how digital libraries are used and perceived by users. Although most researchers prefer either quantitative or qualitative research work, some have suggested combining one or more methods in the same study. At a general level, this method has the advantage that researchers are able to capitalise on the strengths of the two approaches, and to compensate for the weaknesses of each approach. Additionally, multiple types of data analysis techniques not only provide more data and different types of data but can also be used on the different types of data with the goal of gaining a more comprehensive and valid understanding of human information behaviour.

In particular, this study aims to gain an understanding of how end-users perceive and use academic digital libraries. Specifically, it is focused on drawing the profile of the academic digital library user by researching their current search habits, practices, perceptions and ways to obtain information.

Specifically, the objectives regarding the way end-users perceive academic digital libraries are:

- to specify whether they use them as a supplement of or replacement to the traditional forms of academic libraries,
- to specify whether they would use them again in the future or recommend friends or colleagues to use them,
- to specify whether there is an increase in the use of academic digital libraries as time goes by. In addition, to show the times, days and months that users access academic digital libraries,
- to evaluate academic digital libraries in relation to the traditional forms of libraries. For this purpose, users are invited to specify the advantages and/ or disadvantages of academic digital libraries over the traditional ones. Also, in order to gain a further understanding they are asked to compare the electronic and print version of a piece of information. Those who have the experience of using both formats could specify the advantages of each. Then, people who are in charge of developing digital libraries

should take into consideration the advantages of the print version and the disadvantages of the electronic version. Regarding the print version, these advantages should also appear in the electronic version. On the contrary, they should think hard about the disadvantages of the electronic format and find ways to get rid of them,

- to evaluate academic digital library services or features as very important, important, or not important. The purpose is to identify which services or features are described as more important than others. Then, the services that will be characterised as the most important ones are probably the ones that users expect to be provided by academic digital libraries, and
- to specify factors that might prevent them from using a digital library.

Then, the objectives of this study regarding the way that end-users make use of academic digital libraries are to specify:

- the frequency with which users have access to academic digital libraries,
- the place from which users gain access to academic digital libraries,
- the reasons for which users access academic digital libraries,
- the searching methods used in order to search and obtain information provided by academic digital libraries,
- the support services they consult when they have difficulties in carrying out their search,
- the way they read the information provided by academic digital libraries. For example, most times, users are able to print data out or save it on disk. Others can read information directly from the screen,
- the way they store information obtained by academic digital libraries for future use. For example, users can save information on disk, or print it out,
- the types of information that users have access to. Users are able to find on the Internet a variety of information, including electronic journals, reports and papers, digitised books, scholarly mailing lists and archives, educational software, bibliographical databases, electronic newsletters and home pages of key organisations, and
- the way that users communicate with information scientists, authors, or other users who share the same interests.

1.2 Scope

1.2.1 *Types of end-users studied*

For the purpose of this study, the target group is the academic community; academic and research staff, and students (undergraduates and postgraduates). This is due to the belief that the academic community is possibly the largest and the most important user group of academic digital libraries (Meyyappan, Chowdhury and Foo, 2001). In addition, Covi (1999) believes that the way that university members use them at present would indicate how other populations might use them in the future. Regarding their requirements from digital libraries, they are influenced by a number of different issues. These issues are the nature of their work, their educational background, and their accessibility to technology. The nature of their work varies according to tasks they need to accomplish in an academic setting. In the Internet era, academics can obtain information to support their teaching and / or write a paper. They can also find information just in order to keep abreast of information published in their subject area of interest.

1.2.2 *Case studies*

Two Subject Based Information Gateways are studied: the Social Science Information Gateway (SOSIG, [http:// www.sosig.ac.uk/](http://www.sosig.ac.uk/)), and the Art, Design, Architecture, and Media Gateway (ADAM, <http://www.adam.ac.uk/>), and one electronic journals service: the e-journals service of the Library and Information Service (LIS) of the University of Patras, Greece ([http:// www.lis.upatras.gr/cgi_bin/ej3/ej.pl/](http://www.lis.upatras.gr/cgi_bin/ej3/ej.pl/)).

The selection of two gateways is based on the fact that they refer to different subject areas. SOSIG provides information to social scientists, while ADAM focuses on identifying information for humanists. Therefore, having results from both gateways would provide information on how more than one category of searchers (social scientists – scientists) use and perceive subject gateways. On the contrary, the specific electronic journals service covers a variety of subject areas providing access to journal titles from different areas of interest. The subject areas that it concentrates on are: humanities and social sciences, natural and applied sciences, economics, medicine, pharmacology and life sciences. Hence, one electronic journals service can describe the way that end-users from a variety of disciplines use and perceive electronic journals. In addition, the SOSIG and ADAM gateways are UK

projects of the Electronic Libraries Programme (eLib). They are included in the same research area entitled 'Access to Network Resources'. This implies that it is easier to compare their results when their goals are similar based on the same general concept of developing accessible network resources.

At this point, it would also be valuable to refer to the audience of SOSIG and ADAM gateways and the electronic journals service. SOSIG and ADAM gateways are able to be used by any end-user located in any part of the world. Although they were designed in the UK and have been based there until now, they can be accessed by any European or other country. There is also another issue that supports the fact that both gateways are used by anyone. End-users can belong to different communities without any restrictions, such as academic, commercial, educational, or industrial. These universally accessible services are able to provide valuable information concerning the use of Subject Based Information Gateways. They can reveal the number of end-users that access them and most importantly indicate how many of these are from the academic environment. In this case, it is possible to show whether the academic community represents the group of end-users that access them the most. The fact that these services have been implemented by a higher education system does not guarantee their use by the academic community.

On the contrary, the situation for the electronic journals service is different. The service is accessible only to Greek end-users located in Greece. These end-users are registered as members of the University of Patras, being academic staff, research staff or students. Access to any other non-members of the university is not allowed. Therefore, it is defined as a strictly accessible service targeted at a specific group, the academic community.

Nevertheless, the fact that the service is open to a specific located group of end-users is an advantage. It is possible to identify the local factors that affect the use of electronic services. Pullinger (1999) believes that the local information environment is likely to have an effect on the use of electronic services and attributes to this fact the great difference in use in the various electronic services. Researchers are able to provide more justified explanations of the use and non-use of an electronic service when they are aware of the various local factors. Also, Pullinger names a number of local factors which play their role in the use of electronic services, including technical infrastructure, training and support for information retrieval, and promotion of availability of electronic services. For example, some users may be driven by

need to access electronic journals only if the appropriate training is provided to them; others may feel more confident and use them without the appropriate induction; and others may believe that the time that a service is accessible is not enough for them. All these indicators might prevent users from accessing electronic journals, reducing their use. Then, the low percentage of use gives the impression that end-users are not willing to access electronic journals.

The strict access to the electronic journals service of the University of Patras contributes to the fact that it is possible to identify the various local factors that might prevent end-users from using it or encourage them to do so. For example, it is possible to describe the technical infrastructure that supports the university, such as the places that users are able to have access to electronic journals from.

1.3 Description of digital libraries studied

1.3.1 Social Sciences Information Gateway (SOSIG)

In 1992 the Economic and Social Research Council (ESRC) appointed a networked information support officer to examine the potential for the use of networked information amongst the UK social science community and to encourage further development. Results of this research showed that social researchers were not reaping the benefit from networked resources. This happened either because they were unwilling to navigate through the Internet and locate material of interest to them or because they did not have the time to spend. The project that grew from this idea was the Social Science Information Gateway established in 1994 as a pilot project. It was designed by the Institute for Learning and Research Technology (ILRT) based in the University of Bristol. It is a project funded by the ESRC and Joint Information Systems Committee (JISC) (Hiom and Ferguson, 1996).

The basic aim of SOSIG was to set up a 'one-stop-shop' for UK social scientists providing researchers and practitioners with a trusted source of selected high quality Internet resources in the social sciences, business and law (Hiom, 2000). The primary feature of the service is the SOSIG Internet catalogue, which is a database of Internet resources. The Catalogue is the Internet equivalent of an academic library, where information scientists and technical staff use a combination of traditional library practices to create a quality collection. Resources

should be focused on one of the following subject areas in order to be included in the SOSIG Catalogue: Economics, development - Education - Environmental issues - Ethnology, social anthropology - Geography - Government, military science - Law - Management, accountancy, business - Philosophy - Politics - International relations - Social science general-methodology - Social welfare-community, disability - Sociology - Statistics-demography - Women's studies.

Concerning the nature of resources provided, there is a wide range of formats. These are: electronic journals, reports and papers, educational software, electronic newsletters, home pages of key social science organisations, digitised books, scholarly mailing lists and archives, bibliographical databases, datasets, and bibliographies. The SOSIG Catalogue is characterised as a selective catalogue of resources. This implies that it only focuses on Internet resources of a high quality that can support education and research. These resources come from any country, written in any European language. However, there is a particular emphasis on European resources. In order to value the quality of resources, researchers are advised to follow the guidelines of two important evaluating documents: the *Scope Policy* (SOSIG Scope Policy, 2000) and the *Selection Criteria* (SOSIG Selection Criteria, 2000).

The scope policy outlines the collection parameters in terms of the language, geographical coverage, subject, resource description and access issues, such as technology, cost and registration. Then, if a resource falls within the scope policy it should be evaluated in terms of its content, form and process. These criteria are called quality selection criteria. The content criteria are: the validity, authority and reputation of source, substantiveness, accuracy, comprehensiveness, uniqueness, and composition and organisation. The form criteria are: the ease of navigation, provision of user support, use of recognised standards, appropriate use of technology, and aesthetics. And the process criteria are: the information integrity, site integrity, and system integrity. The latter process is more difficult than the scope policy procedure; however, it is essential to weigh up the strengths and weaknesses of a resource in order to form an overall judgment.

The next step, when a researcher has identified a resource that satisfies the parameters of both evaluating documents, is to catalogue it. Resources are catalogued using a standard template creating a record for each of the Internet resources. The record contains information (metadata) about the resource including the title of the resource, keywords, descriptions (a

brief summary of the content of a resource), the country in which the computer hosting the resource is located, the language that the resource is written in, and the Universal Resource Locator (URL) or network address. The record is then entered into the catalogue database. When someone searches the SOSIG catalogue, he is actually searching the information held in the database and not the resources themselves. This means that it is more likely to get higher precision from the search, as people who are in charge of creating these records have ensured that the descriptions and keywords are carefully chosen to help users find information relevant to their information needs.

Users are able to express their opinion on which search method they prefer - search or browse. Searching the catalogue is a valuable retrieval method when users know what they are looking for: for example, a specific resource or piece of information on a specific subject area of social sciences. There is the basic search and the advanced search. The basic search is more simple than the advanced search because users have only to type-in one or more keywords in order to retrieve resources. On the other hand, the advanced search provides users with the advantage of restricting their search in two ways. First, they can search for keywords that exist in a specific area of the record, such as in the title or in the description area. And second, they can restrict their search by resource type, such as electronic journals or educational software. Also, there are four more tools that support the advanced search. The first tool refers to the structure of the results of a search ('hits'). While a standard 'hit' contains the information provided in a record, users are able to ask the system to display only the titles of the resources. The second tool is the case sensitive function. The third tool is the stemming. The fourth tool is the ranking, where 'hits' records with most instances of keywords are displayed first.

The simple or advanced search is further supported by the possibility of using thesauri. The thesaurus is a utility which provides users with a list of alternative search terms. It contains listings of terms used within the SOSIG Catalogue, organised into a hierarchy of relationships. The aim is to increase the number of 'hits' when initial attempts retrieve few or no relevant results or if users cannot think of appropriate search terms to start with. Alternatively, users might need to broaden or narrow the subject focus of their search in order to find useful resources. They can do that either by using the Boolean operators AND, OR and NOT in their search, or by using broader or narrower search terms provided by the thesaurus. Search terms used in the SOSIG thesaurus are derived from Humanities and Social

Sciences Electronic Thesauri (HASSET) developed by The Data Archive at the University of Essex.

Browsing offers users the chance to find all the available resources under a particular subject area, or relating to a particular geographical region. It is a way of seeing what is available, and of finding information without having to think up specific search terms. For a wider search, users can look at resources from around the world, for a European focus, users can browse resources located on computers in Europe. Behind the scenes, browsing is made possible by the use of a classification scheme. SOSIG uses the Universal Decimal Classification scheme (UDC). Each resource is allocated a classification number, based on the subject area it relates to. The SOSIG database uses these numbers in order to arrange resources automatically into browsable lists arranged under subject headings.

Apart from the search and browse functions users are provided with a number of additional services: The *What's New* and the *Add New Resources* services. The first service aims to show users the resources that have been added to the SOSIG Catalogue lately, while the second service provides to users the chance to suggest resources that might be useful to include in the SOSIG Catalogue. Finally, there is the online help function whereby end-users can find information about how to use the service.

In 2000, SOSIG launched its brand new service. This new service is similar to the old version providing the same services. However, there is a new interface with improved design and navigability. Also, it provides three additional services to help users to find accurate, current, authentic information resources in social sciences (Inform, 2000). The new features include: the SOSIG Harvester Index, the social science grapevine and the 'my account' service. The Harvester Index was an attempt of the SOSIG team to expand and enhance the central database of selected resources providing access to an automated database of over 50,000 social Web pages. Whereas the resources found in the Internet Catalogue have been selected by subject experts, those in the Harvester Index have been collected by software called 'harvester'. Grapevine is the 'people oriented' side of SOSIG, allowing end-users to search and/ or browse details of university social science departments and relevant conferences and courses. In addition, they can make their CVs available online freely accessible to all visitors to the site. Finally, the 'my account' service refers to the personalised account area on SOSIG. End-users who would like to customise their use of SOSIG are asked to enter their subject

interests and information preferences into a database, enabling the service to notify them of new resources and related information. Also, it allows information and service providers to post information of new social science conferences and courses to Grapevine. Finally, there is an increase in the number of thesauri. There are currently three subject thesauri available through SOSIG, while the old version provided only one. These thesauri are: Humanities And Social Sciences Electronic Thesauri (HASSET), Government, Politics and Anthropology (IBSS) and Social Work and Welfare (CareData).

1.3.2 Art, Design, Architecture and Media Gateway (ADAM)

ADAM was launched in 1996, funded by the Joint Information Systems Committee (JISC). However, since 2000 it has not been in active development. All areas of the site other than the search engine are closed. According to the ADAM team, its role will be continued by the forthcoming Arts and Creative Industries (ACI) Hub.

Originally, it was a service developed in order to help users find useful, quality-assured information on the Internet and pledged to serve its dedicated user community with the highest of standards. As part of a UK higher education programme, ADAM is essentially compiled for the academic community covering the following subject areas:

- ❑ **Fine Art:** including painting, prints and drawings, sculpture and other contemporary media and practices, such as fine art using technology and performance art
- ❑ **Design:** including industrial, product, fashion, graphic, packaging and interior design
- ❑ **Architecture:** including town planning and landscape design, but excluding building construction
- ❑ **Applied Arts:** including textiles, ceramics, glass, metals, jewellery and furniture
- ❑ **Media:** including film, television, broadcasting, photography and animation
- ❑ **Theory:** including relevant historical, philosophical and contextual studies
- ❑ **Museum Studies and Conservation**
- ❑ **Professional Practice** related to any of the above subjects (Bradshaw, 1997)

The development of ADAM is directed by a Steering Group made up of representatives from nine institutions. Each institution nominates a representative to sit on the ADAM Steering Group in order to make strategic decisions about the development of the service. The

institutions' partners are the following: The Surrey Institute of Art and Design , which is the lead partner, the University of Northumbria at Newcastle, which hosts the WWW server, the National Art Library, Glasgow School of Art, The Tate Gallery, Middlesex University, Winchester School of Art, University of Southampton, Birkbeck College, and Coventry University. There is also a former partner, the University of the West of England and a former JISC representative from UKOLN.

The primary feature of the service is the catalogue, which is a database of Internet resources. It provides a variety of Internet resources. These are: discussion lists, resource lists and guides, recruitment and employment resources, electronic journals, training materials, guides and tours, and reference and directory resources. Similar to the SOSIG gateway, records in the ADAM Catalogue are created. Each record provides a description of each Internet resource included in the database. Users are able to search or browse. By searching, the ADAM search engine is looking for records that contain the exact words users entered into the query box (keywords). It automatically searches the title, description, identifier, and keywords or subject fields. This is the simple search. However, users are able to use other more advanced methods of searching of information. These are: option search (search specific fields, such as title or keyword), advanced search, proximity search (search by specifying how close your search terms must be to each other), and what's new search (search for the most recently added records). Use of Boolean operators is possible, while end-users can find narrower or broader terms using the Art & Architecture Thesaurus (ATT). Regarding browsing, there are three options: ADAM browser (browse the database by subject headings created by ADAM), multi-option browser (browse the database by any combination of the following: historical period, resource type, subject headings and the Art and Architecture Thesaurus, and place name browser (browse the database by geographical area, based on the thesaurus of geographic names).

The records in the ADAM database are created by a group of professionals who are responsible for locating, evaluating and cataloguing online resources. The Collections Policy (ADAM Collections Policy, 2000) describes the types of resources that are suitable for inclusion in the ADAM database. It provides guidelines regarding the subject area, target audience and types of resources preferred. Then, professionals evaluate the quality of resources on the basis of their content, structural design and navigability and overall

appearance and usefulness. The guidelines are broken down into several areas for evaluation, therefore resource for inclusion in the database must:

- be relevant to ADAM's subject scope,
- be accurate,
- contain a significant amount of unique data, where data can be text, images, etc.,
- be authoritative, and to
- be relatively current (Bradshaw, 1996).

Finally, they use the traditional tools and skills of librarianship to create a detailed description of any resources. ADAM uses the Universal Decimal Classification scheme (UDC). Each resource is allocated a classification number, based on the subject area it relates to. In addition, a set of cataloguing rules (Bradshaw, 1997) has been drawn up, based upon the Anglo American Cataloguing Rules (2nd ed.) and Nancy Olson's (OCLC) *Cataloguing Internet resources: a manual and practical guide* (Olson, 1996).

Except for the main ADAM database, there are some additional features: the '*Friends of ADAM*' and '*Nominate a site*'. The '*Nominate a site*' service offers to end-users the chance to nominate and review sites that they would like to see included in the database. Also, there is an online feedback form used to obtain critical comment about the ADAM gateway. Finally, there is the online help whereby end-users can find information about how to use the service properly.

1.3.3 Electronic Journals Service of the Library & Information Service (LIS), University of Patras (Greece)

The electronic journals service of the Library and Information Service (LIS) of the University of Patras was introduced in December 1998. Initially, it provided access to 150 journals. Later in March 1999, thanks to the establishment of the Hellenic Academic Libraries Consortia (HEAL-Link, <http://www.heal-link.gr/>) and the first license agreements between HEAL-Link and major publishers/ providers, the LIS was able to offer access to more than 2500 journal titles. The HEAL-Link operates as a consortium and comprises the 32 Higher Education Institutions of Greece, the Academy of Athens and the National Library of Greece. Generally, the purposes of the link are: the creation and operation of a Union

Greece. Generally, the purposes of the link are: the creation and operation of a Union Catalogue of Hellenic Academic Libraries, the development of standards in library operations, the continuous training of staff, the common subscription to electronic resources and information services and the cooperation with relevant organisations both domestic and foreign for the assurance of the participation of HEAL-Link in international developments concerning library operations and management copyright. The HEAL-Link is a member of the International Coalition of Libraries Consortia, an international organisation for the advancement of cooperative efforts among libraries world-wide.

Then, there were individual agreements with other publishers in the period up to Autumn 2000 that raised the number of journal titles up to 3200. Approximately, there were journal titles from 40 different publishers/ providers covering a wide range of subjects.

Access is possible to all journal titles only from inside the campus. Sometimes also a username and/or a password is required in order to have full-text access. Most of the e-journals are in the English language.

The LIS aims to provide a user-friendly web service offering simple, but effective search and browse facilities. This web service is a Metadata Management System that targets to provide end-users with relevant web sites and reduce the navigation and information retrieval time. The system is based on a number of scripts, written in Perl and designed in such a way as to handle simple text databases. A unique database is created for every publisher/provider including all the appropriate metadata sets for every journal title. These sets are: the title, home page URL, subject, and access status information (content level access, access recognition type- IP (Internet Protocol) recognition or use of passwords, etc.). The system offers indexing by title, subject, and publisher/provider, while an online help module is available as well. The aim of this online help service is to provide instructions to users on how to use the e-journals service of LIS. Also, each journal title offers online help indicating how to search a specific journal title.

Each journal title is linked directly to its home web page providing information about journal titles including access status, publisher/provider information and links, copyright notices of use for specific journal titles. In this way, users obtain notice of terms and conditions of use

and/or any restrictions on use, and also LIS is able to collect useful statistics for each journal title accessed.

Use of the e-journals service is monitored furnishing information on IP address, date and time of access and journal title accessed. From this information we are able to obtain useful statistics such as: which departments use the service, which journal titles are used most/ least and the number of potential users who accessed the e-journals service. However, the number of IPs do not always represent the real number of users who accessed the service. An IP address can identify the computer that access took place from, but it is possible that more than one user accessed the service from the same terminal.

1.4 Limitations of study

A limitation of this study is to generalise its results and conclude that the findings of this study show how the majority of end-users use and perceive academic digital libraries. In order to support this, a greater number of academic digital libraries and end-users should be studied.

In addition, although someone could expect that the findings obtained regarding Subject Based Information Gateways (SBIGs) show the way that the majority of their end-users use and perceive academic digital libraries, this is not possible. This occurs because there is not information about the actual number of users who accessed the gateways every month. The only data that is known is the number of accesses/ file requests and the IPs numbers that specify the location that accesses take place from. For example, regarding the SOSIG survey in the space of a month when the research took place there were approximately 300,000 requests for files. But, it is known the number of users who carried out these requests. Regarding, the IPs number it is possible to reveal that these requests occurred from different UK Universities and to specify these Universities. But, it is not possible to figure out the number of individual users who accessed the SOSIG system.

In addition, it was difficult to attract a great number of respondents who were located in different parts of the world. However, in order to persuade users to take part in this research and increase the response rate, all those who were included in this study were able to decide whether they would like to enter for a draw, where the prize was books. The winner was only

one person per case study. On the contrary, it was easier to persuade the academic community of the University of Patras to contribute to this research. For example, the Library displayed some notices that advertised the existence of this study and some members of the academic staff informed their undergraduate and postgraduate students. Similarly, all those who took part in this research could enter for a draw, where the prize was either a book or a CD. The winner was only one person.

Chapter 2

Literature Review

This chapter is divided into two parts. The first part aims to show the various concepts and entities used in order to define the term 'digital library' and explain why this term has different meanings. It also provides an overview on the research carried out regarding the implementation of academic digital libraries. The second part is concerned with the actual impact of electronic information resources on end-users as reported in the literature and particularly in studies of information use and communication in the academic community. It is focused on showing how users use and perceive academic digital libraries. It describes their searching behaviour and need for support services, such as online help function or training sessions. Then, it presents the advantages and disadvantages of academic digital libraries. In addition, it provides which version of information – print or electronic – users prefer to use when they are able to have both.

2.1 Definitions of digital libraries and research on the implementation of an academic digital library

2.1.1 Definitions of digital libraries

The term 'digital library' is the most recent in a long series of names for a concept that has been written about nearly as long as the development of the first computer. In 1945, Bush (1945) published a groundbreaking article entitled: 'As we may think' in the *Atlantic Monthly*, in which he forecast among other things, the 'memex'. It was a writing, reading, filing communication system that was contained in a desk and comprised a screen and a

keyboard. Memex was the prototype of the personal computer. It was the first attempt at a design that involved a machine in the management of information. Its purpose was to extend the human memory by providing the means to organise information associatively, creating an intricate web of trials interconnecting the memories and data with the mind. Nowadays this process of linking information is called hypertext, which is the fundamental philosophy of digital libraries. Twenty years after the concept of 'memex' in 1965, Licklider (1965) coined the phrase 'library of the future' to refer to his vision of a fully computer-based library, and ten years later Lancaster (1978) wrote of the soon-to-come paperless library. About the same time, in 1974 Nelson (1974) invented and named the previous inspired hypertext.

Nowadays, there is more than one definition of what a digital library is. One reason for the confusion of terminology is that different phrases over the years have been used as synonymous with the term digital library. These are: *electronic library*, *virtual library*, *library of the future*, *library without walls*. But, it never was quite clear what each of these different phrases meant. However, Griffin (1998) provided three different definitions for the terms: electronic, virtual and digital. The term 'electronic' in electronic libraries refers to the nature of technologies that operate on information. 'Virtual' in virtual libraries implies a synthetic environment that resembles the original, physical environment; human experience and interaction with objects in a virtual library are similar in some degree to that in a physical library. Finally, 'digital' in digital libraries refers to a representation of information on electronic media.

Another reason is that research and practice in digital libraries are being conducted concurrently at each stage of the continuum from the basic research to implementation. This has the result of making digital libraries the focal point of many different areas of research. Scholars of computer science are mainly concerned with enabling technologies and networks. Scholars of library and information science are largely concerned with content, organisation, user behaviour, and publication. Those studying sociology or economics are more likely to focus on social context and economic models, respectively. Scholars of application areas, such as education, geography, arts or humanities may combine all these areas with expertise in their problem domain. Therefore, what constitutes a digital library differs, depending upon the research community that is describing it. For example, from an information retrieval point of view, it is a large database; for people who work on hypertext technology, it is one particular application of hypertext methods; for those working in wide-area information

delivery, it is an application of the Web, and for library science, it is another step in the continuing automation of libraries that began over 25 years ago (Cleveland, 1998; Borgman, 1999).

Griffin (1998) claims that the meaning of digital libraries continues to evolve. More definitions of digital libraries will be introduced because technology advances and, more importantly, people explore new possibilities offered by open, dynamic, globally distributed information environments. In addition, he claims that it is a benefit to keep the concept of digital libraries as open as possible for as long as possible. This attitude has the advantage of providing a wider area of research. On the contrary, a 'hard' definition might prematurely shape or constrain future discourse, research and practices. Similarly, Elliot and Kling (1997) shared the same opinion, specifying that if digital libraries are narrowly defined, then we might lose the ability to learn about key issues from previous research, theory and professional practice in information science and librarianship.

However, at this point it would be useful to provide a number of these approaches in order to show this diversity of ideas regarding the concept of digital libraries. Bawden and Rowlands (1999), suggest that twenty '*assumptions*' underlying research in the area of digital libraries can be identified. These assumptions deal with:

- ❑ definitional issues, such as 'digital libraries will contain material in digital form',
- ❑ services provided, such as 'a digital library will provide a range of searching and browsing tools' or 'digital libraries will provide integrated services, ideally approaching 'seamless' integration',
- ❑ issues explaining the purpose of digital libraries, such as 'digital libraries will be concerned with preservation of material', and
- ❑ the introduction of new roles, such as 'the digital library marks the end for the traditional library/information professional' or 'the digital library builds upon the traditional strengths of the library/information professions'.

Lesk (1997) defines a digital library simply as 'a collection of information, which is both digitised and organised'. Miksa and Doty (1994) explore the question of whether a digital library should be called a library at all. In order to achieve this, they examined particular traditional aspects of the term; the library as a 'collection', the library as a collection of

'information sources', and the library as a collection of information sources 'in a place'. They concluded by taking a traditional perspective supporting the review that a digital library is a collection of information sources in a place. They argued that a broader definition would lead to something different from what is normally understood to be a library. Levy and Marshall (1995) examine three characteristics that digital libraries are assumed to have; characteristics of their collection, of their technology and the work they are meant to enable. They claimed that: (1) digital library collections contain fixed, permanent documents, (2) digital libraries are based on digital technologies, and (3) digital libraries are to be used by individuals working alone.

Bishop and Star (1996) also specify that three elements are necessarily connected with the collection: (1) there must be some sense of a collection, with some kind of organisation. The content may be partly physical and partly electronic, or entirely electronic, (2) the collection is not entirely bibliographical or exclusively a set of pointers to other material, however it must contain some full-text online material in a variety of formats, and (3) a goal must exist in order to link end-users with attributes of the collection.

Walters (1998) provides a succinct definition from an information professional's perspective, by the Digital Library Federation (DLF). It emphasises the traditional services of libraries - selection, access, and preservation - as well as the fact that digital libraries will necessarily be constructed to serve particular communities. *'Digital Libraries are organisations that provide the resources, including the specialised staff, to select structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities'*.

2.1.2 Research on the implementation of academic digital libraries

Research on the implementation of digital libraries has been attracting much attention during the last decade. This interest occurs not only in the developed technologically countries, but also in developing countries (Meyyappan, Chowdhury and Foo, 2000). A variety of funding initiatives are underway in different parts of the world, such as in the United States, the United Kingdom, Europe, Australia, and Asia. Multiple domestic and international conferences have been established and digital libraries topics have been

introduced at meetings in a variety of disciplines and professions. In addition, several new print and online journals on digital libraries have been set up, while online distribution lists with news of related projects have been created. The primary idea was that digital libraries were able to solve some of the serious problems that Higher Education Libraries had to deal with on a daily basis.

A vivid example was the critical situation in the UK. In 1993, the Libraries Review Committee consisting of the UK Higher Education Funding Councils of England, Scotland, Wales, and Ireland published a seminal report. This report was entitled 'Follett Report' and named after the Chairman of the Committee, Sir Brian Follett (Joint Funding Council's Libraries Review Group, 1993). Its purpose was to describe firstly the situation in education and secondly the future needs and development of academic libraries in the UK. The Review Group's work revealed a situation where libraries were under pressure. The number of student population was steadily rising, while academic libraries did not have the financial support to increase the stock of books, periodicals and other materials. At the same time, there was a disproportionate increase in the price of books and periodicals, and in the volume of publications, especially periodicals. In the report, it is characteristically mentioned that the total number of printed journal titles cited in Ulrich's International Periodicals directory rose from 62,000 in 1980 to 126,000 in 1992. But, while between 1980-1981 and 1991-1992 the Blackwell's Periodicals Price index rose by almost 300 per cent, library spending with higher education institutions on periodicals rose on average only by 111 percent. As a result, libraries have found it necessary to reduce the number of periodicals to which they subscribed, or to avoid taking out subscriptions to new journals.

In addition, the Review Group described two more issues illustrating the stressful situation. First, it was well known that libraries had problems with accommodating their present materials. There was not enough space even to store the existing printed material, such as books and journal titles. This means that even if academic libraries had the financial help to increase the amount of printed information provided, they probably would not have the space to accommodate both readers and stock. Second, users became more demanding concerning their information needs, expecting to be able to have direct and quick access to information.

At the same time, it was apparent that academic libraries had achieved an important role in the educational process, in teaching, learning and research. The scale of investment in

libraries by higher education institutions illustrates this fact. *'It is impossible to imagine any university or college functioning effectively without a good library service'*. Therefore, the Review Group should provide an economic solution in order for libraries to be able to maintain and/ or extend their services.

The main and clear suggestion of the Review Group was the potential for further application of **information technology (IT)**. Information technology was introduced as having the power to solve the problem of accommodating users and stock. In practice, the report commented that most libraries would continue to combine traditional resources with electronic resources for the foreseeable future, and the purely digital library would be rare. Their argument was that information technology made it possible for information *'to be stored, accessed and transmitted electronically. The user working at an information terminal would have the information required, regardless of its physical location. Indeed, to the user the location of information is irrelevant, as is the location of the terminal, which provides the means of access to information.'* This can be characterised as moving from a 'holdings' to an 'access' strategy, while for end-users the place that information is held is relatively unimportant. Information will be in digital format and users will use it via electronic channels. As an illustration of these possibilities, they referred to the new concepts of the electronic book, electronic document delivery and electronic journals.

As a direct response to the recommendations of the Follett Report, in the UK the Joint Information Systems Committee (JISC, <http://www.jisc.ac.uk/about.html>) established the Electronic Libraries (eLib, <http://www.ukoln.ac.uk/services/elib/>) programme. The primary role of the JISC was *'to promote the innovative application and use of information systems and information technology in further and higher education across the UK'*. More specifically with the eLib programme JISC plans to engage the Higher Education community in developing and shaping the implementation of the electronic library. The eLib programme started in 1995 and was divided into three phases. Each phase consisted of many areas of research and each area of many projects. Phases 1 and 2 of the Electronic Libraries Programme (eLib), which were completed in 1999, covered a variety of research areas. These areas were:

Access to Network Resources (Subject Based Information Gateways)

- raise awareness of networked information resources
- explore issues associated with running large scale services
- ensure community involvement in developments at national and international levels

Digitisation

- network access to digitised material
- Electronic Document and Article Delivery
- working services which will become self-standing within the period of the contract
- demonstration of benefits to libraries and end-users, and of means of maximising value for money from the higher education community's investment in libraries
- lower delivery price
- improved services

Electronic Journals

- projects which involve parallel publishing in traditional and electronic form of both prestigious, well established publications and low volume specialist journals
- promotion of new forms of electronic journals to show the possibilities beyond parallel publishing
- a small number of high profile referred electronic journals (with no print equivalents) which capitalise on features that will only be possible in electronic form
- wider exploitation of methods of informal communication across the network e.g. bulletin boards, pre-prints services
- significant space savings in HEI libraries resulting from the disposal of back runs
- easy access by researchers and students throughout the sector

Electronic Short Loan Projects

- development of transferable model of course reading
- copyright management systems
- development of integrated multi-media electronic system for delivery of audio, video, and text

Images

- creation of image resource banks
- digitisation of collections of images

On-Demand Publishing

- a small number of on-demand publishing models suitable for UK higher education
- collections of electronic materials which are available for customised publishing

- simple mechanics for copyright payment collection (as appropriate)
- reduction in pressure on library materials

Pre-prints

- explore peer review processes, such as article submission and peer review by email
- copyright controls with online editorial and peer-review panels

Quality Assurance

- to establish a generally accessible database of texts awaiting "traditional" publication or without widespread availability, making research results more quickly available
- to facilitate visible discussion about such documents and general education and training issues
- to provide a wide community of users with an information resource which promotes quality research and practice

Supporting Studies

- development of applications frameworks for the management of heterogeneous resources and services including discovery, ordering publishing, archiving
- investigation of the social, organisational and cultural impact on HE community of electronic libraries development
- investigation of the options, methods and management of document delivery

Training and Awareness

- demonstrable increase in the level of relevant knowledge and associated competencies among library staff and others responsible for the exploitation of networked information resources
- significant improvements in the quality of training provided to end-users by library staff and others through the development of more effective training techniques
- progress throughout the HE community in heightening awareness of the value of networked information resources and of their role in the development of alternative models of information provision

Finally, Phase 3 was finished in 2001 and focused on the areas covered by Phase 1 and 2, but was enriched by three more. These were:

Digital Preservation

- piloting University/ publishers' archiving of digital materials
- building costing models

- exploring data type issues
- developing skills for digital preservation
- obtaining cooperation of copyright owners
- preservation of material published through eLib projects
- producing concrete recommendations in: legal agreements, access controls, metadata requirements, selection criteria, standards issues, good practice guidelines

Hybrid Libraries

- synthesise technologies form new electronic library developments worldwide
- integrate electronic products & services with the historical library functions
- develop models for well organised, accessible hybrid libraries
- cover a wide range of techniques seamlessly
- use commercial products where effective
- encourage institutional commitment and take-up
- develop skills and their embedding

Large Scale Resource Discovery (Clump)

- use of protocol Z39.50
- produce model technical and other agreements to allow subsequent Clumps to be justified either regionally or by subject
- encouraging Clumps to form
- providing unifying organisation, standards and brokerage services
- in the long term to see Clumps extending to a truly national scale
- diversity of institutions and systems
- producing benefits beyond the immediate region

Interest in implementing digital libraries came also from other parts of the world, such as Asia and Australia. However, research in the UK and in the USA have played a key role in digital library developments (Meyyappan, Chowdhury and Foo, 2001). Similarly to the UK, in the USA the National Science Foundation (NSF), the Department of Defence Advanced Research Projects Agency (DAPRA) and the National Aeronautics and Space Administration (NASA) created in 1994 the Digital Library Initiative (DLI - Phase 1, <http://www.dli2.nsf.gov/dlione/>). This collaboration signalled the beginning of a national conversation about the digital libraries. The focus of Initiative was varied aiming *to advance the means to collect, store, and organise information in digital forms, and make it available for searching, retrieval, and processing via communication networks – all in user-friendly*

ways. Four years later, in 1998 the second Digital Library Initiative (DLI - Phase 2, <http://www.dli2.nsf.gov/>) was introduced, aiming to extend the research carried out by Phase 1. Three more sponsors were involved: the National Library Medicine, the Library of Congress, and the National Endowment for the Humanities. Projects of both Initiatives were focused on various issues, such as digitising various formats of information including texts and images, identifying methods of organising, searching and retrieving information, and on developing interfaces and infrastructures for digital libraries.

In Greece, a similar attempt was made by various academic libraries. The European Community provided the Greek Higher Education Community with two operational programmes for education and initial vocational training (EPEAEK): EPEAEK A' and EPEAEK B' (<http://www.epeaek.gr>). The first programme covered the years from 1994 to 1999 and was funded by the Second Community Support Group. The second programme has been planned to cover the years from 2000 to 2006, while it is funded by the Third Community Support Group. These programmes signalled the beginning of a national conservation about academic libraries. Their purpose, which is provided in detail in the Technical Report of the *Horizontal Action for Libraries*, is to promote the importance of improving traditional libraries and to design academic digital libraries.

On this basis, there are academic libraries that have started to digitise part of their collection. They created the adequate format in order to be able to organise, store and retrieve various information in digital information. Most interest was on course notes, exam papers, results of exam papers, dissertations and thesis, and books after collaboration with appropriate publishers. The decision to digitise these types of information was because they are highly demanded. In addition, both European programmes contributed to the creation and operation of a union online journal catalogue. The purpose was that all Hellenic academic libraries should be members of this uniform catalogue that includes journal titles both in electronic and printed format. This catalogue is named Hellenic Academic Libraries Link (HEAL-Link). It operates as a Consortium and comprises the 32 Higher Education Institutions of Greece (18 higher education institutes and 14 technological education institutes), the Academy of Athens and the National Library of Greece. It covers every aspect of research concerning the creation of a union catalogue that contains journals in electronic and printed format. Specifically, it aims:

- (1) to develop and establish standards in library operations,
- (2) to continuously train staff of the member-libraries,
- (3) to set a common subscription to electronic resources and information services,
- (4) to cooperate, through a common policy, in journals' subscriptions (both in print and electronic) among the members, in order to have access to a larger number of resources for the coverage of educational and research needs of the users of the member libraries,
- (5) to cooperate in the availability of the material of every participating, library through interlibrary loan and other methods and practices which assume this availability,
- (6) to cooperate with relevant organisations both domestic and foreign in order to assure the participation in international developments concerning library co operations and management of copyright, and
- (7) to undertake of every initiative which promotes and develops the Hellenic academic libraries through common activities and initiatives.

2.2 Use and perception of academic digital libraries

2.2.1 *How end-users use academic digital libraries*

Until the mid 1980's, most database searching was conducted by expert intermediaries. Evans (1995) showed that mediated searching peaked through the mid 1980s, then began a sharp decline. Nicholas, *et al.* (1988) conducted a survey entitled 'Information Seeking in an Information Society Online (ISIS): The End-User. Among the conclusions was the fact that online searching in British academic libraries is popular and growing, even though all this searching seems to be done by librarians, in a library. Reference librarians familiar with the database and trained in information retrieval would conduct searches for the end-user and then present to the user a highly relevant set of references. The typical procedure was that a user would go to a library and express to a reference librarian his information needs. Then the reference librarian, based firstly on his ability to understand what a user wanted and secondly on the user's ability to describe what he needed, would retrieve an amount of information. Finally, the user would evaluate this information and if he identified it as irrelevant, the procedure would start from the beginning. Rudner (2000) describes the process as time-consuming and partly dependent on the ability of the intermediary. Eventually, that has changed. Barbuto and Cevallos (1991) concluded that the

use of end-user databases has increased steadily, while the use of librarian-mediated searching has decreased dramatically. Nowadays, end-users have quick and direct access to vast amounts of electronic information. This information comes in various formats, so that people are able to obtain a variety of data, such as sound, texts and videos. Users are also expected to be in the position to identify and evaluate this information on their own in order to satisfy their information needs.

2.2.1.1 Searching behaviour

However, results are not so positive. Although end-users are exposed to a great amount of information available in electronic format, there is a large body of literature claiming that most end-users have not increased their ability to search. Tolle and Hah (1985) studied the online search patterns within user searching sessions of the National Library of Medicine ELHILL system. In particular, there was emphasis on the CATLINE database analysing its machine-readable transaction logs. Data collection lasted eight weeks and included forty-one days of system use data from the period 31 December 1979 – 23 February 1980. They found that end-users used poor searching techniques, marked by overly simple statements and limited use of Boolean operators or other commands. A later large-period survey of the National Library of Medicine (NLM) was conducted, investigating the use of databases for eleven years. Results showed that end-users did very simple searches, using the Boolean operator '*and*' almost exclusively.

Similarly, Bates and Siegfried (1993) observed the searching behaviour of scholars and reported that 63% of all the searches contained only one or two terms and 25% included no Boolean operators at all.

Later, East, Sheppard and Jeal (1995) carried out a study in order to show the use of the Bath Information and Data Services (BIDS). BIDS is a service supplied by the Institution of Scientific Information (ISI) and provides direct end-user access to four databases. These are: *Science Citation Index*, *Social Sciences Citation Index*, *Arts & Humanities Citation Index* and the *Index to Science & Technical Proceedings*. End-users are able to search and retrieve bibliographical references from over 7500 international journals. The purpose of this study was to indicate how BIDS was used, who the users were, and how they perceived the benefits and shortcomings of the service. Findings showed that end-users generally took a simplistic

approach to searching. Most searches were conducted in title, keywords, and authors' names, singly or in combination.

Finally, Barbuto and Cevallos (1991) carried out a survey during the 1989-1990 academic year. They aimed to determine how well end-user services satisfy information needs and the extent to which end-users apply the concepts and techniques emphasised in the training programme. Among their conclusions, they indicated that users could not make a clear distinction between keyword and descriptor searching. In addition, they referred to the use of thesaurus. After the initial search session, use of the thesaurus declines, and nonusers of a thesaurus were at least as successful and often more successful than users of a thesaurus in retrieving the number of items that they said they needed.

The value of these responses could be undermined by the fact that they referred to the past. However, a number of attempts have been made during the last decade in order to understand the online searching behaviour of academics. Results indicated that end-users adopt a simplistic approach to searching. King and Moffat (1996) concluded that users were using relatively unsophisticated searching techniques. They tended to use single keywords and rarely used Boolean operators, while search was preferred to browsing. Over the test period of the service 2,818 search or browse transactions were registered on the server of EEVL gateway of which 63% were searches and 37% browses. End-users believe that searching with keywords is more likely to produce 'hits' closer to what they are actually seeking. However, those who used browse facilities still supported that it was an excellent way to gain an overview of a subject. They also faced difficulties in using filtering options that could help them to reduce the number of 'hits' returned. The preference for search facilities is also provided by the results of the survey on the use of the Internet Library of Early Journals (ILEJ, 1999). 47% of the respondents indicated search facilities as their favourite method of retrieving information, 37% browsing, and 16% fuzzy searching.

However, concerning e-journals services, previous results have indicated that users prefer to browse for relevant articles rather than looking for a specific article (Dalton and Nankivell, 2000; McKnight, 1997a). Therefore, they browse journal titles in a particular subject area that they are interested in.

In addition, Covi and Kling (1996), aiming to show academics' attitudes to digital libraries, showed that academics were either unaware of, or did not know how to use, advanced database services and features. Finally, concerning the use of thesaurus, the preliminary study of the Art, Design, Architecture & Media Gateway (Ferry, 1996) revealed that the use of thesaurus was very low, while information scientists seemed to be the greatest users.

2.2.1.2 Use of support services

Notwithstanding the low use of advanced searching techniques, such as Boolean operators and thesaurus, few end-users seem to need to call upon support services (East, Sheppard and Jeal, 1995; Kemp and Davenport, 1998). The low proportion of requests for help can be explained by the fact that few users recognise that they are inexperienced in using on-line searching tools or have problems suggesting appropriate keywords. The majority of users do not realise that a low return of 'hits' from searching may be because of a poor search strategy employed. They are more likely to attribute this to the database coverage rather than realise that better use of Boolean operators, truncation and alternative synonymous keywords may yield better results. For example, McCathey (1995) mentioned that when users of the University of Rhode Island Library were asked 'What would help you to become more effective in using the resources of the University Library?', most respondents (40%) tended to blame the library resources and staff for their ineffective searches. Students seemed to be more concerned with improvements in the library materials provided than with improvements in their own skills. One student claimed: *'You are asking the wrong question. I am O.K., but the library needs to improve'*. However, thirty-five percent of the students reported that the library needed to offer more training and more staff assistance if students were to become more effective users of the services provided by the library.

Similarly, Allen (1989) emphasised the role of CD-ROMS training sessions reporting that libraries should consider offering support in the use of CD-ROM equipment. Libraries should consider many issues concerning user education. They should be aware of the fact that although little guidance may be provided to users in order to begin using a system, this does not mean that they will be able carry out advanced or even minimally effective searches (Harter and Jackson, 1988). But, CD-ROM databases training sessions are able to teach end-users effectively to search and retrieve more relevant references, while search speed can be greatly improved (Stewart and Olsen, 1988). In addition, Barbuto and Cevallos (1991)

concluded that the extent to which end-users consulted appropriate thesauri was of particular interest because of the emphasis placed on their use during training sessions.

Nowadays, as academics increasingly use services at their own desks instead of carrying out their searches in libraries, any need for training is not immediately apparent to others, as it would be through observation in libraries. Nor can the user turn and ask a quick question. Therefore, the problem of training becomes more acute. Especially, because there are increasing types of services with a wide variety of features and different interfaces (Pullinger, 1999). The ELINOR project reported that user support in any form is essential for the use of electronic libraries. It is more significant for those who do not have technical and library backgrounds. Similarly, end-users of the EEVL gateway (Kemp and Davenport, 1998) specified that generally their search strategies were often ineffective, and that training would be useful. A possible suggestion was that online help could be extended to include more strategic advice. However, it was rare that users actually used the existing online help, and it might be that they had to be persuaded about the quality of information provided.

Finally, although end-users of the BIDS-ISI databases as a whole did not give the impression that support services were a major issue for them, there was a feeling that they would miss them if they were not there in one or another form (East, Sheppard and Jeal, 1995).

2.2.2 How end-users perceive the academic digital library

Findings from previous user studies on how end-users perceive various forms of electronic information systems, such as OPACs, CD-ROMs, online databases, subject based information gateways, or electronic journals have shown that they are well disposed to the general concept of electronic information. Littlejohn (1987) concluded that the students of the University of Pennsylvania were unanimously enthusiastic about the use of various online databases. They were able to search a number of databases with time totalling nearly seventy hours each week, while students signed up for fifteen-minute search appointments. Therefore, end-users asked to have access to a greater number of databases and be able to search for more than fifteen minutes. The best assessment comes in the words of the students themselves:

'Fantastic resource. Ten-year database (ABI/Inform) is in high demand. Should be available for a longer period during day, and/or search times should not be limited to fifteen minutes'.

'This service is an invaluable time-saver for research'.

Later, in 1995 East, Sheppard and Jeal published the results of an in-depth study on the use of BIDS (Bath Information Data Services), a service providing direct end-user access to databases supplied by the Institute of Scientific Information (ISI). End-users were able to make any comments regarding the use and future of databases. Their comments were more than positive:

'I find BIDS an effective and extremely useful method for quickly filtering through relevant literature...It is now my chief searching technique.'

'This is a service which is of enormous value for us and we would be very poorly off without it although it could be improved in several minor respects.'

'I think BIDS-ISI has revolutionised the method of searching relevant information for a research student.'

'I rely on electronic searching to avoid having to spend hours scanning journals. I don't just come into the library like I used to and just wander around semi-aimlessly looking for stuff. What classically I used to call 'keeping up with the literature' is now making sure you log into electronic searches.'

Similarly, McCarthy, Krausse and Little (1997) concluded that users of the University of Rhode Island (URI) were overwhelming positive when asked 'How satisfied are you with the CD-ROM services?'. Ninety-three percent indicated that they are moderately to extremely satisfied, while seven percent indicated dissatisfaction.

Concerning the users of the electronic journals services, results have shown that there is general enthusiasm about them. The feedback from those who searched for journal articles using the Internet Library of Early Journals (ILEJ, 1999) service indicated general

satisfaction with, and enthusiasm for the service. In addition, users of the BUILDER electronic journals service were asked about their opinions concerning the whole idea of an online journal. Most respondents suggested that the idea of online journals was a good one: *'This is the future of learned journals'* and *'Very informative with user friendly access'* (Dalton and Nankivell, 2000). Similarly, the users of the BUILDER pilot electronic short loan service evaluated it as a positive service. Finally, most of DECOMATE users have been positive about the concept of having online access to a number of journal titles (Jenkins, 1997).

In addition, findings of the Electronic Library Information Online Retrieval (ELINOR) project (Ramsden, 1998 p.133) showed that its users were using the system and the general concept of the electronic library was well received. ELINOR is De Montfort University's (DMU) first electronic library project and was the first such research to create a working electronic library for use by students in a UK university. Moreover, as part of an MSc programme of research in the Department of Information Science at the University of Strathclyde, questionnaires were sent to a stratified sample of academic staff at two universities during 1997 (Mackie and Burton, 1999). The survey was concerned with three different online gateways and how users obtained information. 70% of respondents believed that gateways were effective tools for searching the Internet. And when they were asked to make a clear comparison with search engines, two-third of the respondents replied that online gateways were useful and helpful compared with search engines.

2.2.2.1 Advantages of electronic resources

End-users have identified a number of advantages of electronic resources. The most cited ones are:

1. Convenience and immediate access to information either from off-campus areas or from end-users' desktop. End-users prefer to have access to electronic information from their office rather than to travel in order to find the data they want (Rusch-Feja and Siebeky, 1999; Khalil and Jayatilleke, 2000; Mallet and Smith, 2001; Nelson, 2001; Tomney and Burton, 1998; Wolf, 2001; Tenopir and King, 2002; Baldwin and Pullinger, 2000; Lambert, 1994; McCarthy, Krausse and Little, 1997; Woodward *et al.*, 1998).

2. Prompt availability of information. An electronic service overcomes the physical obstacles and brings the product of academic and scholarly work as close to the potential beneficiaries as humanly possible (Rusch-Feja and Siebeky, 1999; Jenkins, 1997; Khalil and Jayatilleke, 2000; Mallet and Smith, 2001; Tomney and Burton, 1998; Baldwin and Pullinger, 2000; McCarthy, Krausse and Little, 1997; Lambert, 1994).
3. Better searching capabilities. End-users are able to search or browse in order to obtain information relevant to their information needs. In addition, they are provided with simple and advanced options of retrieving information (Mallet and Smith, 2001; Nelson, 2001; McKnight, 1997a; Tenopir and King, 2002; Baldwin and Pullinger, 2000; Woodward *et al.*, 1998; McCarthy, Krausse and Little, 1997).
4. Provision of up-to-date information. End-users are able to read information immediately after being published. There are not ordinary delays, such as post delays (Rusch-Feja and Siebeky, 1999; Khalil and Jayatilleke, 2000; Tomney and Burton, 1998; Wolf, 2001; Baldwin and Pullinger, 2000; McCarthy, Krausse and Little, 1997).

In addition, end-users referred to the 24-hour access to resources (Mallet and Smith, 2001; Wolf, 2001; McKnight, 1997b; Woodward *et al.*, 1998), the benefits of simultaneous access by many users (Khalil and Jayatilleke, 2000; Nelson, 2001; Woodward *et al.*, 1998), the full-text access to information (Rusch-Feja and Siebeky, 1999), the possibility of printing out the desired document or information segment (Rusch-Feja and Siebeky, 1999; McCarthy, Krausse and Little, 1997), and the time saved (Jenkins, 1997; Khalil and Jayatilleke, 2000; Nelson, 2001). There are also users who mentioned the ability of hypertext links either within a specific electronic resource, such as a journal article or between more than one resource (Tomney and Burton, 1998; McKnight, 1997a). Other significant points are the ability of providing access to multimedia content data (Wolf, 2001; McKnight, 1997a), the fact that printouts are better than photocopies and the existence of various value-added services, such as automatic alerting to new issues or articles (Mallett and Smith, 2001).

2.2.2.2 Disadvantages of electronic resources

a) Provision of information

One of the core factors that might deter end-users from accessing digital libraries is the lack of a critical mass of information available in the subject area they are interested in (Baldwin and Pullinger, 2000; Wolf, 2001). End-users have expressed the need to be able to search not only an adequate number of up-to-date information, but - most importantly - data published in the past (SuperJournal project [The], 2000). Rusch-Feja and Siebeky (1999) mentioned sometimes it was possible to find incomplete volumes where either individual issues had been sporadically scanned or digitised or back issues had not been digitised. Concerning the question of how old electronic information should be, Jenkins (1997) reported that end-users would appreciate searching up to 25 years' worth of material in a single search, while some others mentioned that 5 years was the minimum coverage considered to be useful. Similarly, Tenopir and King (2002) concluded that although the majority of readings are journal articles that are less than 2 years old, readings of older articles are reported to be valuable to end-users.

Ideally, users would like to get the full text of all electronic documents they locate. They do not like searching an electronic resource to find a bibliographic reference and then having to use another source to locate the full text of this item. Linkage services from bibliographical databases directly to full-text articles online have been cited as an important factor (Mallett and Smith, 2001; Wolf, 2001; Teskey and Urquhart, 2001).

Finally, end-users have expressed worries concerning the archival of out-of-date information and the lack of guarantee for how long materials archived are accessible. They believe that information that it is able to be searched and retrieved at present will not be online in the future. It is only a matter of time before it becomes to be offline. Concerning electronic journals, this occurs because many publishers still express concern, particularly as print subscriptions are often cancelled to pay electronic collections (Mallett and Smith, 2001; Nelson, 2001; Tomney and Burton, 1998; Khalil and Jayatilleke, 2000; Liew, Foo and Chennupati, 2000).

b) Technology

End-users have also expressed some dissatisfaction because when they use electronic services they are dependent on computers. However, they do not always have the appropriate software and hardware (Tomney and Burton, 1998; Khalil and Jayatilleke, 2000; Liew, Foo and Chennupati, 2000). A perennial problem in many universities is that a small number of academics have the advantage of having their own computer connected to the Internet or one with the right software on the network. This means that sometimes it is time consuming to access digital libraries, due to the need to use an open access computer lab (Lock *et al.*, 2001). In addition, end-users are frustrated when technical barriers occur. For example, when it takes time for a web site to be downloaded (Woodward *et al.*, 1998; Khalil and Jayatilleke, 2000; Baldwin and Pullinger, 2000) or there are other more serious problems with browser server interrupting the connection (Mallett and Smith, 2001).

Some other end-users have complained about the bad quality of electronic images. In addition, it is common for diagrams/ photographs provided in the print version of a journal title not to be included in the electronic version. Pullinger (1999) mentioned that the good quality of image presentation is essential for scientists in order to understand a research paper properly. However, some end-users have characterised online images as poor (Woodward *et al.*, 1998; Jenkins, 1997) not only on the screen, but also in printouts (Wolf, 2001). Nelson (2001) reported that print had aesthetic qualities lacking in most electronic journals.

Moreover, end-users do not like to spend a lot of time in front of a monitor. They valued it as difficult and tiring (Woodward *et al.*, 1998; Nelson, 2001; Lock *et al.*, 2001; Jenkins, 1997; McKnight, 1997a; Dalton and Nankivell, 2000; Liew, Foo and Chennupati, 2000). Finally, one more major problem for users is to remember how to access a digital library when it is firewalled by usernames/ passwords (Pullinger, 1999; Ramsden, 1998 pp.75-76). On the contrary, end-users would appreciate to having fast and easy access to information without being required to memorise passwords or other information (Bishop, 1998).

c) Cost

An important factor that might also prevent end-users from using digital libraries is the possibility of paying. Academics are not prepared to give money simply to have the materials on their desktop or slightly earlier than the printed equivalent (Liew, Foo and Chennupati,

2000). Tomney and Burton (1998) provided the results of an academic staff survey that was carried out at the University of Strathclyde in late 1996 and early 1997. When academic staff were asked if they would be willing to pay a subscription to access an electronic journal, the majority of respondents replied with either a definite 'no' or 'only if there was no printed equivalent'.

d) Prestige of digital libraries

One more factor that might prevent end-users from accessing a specific digital library is whether they value it as significant or not. The most important characteristics are the quality of the information published and the prestige of a specific digital library (Schauder, 1995).

Regarding the quality of electronic journals services, opinions vary. Therefore, there are academics who characterised electronic journals as important as print and others who believed that print journals are far more significant than electronic. Tomney and Burton (1998) concluded that the quality of articles in electronic journals was considered by an overwhelming majority of users to be the same as in print publications; 71.4% of them specified this. On the contrary, Wolf (2001) reported that when respondents were asked 'How do you think electronic-only journals are perceived in the academic community?', 63% of them indicated that print journals are more important than electronic-only journals. But, when they were asked to specify which medium they would choose to publish their work, the majority of them specified that they would prefer a journal title that existed in print and electronic format.

e) Lack of awareness

Nelson (2001) mentioned that there is lack of awareness among end-users of what is available. End-users are not informed about what material is in electronic format. A vivid example is the results that Tomney and Burton (1998) provided concerning the reasons for non-use of the electronic journals service of the University of Glasgow. The most common reason given for non-use was a lack of awareness of any relevant publications when 68.5% of the respondents provided this explanation.

f) Other factors

End-users have also been concerned about some other issues. One of these is the lack of standards concerning the design of digital libraries. They seem to be worried mainly for the lack of universal standards regarding search and retrieval of information from digital libraries (Woodward *et al.*, 1998; Khalil and Jayatilleke, 2000). In addition, they do not feel secure about the security and authority of the contents of an electronic source. They believe that it is possible for someone to make alterations on an electronic format source, such as image or text (Tomney and Burton, 1998; Liew, Foo and Chennupati, 2000). Finally, end-users are not able to highlight parts of a source or make some notes on it. But, for academics the ability of annotating is valued as an important part of their research process (McKnight, 1997; Liew, Foo and Chennupati, 2000).

2.2.2.3 Comparison of print and electronic information resources

Encouraged by the advantages of the electronic version of information resources, it would seem logical that if end-users had the chance to choose between a print and an electronic format, they would prefer the latter. However, their opinions vary. Results of the BUILDER pilot online exam paper database showed that just over half of the users who had experience of both the print and electronic version expressed a preference for the electronic. The reasons are as follows:

- ❑ Reliability that a specific exam paper from the year archived is available - i.e. not lost or mislaid
- ❑ Enabling simultaneous access for many users
- ❑ Printing
- ❑ Speed of searching, some users considered that it was quicker and easier to locate specific papers using the electronic resource.

On the contrary, those that either preferred the printed exam paper resource, or provided criticisms of the electronic resource commented, focusing on the following issues:

- ❑ Coverage: the exam paper database at present only provides access to one year of exam papers

- ❑ Access to appropriate hardware / software: some users had experienced difficulties in getting access to a limited number of computers with the appropriate software installed
- ❑ Printing facilities: the value of the exam paper database was considerably reduced when users did not have access to appropriate printing facilities
- ❑ Browsing: some respondents considered that the paper resource was easier to browse than the electronic resource.

Preference of the electronic version has also been expressed by end-users of the Café Jus (Woodward *et al.*, 1998) and SuperJournal projects. Both were electronic journals projects of Loughborough University aimed to implement and provide access to a collection of electronic journal titles. Two-thirds of the Café Jus respondents saw the electronic versions as offering easier access to journals. By this they meant that all the journal titles they wanted could be accessed from the same terminal. This removed the need to set aside special times for visiting the library. When end-users were asked which type of journal they found easier to use, a smaller proportion (59%) chose the printed journal in preference to the electronic journal (Woodward *et al.*, 1998). Concerning the SuperJournal respondents, 40% said they would prefer the electronic version, 9.5% said they would prefer the print version and 44.8% said they would choose depending on the task (Baldwin and Pullinger, 2000).

Similarly, when users of the CD-ROM databases of the University of Rhode Island (URI) were asked which version of databases they preferred – the print or electronic version - 85% chose the CD-ROM version compared to 11% for print and 4% checked both. The most frequently cited reasons provided for CD-ROM preference by 77% of respondents were: *easier to use, better search access, faster and more efficient search process*. An additional 8% of them preferring CD-ROMs gave the following reasons: *can get a printout of sources, provides abstracts can download, provides more recent dates, and the print source unknown*. On the contrary, those who showed a preference for the print version offered the following reasons: *like hard copy, can find more items in print, CD-ROM misses items, easier and faster to search print, and do not know how to use the electronic version*. Finally those who chose both versions reported that they were valuable and useful for research and that, combined, they included more dates (McCathey, 1995).

Moreover, Wolf (2001) described a survey conducted in late May/early June 2001 to gather feedback from Cardiff University end-users about their experience with electronic journals. Results showed that electronic journals were clearly the preferred choice between electronic and print. Indeed, with only 4% indicating that they chose to use print journals, and well over half preferring to use electronic journals, it is apparent that for these respondents the latter were the most popular means of accessing the literature. However, 37% of them specified that they would like to use print and electronic journals equally.

However, Dalton and Nankivell (1999) describing a survey concerning the BUILDER short loan collection concluded that of those that had experience of using both the print and the electronic there was currently slightly more preference for the print version. BUILDER (Birmingham University Integrated Library Development and Electronic Resource) aimed to develop a model of a hybrid library with the key concept being integration of both the physical and the electronic library. Therefore, students were able to find the short loan collection in electronic and print format. From the thirty respondents who happened to have had experience in using both services - electronic and print version - 60% expressed a preference for the printed service and 37% for the electronic service. The Department of Commerce were the heaviest users; as a result, students were invited to indicate their preference. Some of the reasons for preferring the print service included:

- ❑ Greater coverage
- ❑ No dependence on computer access
- ❑ No need for printing facilities – printed texts are always portable and can be taken away, whereas, without access to appropriate printers the electronic resource does not have this capability and must be read on screen.

Those that preferred the electronic short loan service provided the following reasons for doing so:

- ❑ Speed of access – there is no queuing or photocopying involved
- ❑ Remote access – students can obtain short loan material remotely without having to visit the library
- ❑ Availability – the electronic short loan collection is available at any time, day or night, and unlike the printed resource there are not a limited number of copies.

Finally, there are end-users who support the use of both versions. Findings of the Internet Library of Early Journals project (IELJ, 1999) showed that the majority of respondents felt that they were happy using a combination of paper and electronic, with a preference for electronic where available, though there was a continuing need for an occasional reference to print material. The project aimed to enhance access to the collections of the libraries of the Universities of Birmingham, Leeds, Manchester and Oxford by creating and providing access to a corpus of digitised images from 18th-century and 19th century journals. McKnight (1997b) believed that although electronic journals have the potential to add value to their paper equivalents, there are still areas in which the paper journal remains dominant. For example, a paper journal issue is still far more portable than an electronic version. While delivery to the user's desktop is the assumed aim of the electronic journal, academics often prefer to do their reading outside of office or even library environments. In addition, the transient nature of computer interfaces also indicates an advantage of paper journals. As technology improves, it makes sense to take advantage of such improvements. However, it is not possible to guarantee that today's multimedia journals be readable with tomorrow's software. Also, end-users of the SuperJournal Project identified three more advantages of print journals:

- They are easy to read
- Users can make a photocopy to own and annotate
- They are easy to 'flip' through and scan.

2.2.2.4 Expectations and needs of end-users for academic digital libraries

End-users seem to have the following core requirements from digital libraries:

- *Accessibility in all senses.* Firstly, they want to have quick and easy access to a sufficient and wide range of information. This information should be in different formats, including what does not exist in printed format, such as film clips, and music. In addition, they want to have access not only to up-to-date information, but also to data published in the past. The connection among this data has to be in the form of hypertext links providing access to information within a specific digital library and across many others. In addition, end-users require full-text access. They do not like to use one service to search for bibliographical references and then use

another service in order to find the full-text information (Pullinger and Baldwin, 1997; Borghuis *et al.*, 1996; Pedersen and Stockdale, 1999).

- *Effective search capabilities.* End-users require a full-text index of all electronic information. In addition, thesaurus should be provided in order to help them to search and retrieve information that is relevant to their information needs (Borghuis *et al.*, 1996; McCathey, 1995).
- *Good image text quality* (Borghuis *et al.*, 1996).
- *Alerting services in order to keep them up-to-date, quickly and easily.* End-users want to be informed about the publication of information that is relevant to their information needs (Pullinger and Baldwin, 1997; Liew, Foo and Chennupati, 2000).
- *Possibility of printing.* A number of user studies have shown that end-users prefer to print information out, instead of reading from the screen or writing down some notes. Most of those who used the BUILDER pilot short loan service indicated that they printed out the text, with a few reading the text on the screen and making notes (Dalton and Nanvikell, 1999). In addition, Stewart (1996) reported that when academics of the Cornell University were asked about the use of electronic journals, the single most important feature identified was the ability to create a printed copy; almost everyone considered it 'very important'.

There are three reasons that support the necessity for printing. The first is related to one of the core barriers that might prevent end-users from using a digital library. End-users do not like to spend much time in front of a monitor. It is tiring for the eyes. The second is that the reading of information takes place outside office hours (Stewart, 1996). Therefore, the only solution for those who have not a computer at home or Internet connection is to print information out. Third, few end-users have valued physical contact with data.

Stewart (1996) provides some interesting comments:

'An advantage of print is that I can use my finger to mark my place if I am interrupted while reading. With print, I feel that I am more in "reading mode" whereas computer monitors are more like TV screens. I feel more passive; it's harder to read and pay attention'.

'[Physical contact] It makes you feel connected. Otherwise, the article goes away when you turn the machine off'.

Finally, the (SuperJournal project [The], 1999) provides the most important requirements of end-users. The most important requirement is the critical mass of journals, access, and timeliness. Users want fast and easy access to a wide range of up to date data. The next important requirement is the the ability to browse, search, and print. The next requirement is for a backfile. As important as having access to the backfile, is the knowledge that data (both current and back issues) will remain available into the future, and will not disappear. The last important requirement is that of gateways or "one-stop shopping", ways for users to discover what relevant information is available and then get to it quickly. Users do not want one monolithic service that works in only one way, but choice among multiple services, and organization of content that facilitates discovery within their disciplines.

2.3 Discussion

Generally, end-users seem to be well favoured to the concept of electronic information resources. This optimism probably results from a number of advantages that users have identified that academic digital libraries have over the traditional ones. Some of these advantages are:

- ❑ the quick access to up-to-date full-text information,
- ❑ the possibility of accessing to information from in and off campus areas,
- ❑ the better searching capabilities,
- ❑ the possibility of printing,
- ❑ the benefits of simultaneously access to information,
- ❑ the fact that users can have access to data from their desktop, and
- ❑ the 24-hour access to resources.

However, there are still users who favour print format. Some of the reasons provided are:

- ❑ more information existed in print format,
- ❑ no dependence on computer access, and
- ❑ no need for printing facilities.

Specifically, when users of e-journals services were asked to indicate whether they believe that print journals would be replaced by electronic version in the foreseeable future, results showed that few of them support that this would happen. On the contrary, they mentioned that print and electronic formats should co-exist, because each one has its own advantages. Regarding the print version, they stated that the portability and the ability to browse and annotate articles are three of the most advantageous characteristics.

End-users have expressed some concerns regarding academic digital libraries. For example, they are worried about the lack of a critical mass of digital information (past – present) in the subject areas they are interested in. Also, they have complained about some technical issues, such as the fact that often it takes a long time for a web page to be downloaded or the quality of images is not good. Moreover, some users are worried about the possibility of charging them to have access to information. But, the question is, what the validity of each complaint is. Would any of these factors prevent users from using digital libraries again in the future?

Concerning the digital library users' search abilities and their searching success, there is a large body of literature suggesting that most end-users have not progressed much in this. They tend to adopt a relatively unsophisticated, simplistic approach to searching and limited use of Boolean operators or other commands. Notwithstanding the low use of advanced searching techniques, few people use the online help function, which could support their searches. At the same time online help and generally any kind of instructions provided to users on how to use a system in its full potential are characterized as important factors of an online information system. However, what are the reasons that actually lead users not to use the online help function? Do they believe that online help could replace the human help?

Finally, end-users have already expressed some expectations and needs regarding academic digital libraries. Some of them are: the provision of a satisfied amount of present and past information, the possibility of effective search and browse capabilities, good image text quality, the provision of alerting services in order to keep them up-to-date, quickly and easily, and the possibility of printing. However, it is not clear how they would prioritise these expectations. For example, do they value the existence of past data more important than the existence of up-to-date information? Or, do they value the 24-hour access to the service more important than to be provided with good quality images?

Chapter 3

Methodology

3.1 Introduction

There is an extensive range of research methods on offer concerning the analysis of end-users' use and perceptions of digital libraries. Some of these methods are: questionnaires, interviews, focus groups, observations, talk-about techniques and transaction logs analysis (TLA). The choice and implementation of research methods impose intellectual and practical constraints on the researcher, not least of which is the extent to which the validity of the method can be explained. The major debate is centralised on which the best method is. However, it is not just a case of choosing the best one, because each category has its own advantages and disadvantages. Nevertheless, there are a number of reasons that a researcher needs to take into consideration in order to choose the research method.

Nicholas (2000) points out that data collection methods require *long and hard consideration*. This is due to the fact that data does not come cheap and an evaluation can cost a lot of money. In addition, the credibility and validity of the outcome of a study can hardly be based on the method chosen. Therefore, a meticulous investigation into which method can give the most desirable results is an essential process. However, there are some factors that are able to advise researchers to choose the research methods that would help them to gain the desirable results for their study.

The primary concern is to specify the research problem, which involves representing what you want to know; the reasons for carrying out the research (Hannabuss, 1995). Then, Nicholas (2000) suggests three factors that should be identified. The first issue is associated

with the type and quality of data required to be collected. Great thought must be given to whether researchers want to obtain quantitative and/ or qualitative data. According to Hannabuss, the first categorisation is associated with measurement and numbers used to express quantity. These numbers are used to give some information about the world (Hannabuss, 1995). The role of quantitative research is: (1) to collect data in order to formulate research problems in the form of testable hypotheses, (2) to identify and measure relationships between variables, and (3) to minimise researcher interference. The concept of variables is central to quantitative research, showing how they are seen and organised with respect to each other. By definition, measurement must be objective and statistically valid. The task is that a scientifically calculated sample of people from a specific population is invited to answer to a set of questions on a survey to determine the percentage of their responses. There are many methods for collecting quantitative data, such as survey methods (e.g. questionnaires, interviews, observations, transaction logs analysis, laboratory experiments), formal methods (e.g. econometrics) and numerical methods (e.g. mathematical modelling) (Myers, 2004).

The second categorisation can be defined as empirical information about the world in the form of words. The role of qualitative research is to identify and examine variables. Therefore, participants are asked to respond to a number of questions and the interviewers probe and explore their responses. The goal of the interviewers is to identify and define participants' perceptions, opinions and feelings about the topic or idea being discussed and to determine the degree of agreement that exists in the group. This type of research is much more subjective than quantitative research and the quality of the findings is directly dependent upon the skill, experience and sensitivity of the interviewers. Qualitative data sources include observation, interviews, questionnaires, focus groups, documents and texts, and the researcher's impressions and reactions (Myers, 2004).

Regarding their origin, quantitative research methods were developed in the natural sciences in order to study natural phenomena, while qualitative research methods were developed in the social sciences to enable researchers to investigate social and cultural phenomena. Social scientists realised that for their specific subject area there was the need to move beyond enumeration towards understanding. In addition, their theories can only be measured qualitatively rather than quantitatively (Bains, 1997).

The second factor refers to a belief that it is necessary to select methods with care and most importantly to adopt as wide a range of methods as possible. Although most researchers prefer either quantitative or qualitative research work, some researchers have suggested combining one or more methods in the one study. At a general level, this method has the advantage that researchers are able to capitalise on the strengths of the two approaches, and to compensate for the weaknesses of each approach (Punch, 1998). Summarising, using multiple types of data analysis techniques first provides more data and different types of data. Second, multiple types of data analysis techniques can be used on the different types of data with the goal of gaining a more comprehensive and valid understanding of human information behaviour. However, it is essential to mention that using multiple methods increases the resources and time needed to collect and analyse data (Sonnewald, Wildemuth and Harmon, 2001).

Therefore, researchers have begun to use two or more research methods within a study or across a series of studies in order to gain a more complete understanding of human information behaviour. For example, researchers at City University, London have been particularly concerned with the combination of quantitative and qualitative data. In one important piece of research, Hancock-Beaulieu (1993) employed interviews, questionnaires, observations, talk-aloud, and transaction log analysis in order to obtain a comprehensive picture of user searching behaviour. The authors argued that a basic logging facility providing both qualitative and quantitative data could only be used as an effective evaluative method with the support of other means of eliciting information from users. This recent trend of supplementing transaction log analysis with other research methods is defined by Kurth (1993) as encouraging attitude. He believes that this method contributes to counteracting two serious limitations that allow transaction log analysis. The first limitation is associated with the description only part of the story of the online systems use and the second with the description of even smaller part of the story of information seeking behaviour of users.

In order to illustrate further the need for both qualitative and quantitative methods, Kaske (1993) described the following example. A log showed that a number of subject searches were made on two very different topics. The log also showed that these two topics were not searched in an efficient way. This implies that the user did not find all the items available under the first topic and then moved to the second topic. But, the log revealed that each topic was searched one step at a time, alternating between the two topics. Had the researchers not

interviewed the patrons when they completed their searching, there would have been no way to know that the searching was not done by one person but by a couple taking turns to search their different term paper topics on the same terminal.

Another survey which used a combination of methodologies is by East, Sheppard and Jeal (1995). They used transaction logs, interviews and questionnaires in order to gain a holistic picture of the use of BIDS (Bath Information Data Services) by British Universities from 1988-1994. BIDS is a service that provides direct end-user access to four databases supplied by the Institute of Scientific Information (ISI). There are: Science Citation Index, Social Sciences Citation Index, Arts & Humanities Citation Index and the Index to Science & Technical Proceedings. This service allows academic staff, research staff and students at subscribing institutions to search these databases from any terminal with a network connection. They can search and retrieve bibliographical references. Researchers who were responsible for carrying out this study brought together three research methods. First, they analysed the transaction logs providing quantitative data. Their goal was to indicate the number of end-users who accessed the specific service, providing their profile concerning their subject area, such as natural or social sciences and occupation, such as research staff or students. Second, they carried out a number of in-depth interviews with users and, third, they continued with a detailed questionnaire distributed to a wide range of users. Their purpose was to collect quantitative and qualitative data which would provide an insight into how the BIDS service was used and how users perceived the benefits that the specific service provided.

Finally, the third factor is the information community being investigated. The target group is sometimes able to determine the type of research that needs to be chosen in order to carry out a study. According to Nicholas (2000), there is little chance of investigating practitioners, such as journalists, politicians and lawyers. They are busy and self-important. On the contrary, academics are generally a captive audience, whereas practitioners and the general public certainly are not.

3.2 Research methods used

The number of methods used for this study was three: online questionnaires, face-to-face interviews and transaction logs analysis. Online questionnaires and transaction logs

analysis were used as research methods in all three case studies (SOSIG, ADAM, electronic journals service). However, interviews were conducted only with the users of the electronic journals service. This was due to the fact that end-users of both subject based information gateways are geographically dispersed; therefore, it was not possible to have face-to-face communication with users located in different countries. The SOSIG and ADAM gateways are services that can be accessed by any international user in any country or city. Therefore, conducting research in two geographically remote and separate locations such as SOSIG and ADAM, inevitably meant that methods had to be chosen with these constraints in mind. In these cases, the number of research methods used is limited and questionnaires should be used in preference to interviews (Baker and Lancaster, 1991).

However, the situation for the electronic journals service was slightly different. Due to the fact that this service is restricted to a specific target group located in a specific geographical area, it was easy to identify its users. Therefore, a number of end-users were interviewed, which provided a more comprehensive picture of how they used and perceived electronic journals and digital libraries.

Table 1 shows the research methods used for case studies. In addition, it presents the time period during which these methods were carried out for each study; when questionnaires were online, when the interviews were carried out and which years were covered by transaction logs analysis.

	Online Questionnaire	Face-to-Face Interviews	Transaction Logs Analysis (TLA)
Social Sciences Information Gateway (SOSIG)	(September/October 1999)		(1994-2002)
Art, Design, Architecture & Media Gateway (ADAM)	(May/June 2000)		(1996-2000)
Electronic Journals Service of the Library & Information Services (LIS), University of Patras	(November/December 2000)	(September 2001 and January 2002)	(1999-2003)

Table 1 – Research methods used for each case study

Online questionnaires and interviews contributed to the collection of both qualitative and quantitative data for digital libraries use by academic end-users. However, transaction log analysis presented mainly quantitative data. This was due to the nature of the specific research method. Generally, a transaction log analysis provides quantitative data. Zhang (1999) categorised the information that a transaction log analysis provides for the use of digital libraries into three main aspects:

- users' profile and their frequency of use (Where do users come from? Do they use the system frequently or only seldom?),
- information and services needed by users (Which information / services have been visited? Which information / services are requested more frequently?), and
- information or services' usage in relation to users' information behaviour (How do users visit or use information or services? Do they actively participate in interactive communication processes?).

3.2.1 Transaction Log Analysis (TLA)

According to Nicholas (2000) transaction log analysis is the automatic monitoring activity of a computer system. Peters (1993) provides a more detailed definition, when he specifies that a TLA contains three elements based on the etymology of the term:

1. A *transaction* which is 'a sequence of communicative acts between a human and a computer system. Typically, the end-user constructs a search argument, and the computer system responds'.
2. A *transaction log* which 'must contain at least basic information about the search argument as input by the end-user, the system response, the date and time of the transaction, and the location or virtual location of the activity. TLA captures a sequence of events in time and space'.
3. A *transaction log analysis* which 'involves the gathering of transaction data, coupled with a purposeful effort to analyse the data, either quantitatively or qualitatively, in order to generate new knowledge. Gathering and analysing are the two essential activities. The ease with which the data be gathered belies (and perhaps contributes to) the travails of analysis.

Often the same computer that stores and delivers information to humans also captures, stores, and perhaps analyses data about interactions between itself and human beings. These logs then can be conceptualised both as a form of system monitoring and as a way of observing information seeking of end-users and making some statements about their information needs. Normally, a transaction log record includes the characters' input by end-users when the return/ enter key or function key is activated together with other aspects of that moment of input including the date and time, terminal identifier, and search command identifier, followed by selected aspects of the response from the computer system such as the number of 'hits' (Peters *et al.*, 1993).

Peters *et al.* (1993) mention in their paper that the primary objective of researchers to use transaction log data is to *improve the computer system, human utilisation of the system, and human understanding of how the system is used by information seekers*. This information can provide system designers and managers with valuable data about how the system is being used by actual end-users. It also can be used to study prototype systems and potential system improvements.

For the purposes of library and information science research, Peters *et al.* (1993) narrowly define transaction log analysis as the study of electronically recorded interactions between online information retrieval systems and the persons who search for the information found in those systems. The initial pioneers in the area of information science were people who realised that the computer catalogues (OPACs) could do more than retrieving information quickly. These systems were also capable of capturing data and monitoring their use. This data then was able to be analysed in order to refine and design information systems and to provide insights into the information seeking process of end-users. Previously these insights would be obtained by questioning a number of end-users (Nicholas *et al.*, 1999).

The advantages of transaction log analysis have become the center of discussion for many researchers. A comprehensive list of these advantages is provided by Nicholas (1999 and 2000):

1. It is possible to talk about hundreds, thousands, and millions of people who are using a computer system. Logs are able to overcome a number of problems and describe searching characteristics in terms of plenty of incidences rather than dozens of them

provided by interviews and questionnaires. These problems deal with the capability of logs to record the searching behavior of end-users located in different places of the world, while this monitoring happens quickly, at the same time as end-users search the computer system. Though, in order to achieve this measurement not a lot of labour is involved. There is an amount of software that is responsible for storing and analysing the transaction logs automatically.

2. As a research method, log studies are unobtrusive. They say it as it was, not as what the person who is in charge remembered, as is the case with interviews or questionnaires. Logs simply record events as they happen. Nielsen (1986) compares a log with a bar code-reading grocery cash register, which prints on the register tape every item and price as the groceries are slid off the belt and into bags. In addition, no-one is likely to refuse to take part in the study. This happens because participants are most of the times not even aware that someone is monitoring their searching behavior. Nielsen (1986) mentions that log studies are a way of unobtrusively looking over an end-user's shoulder as he or she has used the computer system. In that case, there are no problems of low responses and biased samples. However, there are some big ethical questions that need to be taken into consideration. These questions refer to the fact whether or not end-users should be aware of this monitoring. And if an end-user knows that at a specific time his searching behaviour is observed, then do logs have the same value?
3. It is important to realise what end-users want, their information needs, otherwise, the information society will never truly come about. In addition, there has been a significant change in the information world for two main reasons. End-users are exposed to an increasing amount of information and this data is available in different formats. People who are in charge of designing an information world, which is well accepted by end-users are invited firstly to understand how end-users use these new information changes.
4. Logs enable direct and detailed head to head comparisons of the searching behaviour of end-user groups - men/women, intermediaries/end-users.

However, transaction log analysis is not the panacea that it first appears to be. Since the earliest monitoring studies, researchers have identified the boundaries that define transaction log analysis as a methodology for studying the use of online systems. However, Kurth (1993)

pointed out that it is essential to identify the nature of these limitations in order to use other research methods, such as interviews and questionnaires to go beyond these boundaries.

1. The fact that a transaction log analysis provides a vast amount of information can also be considered a disadvantage rather than an advantage. Researchers are exposed to an immense amount of information and are invited to analyse it and provide some results on how end-users obtain information from an online system. For example, it is possible to have more data for measuring, but not necessarily more meaning. In addition, there is the danger of reading too much into logs Nicholas (2000). This vast amount of data can be defined as useful only when researchers can obtain a picture on end-users' searching behaviour. Fortunately, there are a number of researchers that provide various suggestions. Kaske (1993) pointed out that loggers' primary concern is to understand what needs to be learned or what research question is to be asked. Kurth (1993) refers to the *execution* process. Execution is the process of identifying search sessions. This usually requires reading the log line by line and marking the first line of each new session. This process is easier when researchers have previously conceptualised clear operational criteria in order to distinguish the various sessions.
2. A log record is an interaction between a computer and a computer, not an individual end-user interacting with a computer. When systems do not require patron identification, it is not possible to isolate and characterise individual end-users of online systems in order to describe their patterns of use. Instead of an end-user ID and password, there is an IP address that is a number. Although it is easy to translate the number into a domain name, the actual information that someone can discern is the location of the computer and the name and type of organisation where the computer is located. Therefore, two or more end-users may alternate commands at a single terminal, but these end-users have the same IP address. Furthermore, there is an increasing use of allocating computers in an organisation with a floating IP address. This implies that more than one computer can have the same IP number. In that case, it is difficult to determine whether an IP address represents a single computer or many computers (Nicholas 2000).
3. The situation is becoming more difficult when systems requiring patron identification. Then, researchers have to deal with ethical and legal factors.

4. Except for the limitation of transaction log analysis to identify end-users, they are not able to capture direct information about thought processes, desires and intentions, or outcomes and levels of satisfaction of remote end-users (Peters, 1993). It is not possible to talk about end-users' motives or reasons for a particular search operation and most importantly it is impossible to measure their satisfaction, their perception of searches. The only indicator of whether end-users retrieve information or not is the 'hit' - a line in a log record which represents a request by the client for a file on the server, page impressions or pages downloaded. But a 'hit' is probably the most misleading indicator of whether use was intended or not for two reasons. Firstly, the fact that end-users downloaded a number of pages does not imply that these specific pages satisfied their information needs. An end-user could download many pages totally irrelevant to his needs. Secondly, as Nicholas (2000) specifies a single page viewed on the end-user's machine can generate several transaction hits on the server. This happens because each image is downloaded as a separate request to the text. Therefore, a single page can generate up to 50 hits in the log file.
5. The real picture of use is also impeded by the cache memory - an area of memory where a computer system stores copies of the sections of pages recently downloaded. This means that the end-user's machine will save a copy of pages recently viewed. When the end-user requests a page, then the system first checks its cache memory for the page. If the page exists in the cache, the requested copy will not be recorded by the server. The server only records hits of new pages downloaded. Hence, a true story of how end-users search the system is not recorded (Nicholas, 2000).

3.2.1.1 Log metrics

It is probably most useful to view logs data in terms of what type of information is provided concerning the use of the SOSIG, ADAM and electronic journals service. The following indicators of use were analysed: time of searching, number of requests, number of page or file requests, number of sessions, use by domain name, use by country, and potential number of end-users (IPs). Table 2 presents the type of log metrics used for each case study.

	SOSIG Gateway	ADAM Gateway	Electronic Journals Service
Time of searching	√	√	

Number of requests, file or page requests, or sessions conducted	√	√	√
Use by domain names	√	√	√
Use by country	√	√	
Potential number of end-users			√

Table 2 -- Log metrics for each case study

Time of searching

Logs provide a large number of details during the exact time period that a search is conducted. They report when an end-user starts using the services, concerning the year, month, date, and time. Therefore, it is possible to measure the use on a daily, weekly, monthly and/ or yearly basis and to detect the most active hour, day, month, and/ or year of a specific time period. Table 3 illustrates the time searching analysis provided for each case study.

	SOSIG Gateway	ADAM Gateway	Electronic Journals Service
Most active month	√	√	√
Most active day of the week	√	√	
Most active hour of the day	√	√	
Work hours use (8:00am-7:59am)	√	√	
After hours use (5:00pm-7:59am)	√	√	
Total weekdays	√	√	
Total weekend	√	√	

Table 3 – Time searching analysis for each case study

Number of requests, page or file requests, or sessions conducted

Sometimes the terms 'request', 'page or file request', and 'session' are referred to as synonymous concepts. However, it is necessary to define each term in order to show that these terms do not have the same meaning. A request is an online enquiry, such as to use a specific service provided by an online system. This service might be the help function or the search or browse facilities. A page or file request is closely related to the downloading of a specific web page (hits). A session is a broader term; it is *the use of a data terminal, between log on and the subsequent log off. During a session, a transaction path is normally opened by the network, and processing resources are held available by the computer system that is*

being used. Many transactions or exchanges (requests or page/ file requests) of messages may occur in one session (Gubton, 1994). The fact that log files do not record when a session ends and when a session restarts is the real problem. Therefore, a 30-minute cut-off point is used to denote the end of the session and once this cut-off is exceeded, anything else recorded is considered surplus. Table 4 describes the measurement tools (requests, page or file requests, or sessions) used by SOSIG, ADAM, and the e-journals service.

	SOSIG Gateway	ADAM Gateway	Electronic Journals Service
Total number of requests	√		
Total number of page or file requests	√	√	
Total number of sessions			√

Table 4 – Measurement tools for each case study

When it comes to measure the use of an online system, there are systems based on calculating the total number of requests. Others are more interested in the total number of file or page requests, while others in sessions. This diversity has the disadvantage that difficulties occur when researchers attempt to communicate their results. It is not easy to compare the logs data of an online system with another one, when they have measured their data with different measurement tools. Kurth (1993) mentioned that the situation in communicating logs results becomes more difficult when researchers have not even sufficiently described the data elements and measurement tools upon which their transaction log analyses have depended. Then researchers have to deal with two issues: firstly to identify the measurement tools used for a specific online system and secondly to compare their results from study to study. As a solution to this situation, Kurth (1993) judged it essential to create national and international standards for transaction logs analysis. These standards would provide an agreed-upon knowledge base for researchers in the field.

Use by domain name

A domain report identifies the origins of end-users to a specific online system. Hence, it is possible to account for the identity of them concerning the country, organisation, and server that they come from. Each of them on the network has a unique address, which is a

string of numerical digits. But there is an equivalent 'logical' version for human consumption such as '*city.ac.uk*'. This logical version is hierarchical in its construction, and end-users insert full stops to separate the different domains in the hierarchy. For example a typical name registered in the UK domain would be *www.analysys.co.uk*, when '*uk*' represents the country, '*co*' represents the commercial part of the '*uk*' domain, '*analysys*' represents a company in the commercial domain, and '*www*' represents an individual machine within '*analysys*'.

Use by country

The domain name is able to provide information concerning the country that access takes place. Therefore, researchers are capable of viewing which countries are the most or less active. However, domain names may not always be an accurate identifier of the actual geographic location of an access point. For example, while most '*com*' domain names are from the United States, there are a growing number of '*.com*' domain names that exist outside the United States.

Potential number of end-users

The estimation of the number of end-users who have accessed an online system is a process with questionable results. The problematic nature of this measurement is closely related with the aforementioned second disadvantage of the transaction log analysis. When an online system does not require patron identification it is not possible to isolate individual end-users. Then, end-users are identified with an IP number, which does not represent a unique end-user. But, it can refer to more than one end-user. In addition, more than one computer may have the same IP number; therefore, different end-users are able to share the same IP number. Although researchers are aware of these limitations, they use IP numbers as an indicator in order to estimate the use of an online system. Taking all this into consideration, the electronic journals service of the Library and Information Services of the University of Patras attempted to estimate the number of their end-users.

3.2.2 Questionnaires

According to Oppenheim (1992) the questionnaire is more than a set of questions. It is a procedure that requires serious consideration from the people who are responsible for designing a questionnaire. There are a number of factors that designers have to consider before they are able to begin to write their first question.

First, they have to decide about the main method of data collection. A general division is between offline, such as postal and telephone questionnaires, and online questionnaires. There are many forms of online questionnaires. The simplest method requires that the researcher embed the questions in an email that is sent to potential respondents. A second way is to send the questionnaire as an attachment in an email. A third way is to send an email with an attachment that contains a survey program, and a fourth method is the Web-based surveys. These are emails that are normally sent to potential respondents inviting them to go to a specific Web address and to complete the questionnaire. The advantage of the last method is that questionnaires can have colours, graphics or audio features. In addition, the software is programmed automatically in order to collect and provide ongoing summaries of the data. However, it has the disadvantage that it requires from respondents a degree of competence in using the Internet. Moreover, potential respondents who have not access to the World Wide Web (WWW) will not respond to this form of survey (Gunter *et al.*, 2002).

Notwithstanding the significance of this development, it is important to recognise that offline and online surveys are not the same. The key differences between offline and online research have been found to relate to:

- *Cost* – A number of researchers suggest that electronic surveys cost less than mail surveys (Bachmann and Elfrink, 1996; Kiesler and Sproull, 1986; Parker, 1992; Sproull, 1986; Schaefer and Dillman, 1998).
- *Sampling of respondents* – Some researchers have doubts about the representativeness of samples. Specifically, Tse (1998) expresses concern that e-mail sampling is necessarily limited to e-mail users. Mehta and Sivadas (1995) express concern that e-mail respondents over-represent the middle-to-upper class respondent. Schmidt (1997) points out that the population of Web users is biased toward young males of above-average socio-economic and educational status, which is a source of concern with respect to the use of Web forms.

- *Operational and design differences* – Regarding the operational procedure, online research can be transmitted more quickly than offline (Gunter *et al.*, 2002) and also provides a faster reaction time than mail surveys. Many studies have reported that most of their e-mail responses arrive within two to three days following the initial e-mail contact (Bachmann and Elfrink, 1996; Kittleson, 1995; Mehta and Sivadas, 1995; Sproull, 1986; Schaefer and Dillman, 1998). Then, concerning the design process, online questionnaires can be presented in multi-media formats. For example, Bishop's (1997) Web survey, involving landscape picture perception, used colour images, demonstrating one of the advantages of the graphically facilitated Web survey.
- *Response rates* – Generally, there is the belief that response rates in online surveys are poorer than in offline ones. There are a number of factors that could explain this. First, an online survey is very easy to be ignored or discarded. Second, some respondents might be confused with how to return a questionnaire. Third, since an online survey cannot use pre-paid incentives, which creates the feeling to potential respondents that a lot of expense and effort has gone in to it, it is less able to make them feel obligated to respond (Gunter *et al.*, 2002).
- *Quality of responding* – Some researchers provide evidence that the quality of online surveys is somewhat different from those offline. When it comes to open-ended questions, they are lengthier. In addition, respondents seem to be more willing to reveal information about their experiences (Bachmann and Elfrink, 1996; Kiesler and Sproull, 1986; Locke and Gilbert, 1995; Sproull, 1986; Gunter *et al.*, 2002).

Second, designers have to find ways of gaining the respondent's cooperation and of motivating them to respond to the questions. Their aim is to increase the response rate and to deal with non-response. Third, designers are required to take some valuable decisions regarding the questions included in a questionnaire. They have to think about the build-up of question modules, the order of questions within modules and the type of questions. A module is a group of questions aiming to collect some answers that refer to a specific area of interest. A questionnaire might have more than one area of interests. Therefore, designers firstly have to consider the order of these modules and then the way that questions included in each module are ordered. Then, they have to think about the type of questions included.

A questionnaire can consist of various forms of questions that provide different forms of responses. Generally, questions may be

1. fixed or closed,
2. open-ended, or
3. a combination of types (1) and (2).

Fixed or closed questions are ones in which the respondents are offered a choice of alternative replies, while open-end questions are not followed by any kind of choice, and the answers have to be recorded in full. Finally, there are questions that offer a number of fixed alternatives, but also respondents have the 'other' choice category. Therefore, they are free to provide short or lengthy replies. Each form has its own advantages and disadvantages. Fixed or closed questions are easier and quicker to answer, since no writing is required of the respondent. The respondent simply checks the response that applies to him or her. This also means that generally more questions can be asked within a given length time. In addition, fixed questions are easy to score and code, when the researcher can easy transfer the results data from the questionnaire to a statistical programme. However, their main disadvantages largely relate to this limited way of response rate. Respondents may be forced to choose between alternatives which do not correspond to their preferred answer for the question, forced to provide a single answer when more than one is appropriate or forced to choose an answer when they do not have enough knowledge to make any informed response. Hence, respondents seem as if they have lost their spontaneity and expressiveness and perhaps bias is introduced.

Another problem of closed questions is the fact that respondents might lapse into a response set. This implies that in order to complete a questionnaire as quickly as possible, respondents may simply go through the entire questionnaire and check the first response he or she finds, regardless of whether such a response is true of him or her.

On the contrary, the open-end questions have the chief advantage of the freedom given to respondents. This freedom allows them to write their own words and does not oblige them to choose a set of fixed alternatives or a straight yes/no reply. They are free to express their own opinions. Hence, researchers are able to gain an insight into the behavior of a particular target group. Although Oppenheim (1992) supports this spontaneous response from respondents,

when they are able to express their ideas in their own language, he mentions that open-end questions are difficult to answer, and still more difficult to analyse. It is possible for respondents to misinterpret a question, especially if the questionnaire has been administered remotely. In addition, persons who cannot express themselves adequately on paper could be combined unfairly with more fluent individuals. This is defined by Black and Champion (1976) as educational bias, while they also refer to the influence of socioeconomic differentials among people: the fact that persons of different socioeconomic backgrounds do not necessarily understand things in the same way as everyone else, nor do they use the same vocabulary to express their opinion.

Another disadvantage of open-end questions is that they are time consuming to complete. Open-end questions, as opposed to closed questions, require respondents to spend some more time in order to complete the questionnaire. However, many respondents may feel they do not have the appropriate time or the interest to sit down and complete a series of questions.

A questionnaire is a valuable tool of research because it is able to provide quantitative and qualitative impressive data, such as numerous tables, graphs and figures. In addition, it is useful when there are a potentially large number of geographically scattered end-users of a system, and a developer wants to obtain information from as large a sample of these as possible. The other main reason for using the method is the fact that questionnaires give to the respondents the time they need in order to complete the questionnaire and collect the necessary data. Therefore, they are allowed to make up their mind without any external pressure. In addition, online questionnaires due to the anonymity that such techniques may provide, do not require respondents to identify themselves. Hence, it might be easier for respondents to answer personal or potentially embarrassing questions.

However, a questionnaire is not a research method which is free from problems. On the contrary, its main problem is associated with the fact that it is not easy to develop a good questionnaire (Nicholas, 2000). Questionnaires should be used with care as they are open to misinterpretation, both with respondents not understanding the questions, and with those analysing the results who do not understand the responses. People who are responsible for designing them often simplify the questions in order to be understandable to respondents. However, this simplicity can lead to questions becoming lightweight - sometimes not really even worth asking. Furthermore, it is difficult to formulate questions that are free from jargon

or questions that are not leading. Most of the time, researchers try their best to keep bias out of question design, but leading questions are presented. Another form of bias occurs when respondents give answers based on what they think is expected rather than on what they truly believe. An example is provided by Baker and Lancaster (1991). They mention that this is common to studies that ask library end-users how satisfied they are with the library. Generally results indicate that end-users are satisfied or very satisfied. In order to avoid generating this kind of meaningless response, they suggest that it would be more useful to ask end-users to specify some problems that they faced. Another attitude of respondents provided by Baker and Lancaster is the fact that respondents tend to play down their 'bad' behaviour. This means that a small number of library end-users would confess that they rarely consult the catalogue or printed indexes. This behaviour can be traced only by asking questions that will gradually reveal the truth without asking for it directly. To avoid all these problems or to reduce them.

Another and even serious problem is the fact that response rate can be low, while often nothing is known about the respondents that do not return the questionnaires. However, the best response rates come from a well-designed questionnaire, that reflect interest on the part of the respondents and goes to a group that has not been studied before, or who may feel that they will benefit directly from the exercise. There are a number of methods that can improve the response rates, such as prizes, offers of a copy of the survey results, and stamped addressed envelopes (Nicholas, 2000).

3.2.2.1 Design of online questionnaires

The online questionnaires of the SOSIG and ADAM gateways and the electronic journals service were Web-based and self-administered. The latter implies that respondents have to complete the questionnaire by themselves. The advantage of the web-based questionnaire was the possibility of getting responses from all around the world. Some researchers have implemented the e-mail survey on a global scale (Kiesler and Sproull, 1986; Parker, 1992; Sproull, 1986). For example, Swoboda *et al.* (1997) performed a world-wide e-mail survey. While achieving only a 20% response rate, they did receive responses from all parts of the world (90% of them within four days) and demonstrated that English-language e-mail surveys can easily overcome national barriers. Furthermore, e-mail users from developing nations can access e-mail as fast as those in developed nations. If the target

population includes e-mail users living in remote places, e-mail is clearly the best communication method to gather data quickly.

In order to increase the response rate, all those who completed the questionnaires were able to decide whether they would like to be entered in a prize draw for purchasing books. The winner was only one person. Those who took part in the draw had to write down their email or contact address. However, end-users' answers were still treated anonymously. The winner was notified when the questionnaire was offline.

Moreover, the main concern was to design questionnaires that should not take more than a few minutes of end-users to complete them. Most of the questions were closed, although there were also a few open-ended ones.

The questions provided in three online questionnaires had some differences. For example, there were some questions that were provided in the ADAM questionnaire, but were not included in the SOSIG questionnaire or some others that were included in the electronic journals service questionnaire, but they were neither in the SOSIG nor in the ADAM questionnaire. This is explained by the fact that results of previous user studies on the implementation of digital libraries played an important role in the format of questionnaires. When the SOSIG study was introduced, researchers had had a narrow picture of the use of gateways and whether or not end-users considered them a valuable source of information. Although their findings were based on results provided by end-users who had either not used a gateway before or had used it but not for a long time, it aided them to make some predictions concerning their future use. Questions for end-users who had never experienced gateways before were focused on the use of computers and existing information resources such as CD-ROMs and Internet. End-users, however, who had used gateways only once had to answer some extra questions. They were invited to indicate their opinion on a number of issues concerning their experience with the gateway.

For example, in 1996 a survey was undertaken by the ADAM team, designers of the service. Respondents were informed about the purpose of research. The primary concern was firstly to introduce the new service and secondly, to gather information about the likely end-user community. They were interested in investigating their occupation and subject of interest. Then, it aimed to examine end-users' perceptions concerning the use of computers, Internet

and its various search tools, such as Lycos, Web Crawler, Yahoo, Infoseek, Altavista, BUBL, and Harvest. Respondents were invited to specify whether they used computers and its applications, how familiar they were with the Internet and which problems they had faced in obtaining information from the Internet. They were required to provide these difficulties in detail.

A similar study was conducted in 1996 for the Edinburgh Engineering Virtual Library or EEVL. The EEVL is a Subject Based Information Gateway helpful tool for discovering internet-based resources in the engineering area of research. The service was introduced to a number of test sites by conducting workshops. Participants were asked to describe their experience firstly with computing and secondly with the Internet. A combination of different techniques was used, such as direct observations, group interviews, questionnaires and online data gathering. Concerning their experience with computers, end-users were asked to specify how frequently they used computers, what type of computers they used and finally to rate a number of applications in relation to their experience. These applications were: email, news, ftp/gopher, on-line searching, word processing, databases, and spreadsheets. Regarding their familiarity with the Internet, end-users were invited to specify how frequently they used the Internet, which search engines they preferred, and whether they had encountered any difficulties in obtaining information from the Internet.

Then, the EEVL team introduced the gateway to end-users. When the induction was completed, end-users were invited to reveal their initial impressions concerning the new service. The primary goal was to evaluate the service. End-users were asked a variety of questions; if they experienced any difficulty in using the service, whether they were satisfied with the number of resources provided and the way they were displayed, whether they read the resource descriptions before deciding to go to a site, whether they used the online help function and they would evaluate it, and whether they felt that a subject based information gateway has advantages over web search engines. Finally, end-users were asked to make predictions concerning the future use of EEVL.

A few years later, in 1998 the EEVL gateway conducted a second more detailed survey. Having analysed the results of the first end-user survey and also taking into consideration the fact that end-users had had the time to familiarise themselves with this new service, end-users were considered capable of evaluating how well the EEVL service was operating. As a result,

professional critics were invited to look at three broad areas: usability and usefulness, the wider working context, and standing in the professional engineering community.

The evaluations of the above subject based information gateways influenced the creation of the SOSIG questionnaire. Some questions were the same in order to contribute to the generalisation of how end-users use and perceive gateways. However, there were questions which were completely new. These questions had two goals; either to provide a more in-depth analysis of a specific issue that previous surveys referred to, such as the search methods that end-users prefer, or to deal with a completely new issue.

The second task was the creation of the ADAM questionnaire. Previous studies were also an influence on the design of the questionnaire. But, there was more information published concerning the use of gateways than in the time period that the SOSIG questionnaire was designed. This occurred because when the SOSIG survey was started a number of other studies were in progress as well, focusing on the use of Subject Based Information Gateways. Therefore, with the completion of the SOSIG study, findings of other surveys were also published. They were carefully studied and analysed in order to contribute to the design of the second online questionnaire. Hannabuss (1995) claims that the review of the literature, what has been written and done already on the subject, and the findings that already exist are an essential step of a study since the research ideas or questions emerge out of the review. Finally, the third task was to design the questionnaire for the electronic journals service. Results of two previous case studies played an important role. In addition, it was important to consult the results of former studies that were focused on the use of electronic journals. There were some questions that were able to be put only to the electronic journals users, such as which version – electronic or print – of a journal title users would prefer to read.

Another reason for the existence of different questions was the fact that the designer team of the SOSIG and ADAM gateways and the electronic journals service was free to add any question they would like to ask for its own purpose. For example, the SOSIG and ADAM groups were interested in users evaluating some new services. Therefore, users were invited to value their importance. These services were related with the possibility of end-users communicating with others or with the system, with searching facilities, with customisation of services and with the types of information preferred by end-users. Moreover, the SOSIG team wanted to discover if end-users faced problems in obtaining information from the

Internet. Then, users had to specify these problems; they were provided with a list of potential problems and they were invited to select all that apply. In addition, the Library of the University of Patras were interested in finding out how end-users were first be informed about the existence of the electronic journals service. Table 5 presents the questions asked for each case study.

	SOSIG (Online questionnaire)	ADAM (Online questionnaire)	Electronic Journals' Service (Online questionnaire)	Electronic Journals' Service (Interviews)
Characteristics of sample population (gender – age – occupation)	√	√	√	√
Obtaining information from the Internet	√			
Frequency of use	√	√	√	√
Reasons for use	√	√	√	√
Place of use		√	√	√
Publicity				√
Searching behaviour	√	√	√	√
Support services	√	√	√	√
Types of information preferred	√	√		√
Methods of storing information		√	√	√
Methods of reading information				√
Communication with authors, researchers or other users who share the same interests	√	√		√
Impressions of using digital libraries	√			
Definition of digital libraries	√	√		
Advantages and/ or disadvantages of digital libraries	√	√		
Reasons that might prevent users from using digital libraries			√	√
Comparison of print and electronic information			√	√
Comments	√	√	√	√

Table 5 – Questions asked for each case study

3.2.2.2 Social Sciences Information Gateway Questionnaire

The questionnaire was made available on the SOSIG web site for a period of one month, from September 15th until October 15th 1999. There was an announcement on the SOSIG Home Page informing end-users about this survey. When users chose to be connected to this survey, a questionnaire appeared. At the beginning of the questionnaire, there was a brief introduction explaining the purpose of this research.

The SOSIG questionnaire was divided into two sections (twenty-four questions). The first section that was entitled 'Background Information on Internet Access' aimed to obtain information firstly on end-users' backgrounds regarding their gender, age and occupation and secondly on their familiarity with the Internet. They were called on to describe the process of obtaining information from the Internet and to indicate whether they encountered any difficulties in obtaining information from the Internet. Respondents were provided with a list of potential problems and they were asked to select all those that applied. These problems were: the lack of any online help, unfamiliarity with search methods, too much information available (overload of information), the lack of time required to search for information, speed of access, and cost. Respondents had also the other option where they could specify any other problem related with the Internet (questions 1, 2, 3, 4, 5).

The second part of the questionnaire that was entitled 'SOSIG Experience' planned to get information on how end-users used and perceived the SOSIG service. Specifically, questions covered the following areas:

a) Frequency of use - (question 6)

Respondents were asked to specify how frequently they obtained information from SOSIG. Therefore, they were provided with four options. These options were: daily, weekly, monthly and occasionally. Unfortunately, this categorisation was rather problematic for two reasons. Firstly, because it was not possible to identify which end-users were using the service for the first time when they completed the questionnaire. Secondly, although the option 'hardly ever' was intended to be included in the list of possible answers, it was not provided on the online questionnaire.

b) Reasons for use - (question 7)

Respondents were invited to specify their reasons for using SOSIG. They were given a list of potential reasons and they were asked to select all those that applied. These options were limited due to the nature of the target group. They were: research - identifying resources for writing a paper or carrying out a study; supporting teaching - identifying resources for supporting a lecture; or personal use - identifying resources for keeping up-to-date with a specific purpose. There was also the 'other' option where respondents could indicate any other reason for using SOSIG.

c) Impressions of using SOSIG - (questions 8, 9)

Respondents were invited to provide their impressions regarding their use of the SOSIG service. Therefore, they were asked to specify by selecting only one of the options provided by the questionnaire. These options were: easy to use, moderately easy, and difficult to use. Respondents who answered that they found the system either moderately easy or difficult to use, were kindly requested to specify their difficulties.

d) Searching behaviour - (questions 10, 11, 12, 19)

End-users were asked to express their opinion on which searching method they preferred. Firstly, respondents were requested to specify clearly whether they preferred to search, browse, or both and also to report the reasons for their preference. Then, in order to obtain more details on the searching methods employed, end-users were invited to indicate which SOSIG search or browse options they used. End-users are able to search or browse by using a variety of options: by title, by keywords, by descriptions, by country, by resource type, and by language.

Finally, they were requested to rank the importance of thesauri and search/ browse facilities provided by an online information service. Therefore, they had to assess them from 1 (very important) to 5 (unimportant) and add any comments they might have regarding these services.

e) Types of information preferred - (questions 13, 14, 15, 20)

The SOSIG service provides access to a variety of information resources in order to satisfy end-users' information needs. These resources are ten in total and are the following: electronic journals, digitised books, reports and papers, scholarly mailing lists and archives, educational software, bibliographical databases, electronic newsletters, datasets, home pages of key social science organisations, and bibliographies. Respondents were kindly asked to rank these resources according to their use. This entailed specifying which resources were used more often, starting with number one (1) and finishing with number ten (10), which represents the resource with the least or no use. Moreover, end-users were requested to indicate whether the resources provided by the SOSIG service covered the range of information they expected. End-users who replied that they were not satisfied with the variety of information provided were invited to specify what other resources they would expect from the specific system.

Finally, end-users were invited to rank the importance of three services concerning some new type of information which might be added to SOSIG in the future. Among these potential services were the provision of conference and course announcements, CVs for social science researchers and searches of other social science research data.

f) Support services - (questions 16, 17, 18, 19)

Respondents were invited to indicate whether they had used the online help function or not. In addition, those who had advised the specific service were requested to comment on it. They were asked to specify how they found the help information supplied by the SOSIG service. The questionnaire provided three evaluation options and end-users were asked to choose only one: helpful, moderately helpful and not helpful. Then, respondents who answered that they found the online help function either moderately helpful or not helpful, were kindly requested to specify their reasons.

Finally, they were asked to rank the importance of online help from 1 (very important) to 5 (unimportant) and add any comments they might have regarding this service.

g) Communication - (questions 19, 20)

End-users were asked to evaluate two services whose role is to contribute to the communication first between end-users and the SOSIG system, and second among end-users. They were invited to rank them from 1 (very important) to 5 (unimportant) and add any comments they might have regarding these services. These services were: the SOSIG mailing list that end-users are able to receive and send emails to people who share the same interests and the ability of end-users to suggest new resources. This means that end-users can suggest one or more Internet resources that could be added to SOSIG.

In addition, they were asked to rank the importance of two more services that might be added to SOSIG in the future from 1 (very important) to 5 (unimportant) and add any comments they might have regarding this service. These services were the possibility to receive their search results through electronic mail service and customise SOSIG by filtering services based on their own preferences. Finally, they were asked to indicate whether they expected any more communication services from SOSIG.

h) Definitions and advantages/ disadvantages of SOSIG - (questions 23, 24)

The last two questions aimed firstly to show how end-users perceived the SOSIG service. Hence, they were asked firstly to define the system and secondly to identify its advantages and disadvantages. Concerning its definition, respondents were given three options of what the SOSIG service is. The options were rather broad and they did not refer to aims of the service or its services provided to end-users. The options were: a collection of information, a collection of organised information, a collection of organised information in digital form. Then, respondents were provided with a Table 6 that listed a number of advantages and disadvantages concerning accessing information in digital form. For each line, respondents were asked to assess the statement on a scale of one (1) to five (5), where 1 was an advantage and 5 was a disadvantage. There was also the 'don't know' option.

Library holding information in digital form	1	2	3	4	5	Don't know
No need for commuting						
No librarian to teach how to use the equipment						
Possibility of 24-hour access to the collection						
No personal contact with other end-users						

Quick and direct access to information	
No librarian to access end-user's back ground and information needs	
Limited wear of the collection	
Adequate knowledge of computer skills is required	
No physical contact with information	
Information can be held in more than one place	
There is access to unique historical information where physical access is not allowed	
It might cost to have access to information	
There is the possibility of unrestricted number of 'loans'	
Information is available in a variety of formats	
Computer equipment is required	
Time spent in front of monitor	
Information can be accessed by many end-users simultaneously	
Privacy	
Online help	

Table 6 – Advantages and disadvantages of information in digital form

i) Future use - (question 22)

In order to have even a small indicator of how end-users considered the SOSIG service, they were asked to report whether they planned to use the specific system again or not. Respondents who gave a negative answer were invited to specify their reasons.

j) Comments

Finally, end-users were given enough space to make any comment regarding SOSIG or expand on any of the answers given. They could also specify if they expected any more services from SOSIG.

3.2.2.3 Art, Design, Architecture and Media Gateway Questionnaire

This questionnaire was made available on the ADAM web site for a period of two months, from May 1st until June 30th 2000. On the ADAM Home Page there was an announcement about completing it. On selecting this notice, the questionnaire appeared with a brief introduction explaining the purpose of this survey. The ADAM questionnaire consisted of two parts (twenty-three questions). The first part was entitled 'Personal

Questions' aiming to provide information concerning the sex, age, and occupation of the respondents (questions 1, 2).

The second part was entitled 'ADAM Use' and it attempted to show firstly the use of various services provided and secondly the way they perceived the ADAM service. It dealt with the following areas:

a) Frequency of use - (questions 3, 4, 5)

Respondents were asked to indicate how frequently they obtained information from the ADAM service. End-users were invited to answer three different questions. The first question asked respondents to specify how many times they had used ADAM in the last month. The options provided by the questionnaire were: none, once, 2-3 times, 4-10 times, and 11+ times. Then, they were invited to indicate whether or not the answer provided to the previous question represented their typical use of ADAM. Finally, respondents were required to specify approximately how often they accessed the service. They could choose from among six options: daily, weekly, monthly, occasionally, hardly ever, and first time. The purpose of providing three questions was that it was possible to identify the real regular and non-regular end-users of the system.

b) Place of use - (question 6)

Respondents were requested to specify the place from which they had access to the ADAM service. The options provided were: home, university, and both. End-users had also the 'other' option, where they could indicate any other place from which they had gained access to the system.

c) Reasons for use - (question 15)

Respondents were given a list of reasons which explained why they used the ADAM service. The options provided by the questionnaire were limited because of the nature of the target group. These reasons were: writing up a term paper/ project, writing up a thesis/ dissertation, writing up a paper for publication, e.g., journal article or conference/ workshop

paper, and supporting a teaching lecture. There was also the 'other' option that respondents could specify any other reason why they used the service.

d) Searching behaviour - (questions 7, 8, 9, 10)

Respondents were asked five different questions concerning their searching preferences. Firstly, they were invited to specify from a list of services provided by ADAM to support searching to indicate which of them they used. These services were: Online help, browse facilities, search facilities, ADAM subject headings, art and architecture thesaurus, list of historical periods, list of resource type, and list of place names. Then, they were requested to state which search methods they preferred - searching, browsing, or both. In addition, they had to specify the reasons for their preference. However, in order to obtain more details on the searching method employed, end-users were invited to state which search or/ and browse strategies provided by ADAM they used. They were able to choose from among five search strategies (simple search, option search, advanced search, proximity search, and what's news search) and four browse strategies (ADAM browser, multi option, place browser, and name browser).

In addition, end-users were asked to rate the usefulness of full-text searching that might be added to ADAM in the future on a scale of 1-4, where 1 is an unhelpful service and 4 is a helpful service. Full-text searching would provide the possibility to search the content of Web Sites as well as a database of Internet resources records that has been created by the ADAM Team.

Finally, they were invited to specify what their next step was when they had finished with their search and had identified a list of search results (hits). The possibilities provided by the ADAM service were: to link up directly to the Web pages suggested by ADAM, to read first the information provided by ADAM concerning the content of suggested Web pages and then link up to them, both of which possibilities depend on searching. There was also the 'other' option and respondents were free to specify their step.

e) Support services - (questions 11, 12)

Respondents were invited to indicate whether they had used the online help function or not. In addition, those who had not called on online help were asked to indicate the reasons for non-use. The list of potential reasons provided by the questionnaire was: I did not know that online help function could help my searching, I did not know that online help function existed, I knew about the existence of the online help, but I have not felt the need for help yet, and I prefer to ask a person to help me. There was also the 'other' option where respondents could indicate any other reason for non-use. Moreover, end-users were invited to give their opinion as to whether they believed that the online help function could replace the help provided by an intermediary, such as a librarian.

f) Types of information preferred - (questions 8)

End-users were asked to rate the usefulness of ADAM in providing access to additional Internet information gateways. Therefore, they had to assess this service on a scale of 1-4, where 1 is unhelpful service and 4 is a helpful service. This access was then unavailable, but the ADAM Team was planning to add it in the future.

g) Communication - (question 8, 16, 21)

End-users were invited to indicate their communication with other end-users. Therefore, they were asked whether they had ever passed on Web site addresses obtained from ADAM to other people who would be interested in them. Respondents who gave a positive answer were asked to specify the method of sending this information. These methods provided were: by fax, email, or hand. There was also the 'other' option and end-users were able to specify any other possible way that they sent information to others.

Second, end-users were invited to rate the usefulness of a new service that might be added to the ADAM gateway. This service aimed to provide end-users with a list of art and design newsgroups where end-users would be able to become members. They had to assess this service on a scale of 1-4, where 1 is an unhelpful service and 4 is a helpful service. Third, respondents were asked to mention whether or not they were members of the service, the 'ADAM Friends'. Then they had also to specify the reasons that led them either to become members or not. The reasons provided for members were: I think that it will help me to

identify some other end-users of ADAM, I think that I will have some more help when I carry out my search, I think that the ADAM Team will keep me informed with ADAM News and no specific reason. In addition, non-members also had to indicate why they had not become members. The reasons were: I did know that 'ADAM Friends' exists, I knew about the existence of 'ADAM Friends', but I am not interested in becoming a member, and I knew about the existence of 'ADAM Friends', but I am not aware about what it can offer me if I become a member. For both members and not there was also the 'other' option where respondents could state any other reason for their decision.

In addition, users were invited to value the usefulness of a new service that contributes to the communication of users with the ADAM system. This service allowed users to make critical evaluation of the web sites suggested by ADAM. They had to assess this service on a scale of 1-4, where 1 is an unhelpful service and 4 is a helpful service.

h) Methods of storing of information - (question 14)

Respondents were asked to reveal how they preferred to store information for future use. The question was, when they had identified a Web page that they were interested in and they decided they wanted a copy for future use, how they stored it. Before, they chose an option provided by the questionnaire they were advised that adding a Web page into 'favorites' was not considered to be a permanent storage. Therefore, the options suggested were: by saving it on a disk, e.g. floppy disk, hard disk, by printing it out as a hard copy, or by making notes from the screen. There was also the 'other' option. End-users were called in to rate these options when one (1) was their first option, two (2) was their second option and so on. They could also use the same rating number if they adopted two or more options equally.

i) Definition and advantages/ disadvantages of ADAM (questions 17, 18, 19, 20)

In order to understand how end-users considered the ADAM service, they were requested firstly to define the system and secondly to identify its advantages and disadvantages. The questionnaire provided respondents with a definition of ADAM and asked them to indicate to what extent they agreed with it. The definition was: *'ADAM is a library, based on the Internet, that provides you with a collection of information that is organised, digitised, and specialised in a specific subject area'*. Respondents could totally agree, partly agree, or

disagree with this definition. Those who partly agreed or disagreed were kindly invited to specify their reasons.

In addition, end-users were expected to specify either that they used ADAM as a supplement or as a replacement for the traditional modes of communication, such as visiting a library. Finally, they had to state whether ADAM has advantages and/ or disadvantages and to specify them. They were provided with enough space to write down the advantages and disadvantages.

j) Future use - (question 22)

In order to gain an impression of how end-users feel about ADAM, they were asked whether they would use ADAM again or not. They were given a scale of one (1) to four (4), where 1 was unlikely and 4 was likely. There was also the 'don't know' option. Finally, respondents were free to add any additional comments.

3.2.2.4 Electronic Journals Service Questionnaire

The questionnaire was online for a period of one month from 14th November until 15th December 2000. When users had been connected to a journal title Web site, the questionnaire appeared. There was a brief prologue explaining the purpose of this survey.

The questionnaire was operated in such a way as to avoid duplicate responses by end-users. For this reason, the questionnaire appeared to each IP address only once. Regardless of end-users' responses, it would never be shown again to the specific IP address. This was due to a script posting, which allows PCs to get connected to Web sites.

It consisted of sixteen questions covering a variety of issues. The first three questions aimed to identify end-users who were accessing the electronic journals service regarding their gender, age and occupation. Then, respondents were asked to specify the department they belonged to and to provide - if they remembered - the electronic journals' title they read. Finally, end-users were invited to answer a number of questions describing the way they used the service and perceived electronic journals. In particular, the questionnaire concentrated on the following issues:

a) Frequency of use - (question 6)

End-users were asked to indicate how frequently they visited the electronic journals service. The question was framed in terms of time scale, such as 'daily/ weekly/ monthly/ occasionally'. There were also two other options that represented end-users who hardly ever used the service; 'only when I know that an interesting article has been published' and 'I have only accessed once or twice'.

b) Reasons for use - (question 8)

Respondents were invited to specify the reasons they used the specific service for. They were provided with a list of potential reasons. This list was limited due to the nature of the target group. These reasons were: supporting teaching - identifying articles for supporting a lecture, identifying resources for satisfying the information needs of a researcher, carrying out a study as an underground student and identifying resources for keeping up-to-date with published information. There was also the 'other' option where respondents could indicate any other reason.

c) Place of use - (question 7)

Respondents were asked to specify the place that they gained access to the service. The options provided were: office, main or departmental library, and computer labs. There was also the 'other' option, where they could specify any other place that they had access to electronic journals.

d) Searching behaviour - (question 9)

The e-journals service of LIS of the University of Patras provides access to journal titles from different publishers/providers covering a wide range of subjects. This implies that the structure and services provided by journal titles published by different publishers will be different. However, there are some basic searching services provided to every journal title. These options are: by title of journals, by title of a journal article, by author, by date of publication, by keywords, by subject, by abstract, and by table of contents. Respondents were asked to indicate the option or options they preferred to use. There was also the other option where end-users were free to specify any other option they used.

e) Support services - (question 10)

When an end-user accesses the home web page of a journal title, an online help service is provided in order to help end-users to find articles relevant to their information needs. The structure of the online help service may differ for titles coming from different publishers. However, the basic purpose of the service remains the same - to provide instructions on how to use a service such as search, browse and print. Respondents were asked to indicate whether they had used the online help function or not. Those who had used the function were invited to indicate their opinion of its usefulness. In addition, respondents who had not called on online help were invited to indicate their reasons for non-use. They were provided with a list of potential reasons: I did not know that online help function could help my searching, I did not know that online help function existed, I knew about the existence of the online help, but I have not felt the need for help yet, and I prefer to ask a person to help me. There was also the 'other' option where respondents could indicate any other reason for non-use.

f) Methods of storing information - (question 11)

Respondents were asked to reveal how they preferred to store information for future use. The question was, when they had identified a journal title that they were interested in storing for future use, how they actually saved it. They were provided with a number of potential methods of storing. These were: by saving it on a disk, e.g. floppy disk, hard disk, by printing it out as a hard copy, or by making notes from the screen. There was also the 'other' option where end-users could indicate other method of storage.

g) Comparison of print and electronic information - (question 12)

Respondents were asked to specify their preference concerning the electronic or the print format of journal titles. They were invited to indicate which form of a journal title - the electronic or print - they would choose to read. In addition, they were asked to justify their preferences providing the reasons that contributed to their selection of the specific format.

h) Reasons that might discourage end-users from accessing an e-journals service - (question 13)

Respondents were asked to indicate which factors would discourage them from accessing an electronic journals service. They were provided with a list of potential reasons and they were asked to choose those that would prevent them from using electronic journals in the future. The choices provided by the questionnaire were focused on different areas including technical issues such as the time required for a Web page to be downloaded, type of information provided, lack of communication, possibility of storing and printing and provision of seminars. These options are provided in Table 7.

Response rate (%)	
If there is not enough information relevant to my subject	
If a Web page is downloaded very slowly	
If I need to pay in order to have access to information	
If I do not feel familiar with how to search the 'e-journals' service	
If there is no human help	
If there is no way to identify other end-users of the 'e-journals' service	
If I am not able to print an article for reading	
If I am not able to print an article for storing	
If I am not able to save an article on a disk, e.g. floppy disk, hard disk, CD-ROM	
If there is no 24-hour access to the 'e-journals' service	
If there is no access from my desktop	
If there is no access to information published in the past	
If I have to memorise end-username and password to log in	
Other(s)	
None	

Table 7 – Reasons that might prevent end-users from using electronic journals services (online questionnaire)

i) Comments - (question 15)

Respondents were invited to indicate whether they would recommend the service to any colleague or friend of theirs. Finally, respondents had enough space to add any additional comment or expand on any of the answers given. They were also asked to specify whether they would like to contribute further to this study.

3.2.3 Face-to-Face Interviews with end-users of the Electronic Journals Service

The interviews were conducted in September 2001 and in January 2002. Thirty-six electronic journals service end-users were interviewed. Each interview lasted from 45 minutes to an hour and they took place in offices of the University. At the beginning of the interview, end-users were invited to provide some personal information regarding their age, gender and occupation. Then, respondents were asked to specify the department they belonged to. Finally, end-users were invited to answer a number of questions describing the way they used the service and perceived electronic journals. In particular, the questionnaire concentrated on the following issues:

a) Frequency of use - (question 4)

Interviewees were asked how frequently they used the service. The question was framed in terms of time scale such as 'daily/ weekly/ monthly/ occasionally'. There were also two other options: only when they know that an interesting article has been published and they have used the service only once or twice.

b) Reasons for use - (question 7)

Interviewees were invited to specify the reasons they used the specific service. They were provided with a list of potential reasons. This list was limited due to the nature of the target group. These reasons were: supporting teaching - identifying articles for supporting a lecture, identifying resources for satisfying the information needs of a researcher, carrying out a study as an underground student and identifying resources for keeping up-to-date with published information. There was also the 'other' option where respondents could indicate any other reason.

c) Place of use - (question 5)

Interviewees were asked to specify the place that they gained access to the service. The options provided were: office, main or departmental library, and computer labs. There was also the 'other' option, where they could specify any other place that they had access to electronic journals. Also, interviewees were asked if they would like to have access to the

service from home, as well as from the University in the future. They were requested to provide their reasons for their response.

d) Publicity - (question 6)

Interviewees were invited to describe how they were first informed about the existence of the specific electronic journals service.

e) Searching behaviour - (question 8)

End-users were requested to give their initial reason for using the electronic journals service. This means that they were asked to indicate whether they used the service only for searching for a specific journal article that they knew had been published or just for browsing for interesting articles. Then, they had to state, firstly, whether they were familiar with the terms search and browse and the Boolean operators, and, secondly, whether they used the operators. Those who used them were asked to specify which ones.

f) Support services (questions 9 and 13)

Firstly, interviewees were asked to indicate whether they had used the online help function or not. Those who had used the function were invited to indicate their opinion of its usefulness. In addition, respondents who had not called on online help were invited to indicate their reasons for non-use. They were provided with a list of potential reasons: I did not know that online help function could help my searching, I did not know that online help function existed, I knew about the existence of the online help, but I have not felt the need for help yet, and I prefer to ask a person to help me. There was also the 'other' option where respondents could indicate any other reason for non-use. Then, they were asked, if they had the chance to decide between an online help and a human help, both provided by the service, which one they would choose. They should also provide their reasons for their answer. Also, they were free to make any comment on the online and/ or human help.

Finally, interviewees were invited to say whether they would like to attend any seminar concerning the proper use of the specific service. Then, those who answered positively were requested to specify the content of these seminars.

g) Comparison of print and electronic information - (question 12)

Respondents were invited to specify their preference concerning the electronic or print format of journal titles. They were invited to indicate which form of journal title - the electronic or print - they would choose to subscribe to if they had the chance of being provided with a free subscription to a journal title. In addition, they were asked to justify their preferences providing their reasons.

h) Methods of storing information - (question 10)

Respondents were asked to reveal how they preferred to store information for future use. The question was, when they had identified a journal title that they were interested in storing for future use, how they actually saved it. They were provided with a number of potential methods of storing. These were: by saving it on a disk, e.g. floppy disk, hard disk, by printing it out as a hard copy, or by making notes from the screen. There was also the 'other' option where end-users could indicate other methods of storage.

i) Methods of reading information - (question 11)

This question was focused on figuring out how end-users prefer to read online information. Generally, there are two methods: firstly to print it out and secondly, to read it from the screen. Respondents were invited to choose either of these two methods or to specify any other reason that they prefer to read online information.

j) Reasons that would discourage end-users from accessing an e-journals service - (question 14)

Respondents were asked to indicate which factors would discourage them from accessing an electronic journals service. They were given the same list of potential reasons provided in the online questionnaire and they were asked to choose those that would prevent them from using electronic journals in the future. The choices provided by the questionnaire were focused on different areas including technical issues, such as the time required for a Web page to be downloaded, type of information provided, lack of communication, possibility of storing and printing and provision of seminars. These options are provided in Table 8.

Reasons that would discourage end-users from using electronic journals services	
If there is not enough information relevant to my subject	
If a Web page is downloaded very slowly	
If I need to pay in order to have access to information	
If I do not feel familiar with how to search the 'e-journals' service	
If there is no human help	
If there is no a way to identify other end-users of the 'e-journals' service	
If I am not able to print an article for reading	
If I am not able to print an article for storing	
If I am not able to save an article in a disk, e.g. floppy disk, hard disk, CD-ROM	
If there is no 24-hour access to the 'e-journals' service	
If there is no access from my desktop	
If there is no access to information published in the past	
If I have to memorise end-username and password to log in	
Other(s)	
None	

Table 8 – Reasons that might prevent end-users from using electronic journals (face-to-face interviews)

k) Evaluation of service and/ or features - (question 15)

Respondents were asked to specify the services and/ or features that an electronic journals service should provide to its end-users. They were provided with a list of services and features and asked to evaluate them as very important, important, or not important. There was also the 'don't know' option. These services/ features referred to evaluation of various issues, including the nature of information provided (current or past information), the searching methods (search or browse), the possibility of storing, printing and reading information, the communication with authors and/ or other end-users who share the same interests and technical issues (Table 9).

Evaluation of service and/ or features	
Satisfied number of relevant current information	
Satisfied number of relevant past information	
Direct access to information provided as bibliography	
24-hour access to the service	
Access to the service without memorising username/ password	
Quick access to the service	
Access to the service from users' desktop	
Easy access to the service	
Provision of Search facilities	
Provision of Browse facilities	
Provision of Online Help	
Provision of Electronic and Human Help	
Customisation of services	

Possibility of saving information	
Possibility of printing information	
Provision of links to other information	
Possibility for users to make online comments for a journal article	
Possibility for users to communicate with authors of journal articles through emails	

Table 9 – Evaluation of service and/ or features**I) Comments - (question 16)**

Finally, end-users were able to make any comments regarding electronic journals services, either for the specific service or for electronic journals in general.

Chapter 4

Synthesis of results

In this chapter, results of the online questionnaires, face-to-face interviews and transaction logs analysis are combined. Regarding the Social Sciences Information Gateway (SOSIG) and the Arts, Design, Architecture and Media Gateway (ADAM) the research methods used were online questionnaires and transaction logs analysis. For the electronic journals service of the Library and Information Service (LIS) of the University of Patras the methods used were online questionnaires, face-to-face interviews and transaction logs analysis. These findings are organised on the basis of the research areas that this study covers. All tables of analysis are provided in the Appendix B.

4.1 Characteristics of sample population

The SOSIG and ADAM gateways and the electronic journals service are used by both males and females and all age and occupational groups provided in the questionnaires. However, regarding the SOSIG and ADAM, findings showed that there were slightly more female respondents than male. 55.7% of them were female and 42% of them were male. Regarding the age groups, results showed that both gateways were used by all age ranges included in the questionnaire (17-65+). However, most respondents belonged to the 25-34 age group, while there were not many respondents aged 55 years old and over – 31.3% of the respondents belonged to this age category. Concerning the occupational categories, most respondents for SOSIG were information scientists (29.8%). However, if information scientists were excluded, the largest group of respondents would be the students (undergraduate, postgraduate, and research) – 16% of the respondents. Then, there were

lecturers, senior lecturers, professors, or Heads of Department and research fellows or assistants. Similarly, regarding the ADAM gateways, most respondents were students (undergraduate, postgraduate, and research – 53,6%), followed by academic staff (lecturers, senior lecturers, professors, or Heads of Department – 16,7%) and by research staff (research fellows or assistants – 3,6%).

In addition, different domains, such as commercial and organization, used both gateways. Although their purpose was to satisfy the information needs of all members of academic communities, some other groups of people (consultants, information scientists and administrator staff) found them useful in order to obtain information from the Internet.

On the contrary, the results of the electronic journals service showed that electronic journals were more popular among men than women. Regarding the electronic journals service online questionnaire 71,5% of males and 28,5% of females completed the questionnaire. Then, concerning their occupation, results showed that the service was accessed used by faculty members (46,1%) and postgraduate students (45,9%) than undergraduate students (6,1%). Regarding the age groups, most respondents were those aged younger than 35. This is a result of the high proportion of students, undergraduate or postgraduate, who completed the questionnaire.

4.2 Obtaining information from the Internet

Results showed that the majority of SOSIG respondents were regular Internet users, either using it every day or weekly. Both men and women proved to be regular Internet users. In addition, all age and occupation groups seemed to be frequent users of the Internet. The most frequent users were females, aged 35-44, and research staff.

However, two-thirds of SOSIG respondents experienced problems when obtaining information from the Internet. Women, aged 17-34, and the *don't know* category and students faced the most difficulties in obtaining information from the Internet. They evaluated the process as either moderately easy or difficult. When end-users were asked to specify their problems, the most cited one was the fact that a lot of information is available – 64% of the respondents specified this problem. Still, there were a large number of respondents who specified that they did not have the time required to search for information they needed

they needed (45.3%) and others who complained about the slow speed of access to the service (44.2%). Less cited reasons were: their unfamiliarity with searching methods, the lack of online help (18.6%) and the cost of searching the Internet (14%).

Although both the gender and age and occupation categories identified the overload of information as a major problem, those aged 45-54 and academic staff seemed to be more worried about the fact that they did not have the time to search for information. All of those aged 45-54 and 43.8% of the academic staff specified this difficulty. Finally, many respondents complained about the quality of information published on the Internet. For example, one respondent noted:

'Some information, whilst interesting, does not always seem to have been rigorously tested. Therefore, you have to make subjective judgements about the quality of information provided, which can be time consuming'.

4.3 Frequency of use

The use of SOSIG and ADAM gateways was varied. 52.8% of SOSIG respondents and 28.6% of ADAM respondents used these services daily, weekly or monthly. The most frequent end-users were students and information scientists. Regarding SOSIG, females were more frequent users than men. But, for ADAM, despite the fact that the survey attracted more women than men, men said they used the service more frequently than women. The majority of those aged 17-44 indicated that they consulted SOSIG on a weekly or monthly basis. But regarding daily access, those belonging to the 25-34 age category accounted for three-quarters of the daily users. Less frequent users were those aged 55+. The occupational categorisation showed that information scientists and students were the most regular users. Regarding ADAM, it appeared to attract a lot of new users, while less than 10% of respondents used the service on a frequent basis - daily or weekly. Regarding age, although end-users belonged to all categories, the majority were under 35 and those aged 55 years old and over were the most infrequent users. Daily users were a male information scientist (45-54) and two male students (17-24 and 25-34). The high number of respondents younger than 35 years old is not a surprising finding, given the large proportion of students in the sample.

On the contrary, results of the electronic journals service were satisfied. Over one-third of the respondents used the service on a daily basis (38.6%) and the majority on a weekly or monthly basis (52.5%). Proportionally more males used the service on a daily, weekly, or monthly basis than females, while those aged 25-34 and postgraduate students were the users with the highest proportion of use on a daily, weekly, or monthly basis. Similarly, results from the interviews encouraged the acceptance of electronic journals. The majority of the interviewees indicated that they used the service on a daily or weekly basis (58.4%). Males indicated that they read the electronic journals more often than females. In addition, two males specified that they accessed the electronic journals service only when they were aware that a relevant article to their information needs had been published. Regarding age and occupational groups, the most frequent users were those aged from 25-44 and postgraduate students.

Data obtained by transaction log analysis showed that the use of both gateways and the electronic journals service had steadily increased since the implementation of its service. For example, regarding the SOSIG in 1994, there were in total 35,513 file or page requests and in 2002 there were 12,189,526 requests (Figure 1). Then, concerning the ADAM in 1996 there were overall 24,496 file or page requests and in 2000 there were 252,735 requests from January to June alone (Figure 4). Finally, concerning the electronic journals service in 2000, there were overall 34,607 sessions and 1,299 potential users (IPs) and in 2003 (from January to November) there were 68,777 sessions and 1994 potential users (Figure 7). End-users of gateways were located in European and non-European countries, but mostly in the UK, the USA, Canada, Australia, Germany, Sweden, Italy, the Netherlands, Spain, Japan and Denmark. Peak use occurred at the beginning and end of the university spring and autumn terms. Regarding daily access, results of both gateways revealed that there was more interest in accessing the services during weekdays, rather than during weekends. The most active days were Tuesdays, Wednesdays, and Thursdays. Concerning the hourly requests, users were more willing to access the SOSIG and ADAM during working hours (from 8am to 5pm), especially between 2 pm and 5pm (Figures 2, 3, 5, 6). The only exception occurred for the SOSIG service for the years 2000-2002. Whereas from 1994 to 1999 the majority of end-users preferred to use the service during working hours, from 2000 to 2002 most of them started to use it after working hours.

Moreover, since the implementation of SOSIG and ADAM, sub-domains related to US Commercial and Network provided an increased number of users (Appendix B). For example, the analysis of SOSIG revealed that in 1994, US Commercial was 5.7% and Network was 1.6% of total sub-domain accesses and, in 2002, it was 18.9% and 13%, respectively. Then, findings of ADAM showed that in 1996, US Commercial was 8.9% and Network was 3.6% of total sub-domain accesses and in 1999, it was 18% and 11.4%, respectively.

Finally, there has been a constant decline in the number of educational sub-domains, such as *ac.uk* and *edu*. Regarding the SOSIG service, in 1994, *ac.uk* and *edu* accounted for 56.4% of total sub-domain requests, and in 2002, *ac.uk* and *edu* were 16.1% and 21%, respectively. Then, for the ADAM service, in 1996, *ac.uk* and *edu* were 43.2% of total sub-domain file or page requests, and in 1999, *ac.uk* and *edu* were 25.7%.

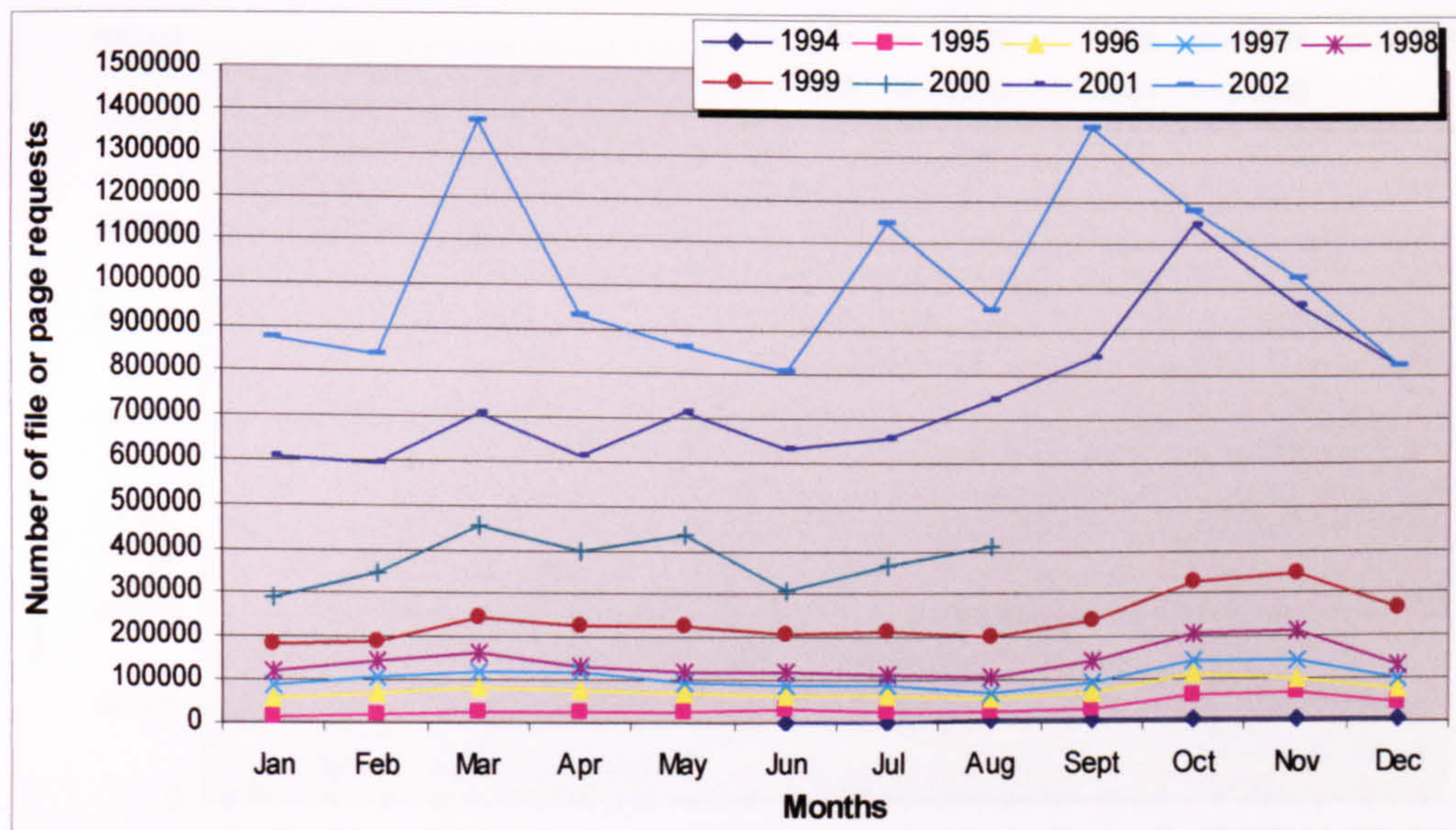


Figure 1 – Number of file or page requests per month for SOSIG (1994-2002)

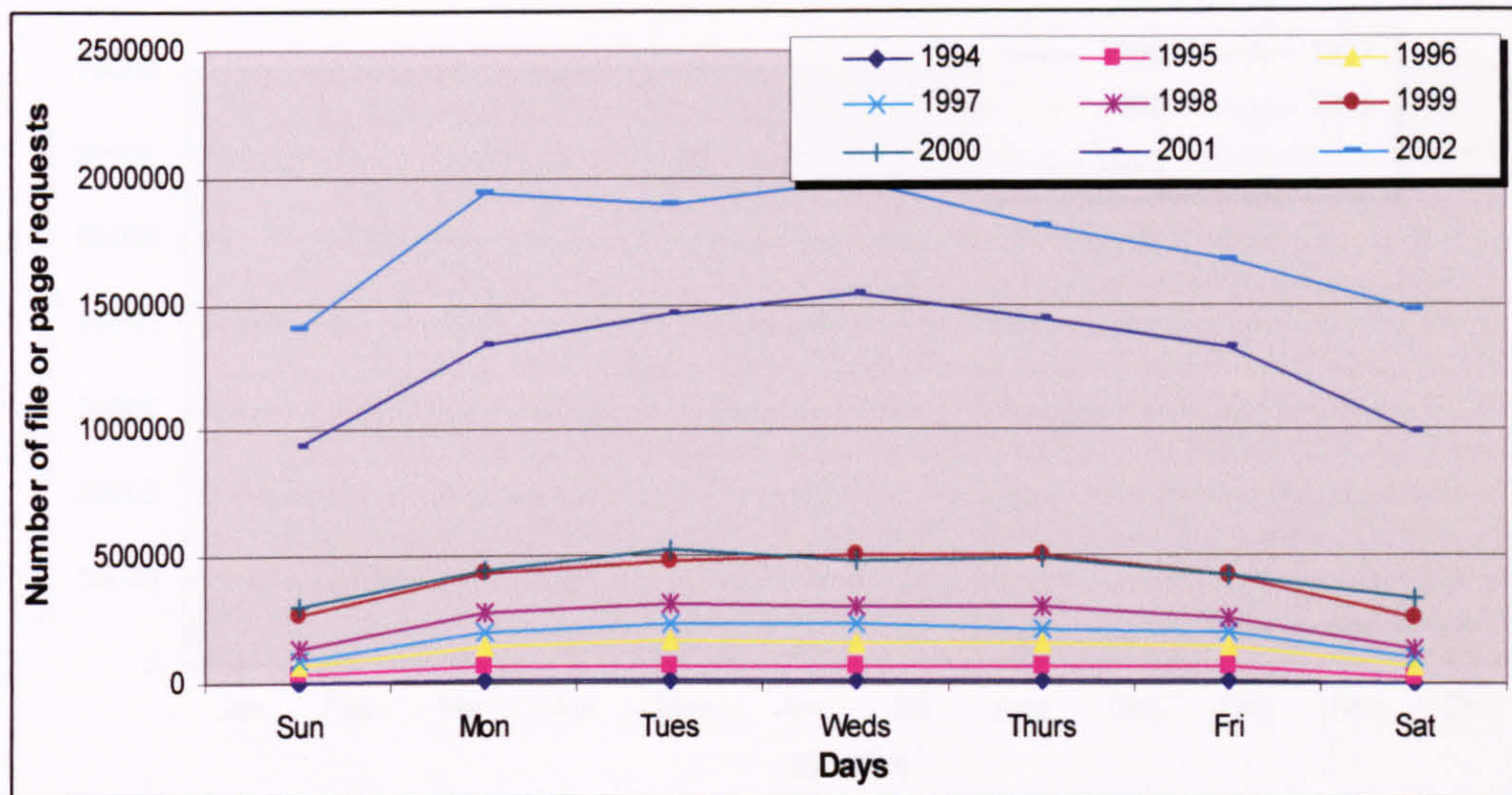


Figure 2 – Number of file or page requests per day of SOSIG (1994- 2002)

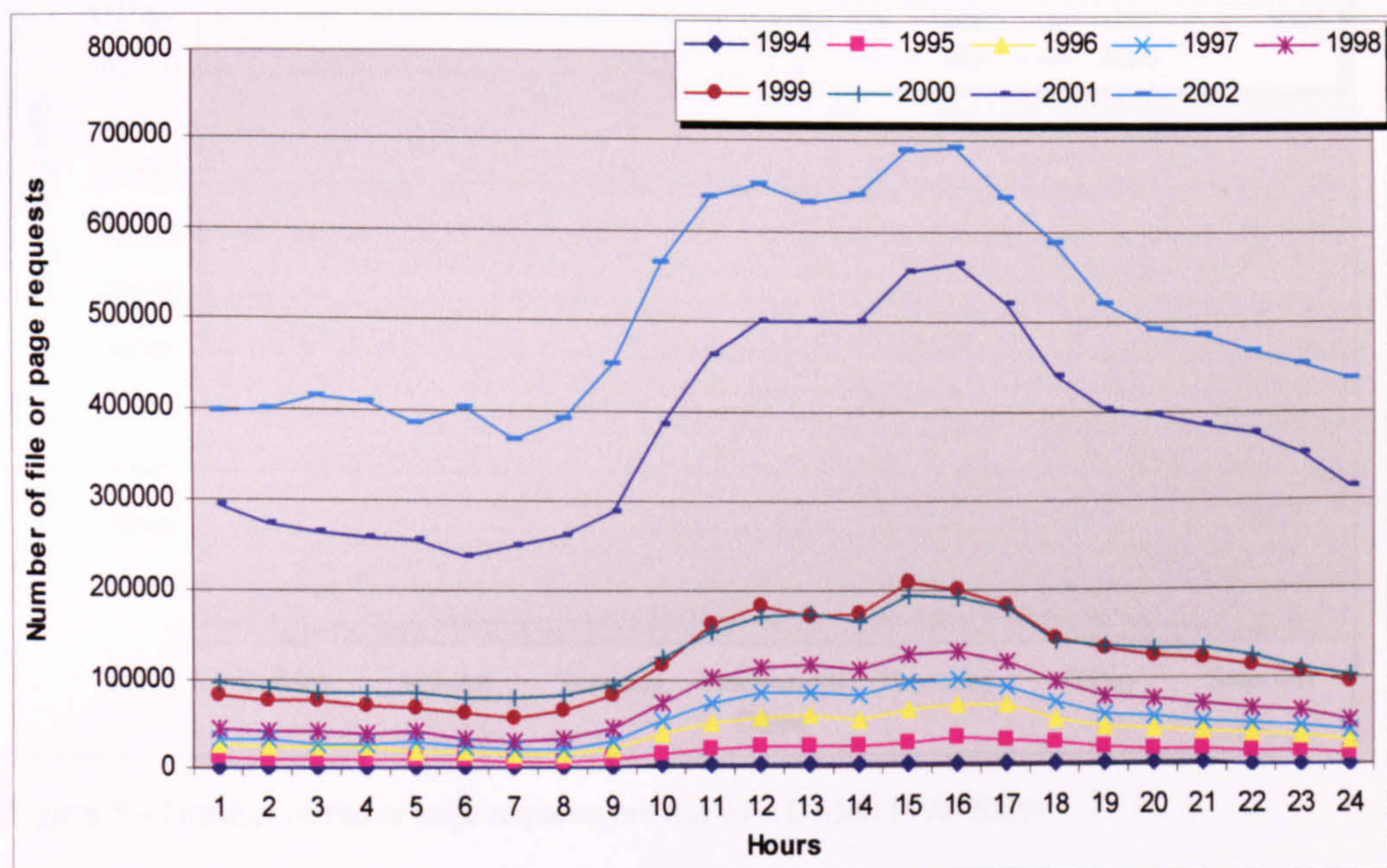


Figure 3 – Number of file or page requests per hour of SOSIG (1994-2002)

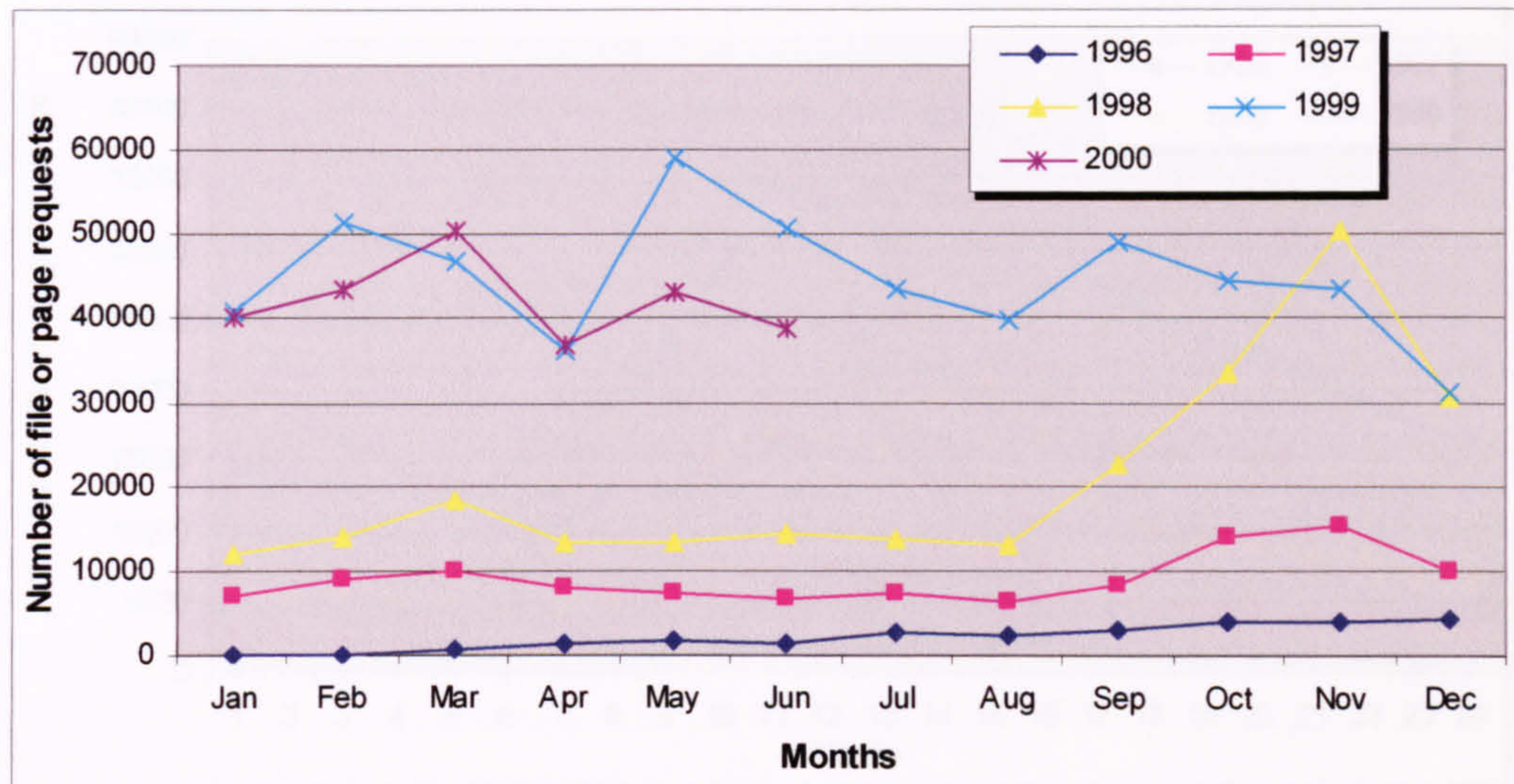


Figure 4 – Number of file or page requests per month of ADAM (1996-2000)

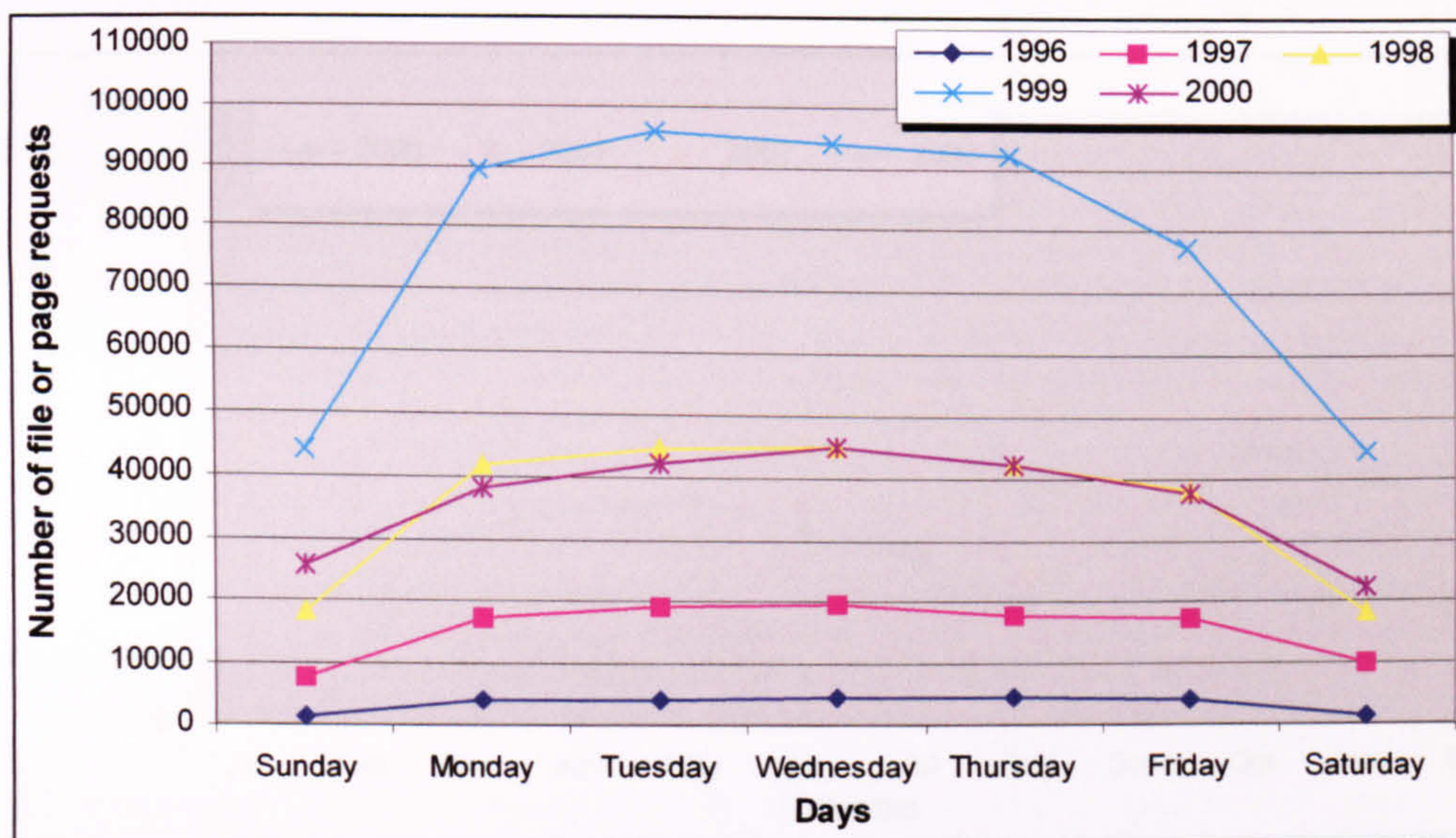


Figure 5 – Number of file or page requests per day of ADAM (1996-2000)

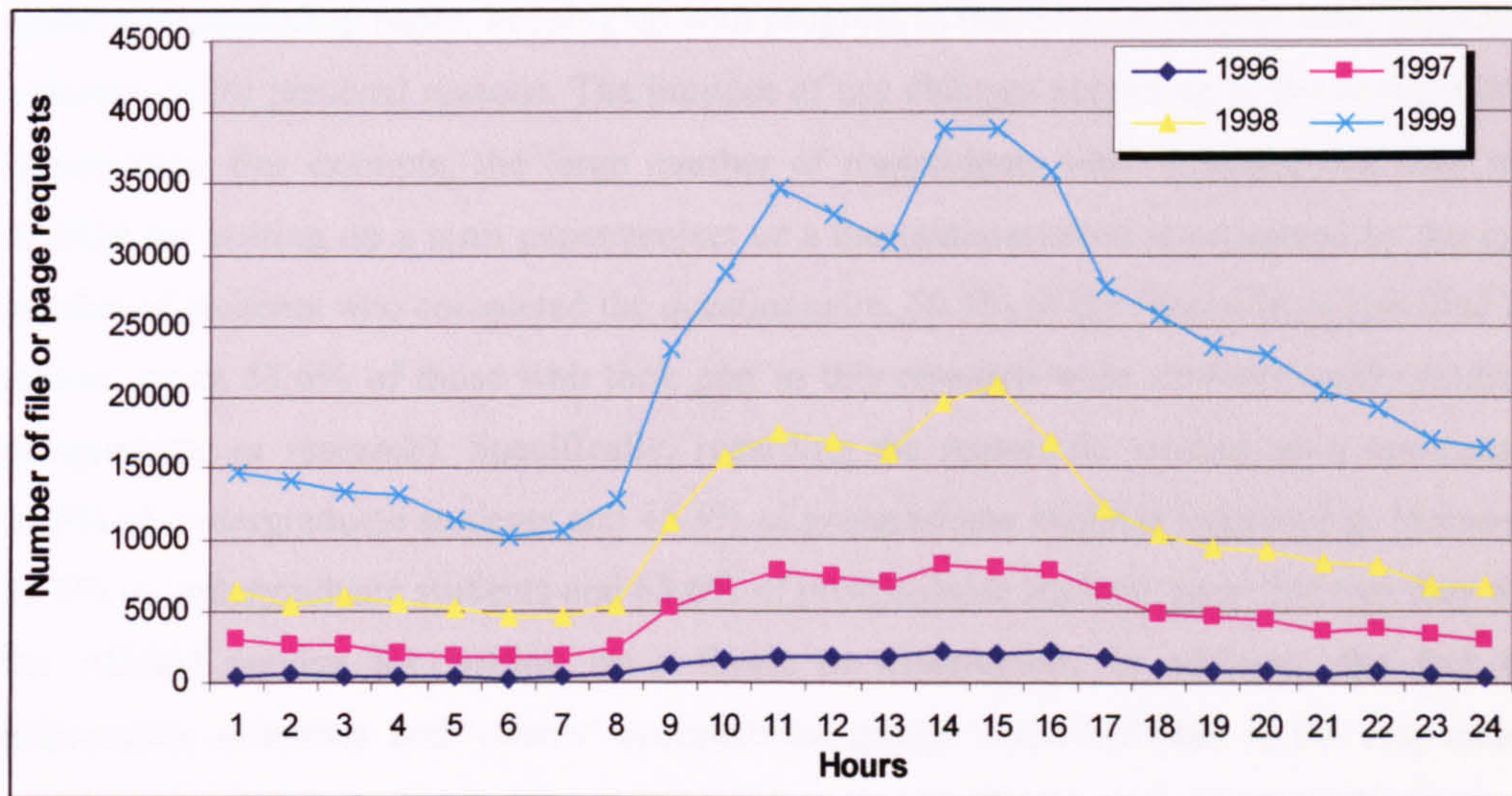


Figure 6 - Hourly use of ADAM (1996-1999)

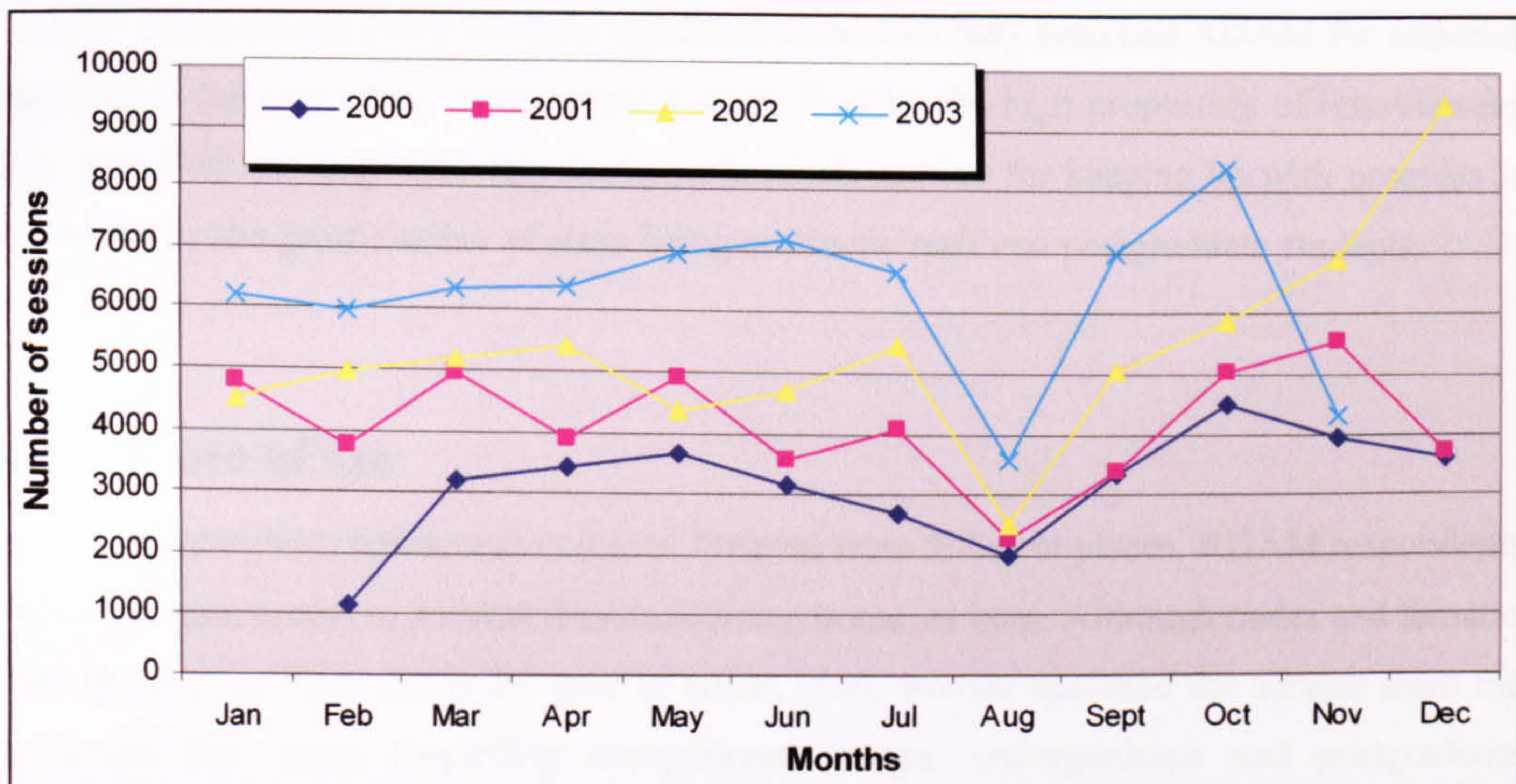


Figure 7 – Number of sessions of the electronic journals service (2000-2002-2003)

4.4 Reasons for use

Findings of both gateways and the electronic journals service revealed that end-users accessed these services for a variety of reasons: for writing up a term paper/project or a thesis/dissertation, writing up a paper for publication, e.g. journal article or

conference/workshop paper, keeping up with progress in the relevant subject area, supporting a lecture or for personal reasons. The purpose of use changes according to the occupation of respondents. For example, the large number of respondents who indicated that they used ADAM for writing up a term paper/project or a thesis/dissertation is explained by the great number of students who completed the questionnaire. 69.9% of the respondents specified this reason, when 53.6% of those who took part in this research were students (undergraduate, postgraduate or research). Specifically, regarding the reason for writing up a term paper, 55.9% of undergraduate students and 45.5% of postgraduate students indicated it. Moreover, 23.5% of undergraduate students and 63.6% of postgraduate students specified that they used the ADAM service for writing up a thesis or dissertation. In addition, the fact that information scientists and ‘*others*’ occupational groups were included in the respondents partly accounts for the large number of people who specified another reason for using the ADAM service. Information scientists indicated that they used ADAM for answering queries from their customers, such as students, or creating catalogues, for instance, compilations of web directories by use of students and staff in institutes of art, design and technology. The ‘*others*’ occupational group category specified either that they searched ADAM for personal interests or for supporting other people’s work. Finally, the high proportion of interviewees who specified that they used the electronic journals service for keeping up with progress is explained by the great number of them being academic staff and postgraduate students.

4.5 Place of use

Respondents had access to digital libraries from different places. ADAM respondents seemed to gain access to ADAM from university, home, or both. Although males and females used the service from university and/ or home, more women accessed the service from the university than men. Regarding occupational groups, undergraduate and postgraduate students were most likely to search ADAM from the university and the academic staff group was most likely to search the service from home. Concerning the areas of universities where end-users are able to have access to these services, more than three-quarters of the electronic journals service’ respondents specified that they gained access to e-journals from their office/desktop. However, not all users were able to use the service from their office. Academic staff, research staff and some postgraduate students had their own office or shared one with others; therefore, they did not have to go to a computer lab or to a library.

Undergraduate students were able to use the service either from a computer lab or a library – main or departmental.

A great number of interviewees expressed interest in gaining access from their home. 55.6% of them revealed that they would appreciate to be able to read electronic information at home. Their most cited reason for this opinion was the fact that when they were at the university they were busy. They had other responsibilities; therefore, it was not possible to search for information, such as journal articles. In addition, some others indicated that at the university they shared their office with other colleagues. Therefore, it was not always easy to concentrate on searching for information or to have their own privacy. Finally, a few interviewees said that they would like to have access from home, but it was important to be certain that the Internet connection would be quick. The greater supporters of home access were females, those aged from 25-34, and academic staff.

Still, there were some users who admitted that they would not like to have access from home 44.4% of them had this opinion. A primary reason provided mainly by male postgraduate students was the fact that when they returned home *they preferred to relax instead of spending time in front of a monitor and searching or reading a journal article* (62.5%). In addition, they said that there were some technical issues that prevented them from using the service from home, such as the Internet connection, which was slow and took time for a web page to be downloaded (25%). Finally, some interviewees admitted that they would like to pay in order to be able to search or read a journal article (18.8%).

4.6 Publicity

Results showed that library played an important role in the advertisement of the electronic journal service. Interviewees specified that they were first informed about the 'electronic journals' service from an email service sent by the Library – 72.2% of the interviewees chose this option. This email aimed at introducing the specific service to the academic community. However, 16.7% of the interviewees were first informed by a colleague, friend or supervisor, while 11.1% of them during browsing the Library Web Site. Males aged 25-34 and academic and research staff represented those who were first informed about the service on their own, while they were browsing.

4.7 Searching behaviour

Concerning the searching behaviour of end-users, results showed that respondents searched and browsed in order to find articles relevant to their information needs. However, they seemed to show a preference for direct searching rather than browsing. Results of the SOSIG survey revealed that 50.4% of the respondents chose the searching option, 33.6% of them specified the browsing option and 14.5% of them both options. Females and males showed a preference for searching – 53.4% of women and 47.3% of men chose the searching option. Those belonging to the age groups: 17-24, 25-34, 35-44, and 45-54 preferred the searching option, while 55-64 and 65+ age groups the browsing one. Regarding occupation groups, all of them showed a preference for search facilities, while research staff were the greatest supporters (66.7%).

Regarding the ADAM survey, 50% of the respondents preferred to search, 11.9% of them preferred to browse and 33.3% of them to use both methods. Women and men showed a similar preference for searching – 49% and 51.5%, respectively. Those aged 17-24 and 35-44 inclined towards the searching method and those aged 25-34 and 45-64 preferred to use both techniques. Regarding occupational categories, undergraduate students, academic staff and information scientists chose the searching option and postgraduate students, research staff and the 'others' category specified both methods.

Supporters of the searching method commented that it was a simple, quick method of retrieving information providing them with more accurate and direct information. In contrast, browsing allowed them to do the equivalent of a 'shelf search' and to identify resources in a specific area. Finally, those who chose both techniques explained that each method had its own advantages and their use depended on the nature of a specific search.

Findings of electronic journals service revealed that end-users used the specific service for searching for a specific article and for searching / browsing in order to find articles relevant to their information needs. In order to be informed about the publication of interesting articles, they looked into various databases, such as MEDLINE. The majority of males and females and age and occupation groups said that they did not use the electronic journals service only if they knew that an interesting article had been published, but also in order to search / browse for articles, except for the 55-64 age group, which indicated that searching for a specific published article was its primary reason for use.

Generally, users of the electronic journals service also showed a preference for search rather than browse facilities. When they were invited to evaluate the importance of both facilities, 77.8% and 61.1% of the interviewees valued search and browse facilities as very important, respectively.

Notwithstanding the extensive use of both methods by end-users, their searching behaviour was simplistic without using advanced searching techniques. Although the ADAM service provided to its users a number of different ways to search and browse, they insisted on using the simplest ones. The most famous search option was the 'simple' and browse option the 'ADAM Browser'. 81.4% of ADAM respondents chose the 'simple search' option and 52.6% indicated the 'ADAM Browser'. Both males and females and age groups specified the simple search and browser as their first choices for searching and browsing. Regarding occupation, all groups showed a preference for simple searching, with research staff, information scientists and *other* category being the biggest users.

In addition, results concerning the use of searching lists provided by ADAM were generally unsatisfactory. Only 12.7% of the respondents looked for information specifying the historical period, while nobody used the list of place names. Females aged 55-64 and research staff were the greater users of the list of historical periods – 75% and 33.3%, respectively. Findings concerning the list of resource types were more satisfactory. 29.1% of the respondents used it, while males (30%), those aged 25-34 (42.9%) and postgraduate students (45.5%) were the bigger supporters. Fortunately, slightly more respondents used the thesaurus and the ADAM Subject headings. 38% of the respondents indicated that they consulted the thesaurus in order to carry out their searches. Most users were males (43.3%), those aged 55-64 (50%) and research staff (66.7%). Then, 39.2% of the respondents looked for information using the ADAM subject headings. Females belonging to the 45-54 age group and academic staff represented the larger users of subject headings. It also worth mentioning that only 21.4% of the SOSIG respondents characterised the thesaurus as very important. Females aged 25-34 and research staff were also the biggest supporters of the thesaurus.

In order to obtain more details on the searching method employed, users were asked to specify which search or browse options they used. Results revealed that there was a spread use of options provided, such as by title, description, keywords, country, language, resource

type, but the option most frequently used was “keywords”. In addition, there were users who were not familiar with the meaning of the terms search and browse and others who were reluctant to use the Boolean operators. Some of them they did not even know of their existence. Regarding the use of the searching options, 95% of the SOSIG respondents mentioned the keywords. Academic staff, research staff, information scientists, the *don't know* and *other* categories preferred ‘keywords’ option, while students used the ‘keywords’ and ‘descriptions’ options equally. Regarding age groups, the ‘keywords’ option seemed to be used by all of them, but those aged between 25-64 were the biggest users, while users aged between 17-24 indicated that they used the ‘title’, ‘descriptions’ and ‘keywords’ options equally.

Similarly, in the electronic journals service, the most popular search method was ‘keywords’ and the second most favourable option was ‘author’. 89.7% of respondents specified searching by keywords, while 75.9% of them searched by author. Women and men, and all age and occupation groups indicated that ‘keywords’ were their first choice except for those aged between 55-64 who showed an equal preference for ‘author’ and ‘keywords’. Interviewees also indicated that they preferred to search primarily by keywords. Both males and females preferred keywords. Regarding age, the 17-24 and 25-34 groups preferred to search by keywords, while the 35-44 and 45-54 groups by authors and keywords, equally. In addition, end-users belonging to the 55-64 category specified only by authors. Finally, all occupation groups chose by keywords, except for academic staff who indicated by authors as their first choice.

Regarding the meaning of the terms search and browse and the Boolean operators, findings showed that a large number of interviewees were not familiar with the terms search and browse. 50% of them said that although they knew that both services were provided by the electronic journals service, they did not know the terms. Females aged 17-24 and undergraduate students were less familiar with the terms search and browse. In addition, although the majority of interviewees said that they knew and used the Boolean Operators, 22.2% of them admitted that they did not use them. Those less familiar with them were females aged 17-24 and undergraduate students.

Some interesting comments from interviewees were that it was essential for them to be able to search simultaneously by keywords all the journal titles they were interested in reading. In

addition, they mentioned that they would like to be informed about the publication of articles relevant to their information needs. Finally, when the ADAM respondents were asked to rate the helpfulness of the full-text searching that might be added to ADAM in the future on a scale of 1-4, where 1 is an unhelpful service and 4 is a helpful service, 60.7% of the respondents rated it as a helpful service. The greater supporters were males aged 45-54 and academic staff.

4.8 Reading of search results obtained by digital libraries

Respondents seemed to appreciate the information provided by ADAM for each Web page concerning its content. There were users who before linking to Web pages suggested by ADAM, carefully read the information provided - 46.4% of the respondents mentioned this. 40.5% of them mentioned that they always read the content of Web pages and 10.7% of them directly linked to the suggested Web sites. Both males and females mentioned that they did *both* option as their first choice. All age groups preferred to do both, except for those aged 25-34, the majority of whom read the content of Web pages, while the *both* option was their second choice. Regarding occupation groups, all of them preferred to use both techniques; undergraduate and postgraduate students preferred to read the content of Web sites. Finally, research staff seemed to use all the options equally.

4.9 Support services

The use of online help was low. However, results showed that both males and females and all age and occupational groups used it. Notwithstanding the low use of online help, users seemed to appreciate its role. 45% of SOSIG respondents valued it as a very important or important facility. The biggest supporters were students and those aged between 17 and 24. 61.9% and 64.7% of them described online help as very important or important, respectively. In addition, students represented the second greatest occupational group who used the service. This means that they valued the service when they had had the experience of using it. However, 9.2% of the respondents claimed that online help was unimportant. This group of people consisted of men and women and all age and occupation groups, except for those aged 17-24.

Those who had used the help of SOSIG were also invited to evaluate the information provided by online help. 64.3% of them stated that the information supplied was helpful, while 28.6% specified that it was moderately helpful. Concerning females and males, the same percentage of each of them found the information supplied helpful (66.7%). But, more women than men evaluated the information as moderately helpful. All age groups identified the information provided by online help as either helpful or moderately helpful except for those aged 17-24 who valued it as helpful. Regarding occupation groups, academic staff and the *other* category seemed to be satisfied with the information provided by online help function. However, students, research staff and information scientists stated that they found online help moderately helpful.

Regarding the reasons for non-use of online help, those who had not called on it were invited to indicate their reasons. The most cited reasons were that users had not felt the need for help yet. However, there were users who mentioned that they did not know that online help was available or they did not know what online help was. Regarding the ADAM gateway, 35.3% of the respondents specified that they had not felt the need for help yet, while 30.9% of them implied that they did not know that online help was available. The primary reason given by men was that they had not felt the need for help yet and by women they did not know that online help existed. In addition, more males than females did not realise that online help could help them. Regarding age groups, most of them specified all the reasons provided by the questionnaire. However, the majority of those aged 45-54 indicated other reasons that prevented them from using the online help function. Those who did not know the existence of online help were mainly students (undergraduate and postgraduate) or respondents from the *other* occupational category.

Similarly, 50.7% of the respondents of the electronic journals service online questionnaire specified that they had not felt the need for help yet, 22.5% of them did not even know what online help was, and 5.1% of them did not know that online help was available. Females and males both indicated that they had not felt the need for help yet as the main reason for non-use - 51.1% and 50.5%, respectively. Regarding the age groups, those aged 25-34 appeared to need online help less than the other groups, while proportionally more respondents aged 45-64 indicated that they did not know what online help was. According to this, research staff and postgraduate students were those that needed online help less. Finally, it is a significant point that 50% of research associates/ visiting lecturers and the *other* category did not know

what online help was. Again the results of the interviews showed that 70.6% of non-users had not felt the need for help yet, while one person said that he did not know that specific electronic journals provided online help.

Moreover, there were respondents whose responses showed they had a jaundiced view of online help. A number of interviewees believed that they would not find the kind of help they needed. Therefore, they preferred not to use it. In addition, some respondents specified the need for seminars in order to learn how to use electronic help. When interviewees were asked whether they would attend a seminar, 61.1% of them were positive. 63.6% of them believed that a seminar might change the quality of using the electronic journals service but that it would not change the frequency of their use. They said that they accessed it quite often according to their information needs. In addition, 13.6% of them (a male 25-34 year-old postgraduate student, a male 45-54 year-old academic staff and a male 35-44 postgraduate student) admitted that although they were able to find the information they were looking for they believed that there were always things to learn. Seminars were very important even if most users did not like to attend them. A male 25-34 postgraduate student specified that a seminar would be useful especially for the use of the online help function.

Although users indicated that the lack of human communication was not their main reason for not using online help, there were still supporters of human help. For example, no ADAM male respondent specified that he would prefer to ask a person rather than using the online help function, while the percentage of women was rather low (4.5%). However, on the question of which help interviewees would choose if they had the chance to decide between online help and human help, responses showed that human help was preferred. 61.1% of the interviewees indicated that they would choose a person to help them, while 38.9% of them would prefer electronic help.

Those who were in favour of human help provided a number of reasons for their opinion. Specifically, 40.9% of them admitted that it was possible to explain their problems to a human being, 31.8% of them said that they generally did not like electronic help, 9.1% specified that they did not feel familiar with the terminology used by electronic help and 9.1% said that only human beings could answer complicated questions. However, two (2) respondents said that the development of a well-organised electronic help that was able to answer any simple or complicated questions might change their opinion. In addition, one (1)

interviewee commented that human help should be in the form of face-to-face communication and not over the phone or through email services. Then, regarding the electronic help supporters, 71.4% of them commented that electronic help was quick and direct, 28.6% said that electronic helps were generally organised and well-structured and 21.4% of them specified that it was always available. This means that even if end-users forgot the answers, they could use it again to find them. Moreover, one (1) interviewee said that someone had to teach end-users how to use electronic help in a proper way, while another (1) interviewee said that human help depended above all on the personality and mood of the person who provided the help and on how well it was organised. This implies that if he is not in a bad mood, it might be difficult for him to help users.

ADAM respondents were invited to evaluate the online help function. Specifically, they were asked to indicate their opinion as to whether they believed that online help functions could replace the help provided by a person such as a librarian. The latter help occurs in traditional forms of libraries, where users are able to have face-to-face communication with library staff and satisfy their needs. Results were positive for online help, when 51.2% of the respondents implied that the online help service could play the role of a human supporter. It is possible to provide users with valuable answers to their questions on how to use an online system. Though, 44% of the respondents had the opposite opinion. This implies that they do not believe that online help functions could replace the role of a human being. Finally, 4.8% of the respondents did not answer this question.

Despite the great number of respondents who answered that the online help function could replace a human supporter, only 18.6% of them had used online help. This means that without having the experience of using the ADAM online help, they replied that it is possible to play the role of human helpers.

Males were greater supporters than females of the idea that the online function could replace the help provided by a person. Regarding age and occupational groups, those aged 55-64 and students (undergraduate and postgraduate) were the greatest supporters of online help and those aged 45-54 and research staff were the least supporters. However, results of the interviews showed that there were a great number of users who were in favour of human communication.

4.10 Types of information preferred

Results showed that end-users considered the types of information provided by digital libraries an important issue. First, they seemed to appreciate having access not only to current information, but also to data published in the past. When interviewees were asked to evaluate a number of digital library features or services, 88.9% of them identified the provision of a satisfactory amount of current information as a very important feature. In addition, 80.6% of them described the provision of a satisfactory amount of past information as a very important service as well. However, there were users who valued the data published in the past more highly than current data. For example, postgraduate students were firstly interested in the provision of past issues and then in the current issues.

Second, interviewees mentioned that they would like to have full-text access to the bibliographical resources of a Web page. This means that they would not like to use another digital library in order to find and read the references of an electronic resource. 58% of the interviewees valued this feature as a very important one. Those who were more interested in this service were males belonging to the 17-24 and 55-64 age categories and undergraduate and postgraduate students. Third, end-users seemed to expect digital libraries to provide access to additional information. For example, when ADAM respondents were asked to value the helpfulness of providing access to additional Internet information gateways, 58.3% of the respondents characterised it as a helpful service. They had to weight it on a scale of 1-4, where 1 is an Unhelpful service, and 4 is a Helpful service. Only 2.4% of them valued it as a completely unhelpful service. More females stated the specific service as a helpful one than males. Concerning age and occupational groups, all of them showed an interest in being provided with access to more gateways, but those aged 45-54 and research staff were the greater supporters. In the same way, interviewees specified that they would like the electronic journals service to recommend to them some other types of data apart from journal articles. This information might be digitised books, web pages or reports. 66.7% of the interviewees valued as a very important service that of the electronic journals services. In addition, respondents of the SOSIG service showed interest in being provided with searches of other social science research data. 75.6% of the respondents valued it as a very important service. Most supporters of this type of information were females, academic and research staff and those aged 55 years and over. However, they were less interested in being regularly informed about conference and course announcements and for CVs. 46.6% and 31.3% of the respondents characterised them as very important, respectively.

Findings of the SOSIG survey revealed that users have access to a wide range of electronic resources when these are available. The specific gateway offers a variety of information including electronic journals, reports and papers, digitised books, scholarly mailing lists and archives, educational software, bibliographical databases, electronic newsletters, datasets, home pages of key social science organisations and bibliographies. Although home pages of key social science organisations and electronic journals were used more often than the other resources provided, findings showed that all of them were accessed. 93.1% of the respondents accessed these organisations in order to find valuable information and 87.9% of them used electronic journals. The third choice was reports and papers, which was specified by 86.2% of the respondents. But, digitised books and educational software seemed to be the least used by end-users. The preference of women and men and age and occupation groups was focused on home pages of key social science organisations, electronic journals and papers and reports. It is worth mentioning that those aged between 55-64 years old indicated educational software as their first choice with electronic journals (85.7%).

4.11 Methods of storing information obtained by digital libraries

End-users generally had two methods of storing information for future use. These two methods were: firstly to make hard copies by printing out the information they would like to store, and secondly to save information on a disk, such as a hard disk or floppy disk. A small number of users preferred to take notes from the screen. The latter method was mainly used by females and those aged 17 to 24. None of those aged 55-64 chose to make notes from the screen. According to the ADAM survey, 38.5% of the respondents indicated a preference for making hard copies and 37.2% of them for saving on a disk as their first choice of storing information. Only 17.9% of them specified taking notes from the screen as their first choice. Hard copies were preferred by females, those aged 17-24, 45-54 and 55-64, research staff, the *other* category and information scientists. On the contrary, males, those aged 25-24 and 35-44 and students (undergraduate and postgraduate), and academic staff inclined towards saving on disks.

Then, results of the electronic journals research revealed that 74.8% of the respondents indicated that they would prefer to print an article out in order to store it for future use, while 55.8% would save it on a disk. Only 5.8% of the respondents would prefer to take notes from the screen. Men and women showed a similar preference for the hard copy - 74.4% and

75.8%, respectively. Regarding the age and occupation groups, almost all of them indicated that they would choose to print a journal article out instead of saving it on disk or taking notes from the screen. The only exception was made by the 35-44 age group specifying that they would prefer to save on a disk (65.8%).

Finally, 63.9% of the interviewees said that they preferred to make hard copies, while 58.3% of them chose the method of saving on a disk. None of the interviewees indicated that they would take notes from the screen. Females showed a preference for printing out, while males used both methods equally. Those aged 17-34, undergraduate students and research staff were the greatest supporters of making hard copies, while those aged 55-64 and research staff were the greatest supporters of saving on disk.

4.12 Methods of reading information obtained by digital libraries

Results of the interviews showed that users prefer the hard copies when they have to read electronic information. 86.1% of them indicated this method of reading electronic journals. The primary reason is that it is a tiring process for the eyes. They do not like to spend a lot of time in front of a monitor. When they were asked to specify their preferred method of reading electronic journal articles, 86.1% of them mentioned that they made hard copies. But only 13.9% of them said that they would read it from the computer screen. Both, males and females specified that they preferred to print information out. Interviewees belonging to age groups 17-24, 25-34 and 45-54 showed a preference for making hard copies, while the 35-44 age group preferred reading from the screen. Those aged 55-64 used both methods equally. Concerning occupation groups, all of them liked to print out better, but the greatest supporters were research staff and undergraduate students, 100% and 94.1%, respectively.

4.13 Communication

Results of online questionnaires and interviews revealed that some respondents showed an interest in communicating with other users who shared the same interests or with authors of electronic information. Only 16.7% of the respondents were members of the "ADAM Friends"; 58.3% of those who were not members did not even know the existence of the specific service. However, 64.3% of those who were members indicated that they joined

the "ADAM Friends" in order to keep informed with ADAM News, 35.7% to identify other users, 28.6% to have more help and 14.3% of them without having a specific reason. More males (24.2%) were members than females (11.8%). Regarding age and occupation groups, the greatest supporters were those aged 25-34 and 55-64 and research staff and information scientists.

Some users had already had a typical communication with other users. They used to pass on Web site addresses obtained from ADAM to other people that might be interested in them. 67.9% of the respondents had passed on information. There were various methods that they used to provide data to other users. When they were asked to specify these, 77.2% of them used the email service, and 38.6% of them by hand. Only 1.8% of the respondents preferred to use the fax machine. The greatest supporters of passing information to others were females, those aged 25-44 and research staff.

Results of the electronic journals were more encouraging. 83.3% and 77.8% of the respondents evaluated the possibility of users communicating with authors of journal articles through email and with other users who shared the same interests either as a very important or important service, respectively. More interest was expressed by those aged 45 and over and academic and research staff. But, 16.7% and 22.2% of all the interviewees valued them as not important services, respectively. Similarly, the possibility of end-users making comments for a journal title was characterised as a very important or important service (47.3%), as well as an unimportant service (52.8%). Research staff and those aged 45-54 were the greatest supporters.

In addition, some ADAM respondents also showed an interest in being members of newsgroups. When ADAM respondents were asked to rate the helpfulness of newsgroups from 1-4, when 4 is Helpful and 1 is Unhelpful, 40.5% of the respondents found newsgroups a helpful service. Females seemed to show more interest than males. Regarding age groups, there were not significant differences in interest among them; however, the greatest interest was shown by those aged 45-54 and the least interest by the 55-64 group. Concerning occupational groups, academic staff were the greatest supporters and research staff were those who had the bigger percentage of the *don't know* option. However, none of the research staff claimed newsgroups to be services of little use.

Finally, there were respondents who emphasised the importance of the communication between users and digital library systems. First, there was also concern in filtering services based on end-users' own preferences (customisation). 51.9% of SOSIG respondents evaluated it as a very important or important service. Then, 61.1% of interviewees valued the possibility of customising an electronic journals service either as a very important or important service. Men seemed to be more interested in customisation than women, while all age and occupation groups were interested. However, research staff and those aged 25-34 were the greatest supporters.

Second, although there were some respondents who would like to provide critical evaluations of the information provided by a digital library. 31% of ADAM respondents valued it as a useful service. Again, females seemed to show more interest than males. Concerning age groups, those aged 25-34 showed the greatest interest. Finally, all occupation groups were enthusiastic about this service, except for the research staff. 33.3% of them indicated that they did not know how to rate the specific service, while another 33.3% of them valued it as a service of little use. Similarly, 52.8% of the electronic journals service users evaluated the possibility of users to make comments for a journal article as an 'unimportant' service.

Third, 46.6% of SOSIG respondents found the possibility of suggesting new resources either very important or important. Women and men showed a similar interest in this service. Occupation groups also had a similar interest, while those aged 14-24 and 25-24 were the greatest enthusiasts of all age groups provided. Fourth, respondents were less interested in being a member on a SOSIG mailing list. Only 13% of them indicated that it would be a very important service and 19.1% an important one. However, there was an interesting comment from a respondent who disputed the importance of mailing lists. This person stated that 'the mailing list too often gives items of only UK importance/ relevance'.

Finally, SOSIG respondents showed a great interest in receiving search results through emails. 65.6% of the respondents valued it as very important or important. More men supported this service than women, while those aged less than 44 were more interested than those who were older. Regarding occupation groups, supporters came from all categories; however, academic staff and information scientists were the largest.

4.14 Impressions of using digital libraries

The majority of end-users stated that it was easy to use the SOSIG service. However, there were some respondents who admitted that they faced some difficulties. 23.7% of them indicated that it was moderately easy and 1.5% of them difficult in use. Females seemed to have more difficulties in using SOSIG than men. 31.5% of women indicated that the use of SOSIG was either moderately easy or difficult, while the respective percentage for men was 18.2%. Regarding the age and occupational groups, those aged 25-34 and students had more problems than the other groups, respectively. 38.1% of students and 34.1% of those aged 25-34 found the specific service moderately easy or difficult to use. The most common problems were first to navigate around the SOSIG service, and second to use the thesaurus. Finally, there were some users who complained about the lack of information related to their information needs.

4.15 Definitions of digital libraries

Most end-users seemed to consider that a digital library is broadly an organised collection of digital information. Regarding the way respondents defined the SOSIG service, 64.1% of them stated that it was a collection of organised information in digital form, 26.7% of them answered that it was a collection of organised information and 4.6% just a collection of information. Women and men seemed to have similar answers and the majority of them characterised SOSIG as a collection of organised information in digital form (67.1% and 63.6%, respectively). Concerning age groups, the majority of those aged 17-24, who were students, did not seem to be aware of the digital format.

Concerning the ADAM gateway, most respondents agreed that the collection of digital information is also focused on a specific subject area. More than three quarters of them (76.2%) agreed wholly with the definition that the ADAM is *‘a library based on the Internet that provides you with a collection of information, which is organised, digitised, and specialised in a specific subject area’*. However, there were some users who had doubts about the use of the word ‘library’ and what the connection between a subject based information gateway and a library was. More men seemed to accept the given definition than women. Regarding occupational and age groups, students (undergraduate and postgraduate) and those aged 55 to 64 were those that showed the highest levels of agreement.

Finally, results revealed that the ADAM service was used more as a supplement to the traditional modes of communication than as a replacement of them. 79.8% of them indicated that they obtained information for the ADAM information system as a supplement and 17.9% of them as a replacement. Slightly more females viewed ADAM as a supplement than males, 82.4% and 75.8%, respectively. Concerning age and occupation groups, all of them characterised ADAM as a supplement except for those aged 55-64. The greatest supporters of this idea were those aged 55-64 and academic staff.

4.16 Advantages and disadvantages of digital libraries

End-users of both gateways stated that digital libraries have both advantages and disadvantages over traditional ones. More than two-thirds of the ADAM respondents (63.1%) mentioned that they had advantages. On the contrary, 34.5% of them were strong supporters of traditional libraries. More men admitted the existence of advantages and disadvantages in the ADAM service than women did. Concerning age groups, all of them indicated the existence of advantages and disadvantages, but those aged 45-54 provided the greatest percentage of disadvantages and those aged 55-64 the greatest percentage of advantages. Regarding occupation, all groups claimed the existence of both advantages and disadvantages of the ADAM service over a traditional library. However, the '*others*' category was the group of respondents with the highest percentage of people admitting that ADAM had advantages over a traditional library (81,8%) and research staff with the highest percentage of disadvantages (66,7%).

The most cited advantages provided were the possibility of 24-hour access to the collection, quick and direct access to information and the fact that users were able to have simultaneous access to data. 74.8% of the SOSIG respondents identified the possibility of 24-hour access to the collection as the main advantage of digital libraries. More females than males would appreciate having all day access. Consequently, 65.6% and 63.4% of the SOSIG end-users chose the possibility of quick and direct access to information and the fact that data could be accessed by many users simultaneously, respectively. Regarding quick and direct access to electronic information, 83.3% of the interviewees specified that this was a significant advantage of electronic articles over printed ones, because they would not have to deal with postal delays.

Moreover, another significant advantage identified by interviewees was the possibility of printing out the electronic information. 33.3% of the interviewees admitted that printing was a benefit of the electronic journals services. Their primary reason was the fact that they did not enjoy spending a lot of time in front of a monitor. Therefore, when they wanted to read a paper they printed it out. In addition, respondents seemed to identify as advantages the fact that there was no need for commuting, information could be held in more than one place, there was access to unique historical information where physical access was not allowed, there was the possibility of an unrestricted number of 'loans', there was the provision of comprehensive and up-to-date information, and information was available in a variety of formats. Finally, 30.6% of the interviewees said that electronic journals saved space.

On the contrary, the highest scored disadvantage was the possibility of users having to pay in order to have access to information. 29% of the SOSIG respondents decided that it was a definite disadvantage. In addition, more women identified this as a problem than men, while all occupation groups seemed to be unwilling to pay. However, academic staff and the *don't know* occupation category seemed to be less reluctant to pay for information than the other groups provided. Concerning age categories, those aged 55-64 were less worried. Only 12.5% stated that paying for information was a definite disadvantage. On the contrary, those aged 17-24 were the most numerous in characterising it as a definite disadvantage.

Respondents also raised doubts concerning the time spent in front of computers, and the lack of human support and communication. 22.1% of SOSIG users evaluated it as a definite disadvantage, while another 28.2% weighted it at number 4. Those aged 55-64 and the *don't know* occupation category were least worried about spending time in front of the monitor. In addition, end-users seemed not to appreciate the possibility that there was not personal contact with other users and librarians. 26% of the SOSIG respondents characterised the lack of communication with users as a definite disadvantage. Also, 25.2% and 20.6% of them assessed the shortage of librarians to teach them how to use the equipment and to access their background and information needs as significant drawbacks. Academic staff and information scientists and those aged 35 and over were more worried about not having personal contact with other users compared to the other occupation and age groups. The lack of contact with librarians in order to teach them how to use SOSIG was assessed as a disadvantage mainly by students, research staff and information scientists and the 25-34 and 35-44 age groups.

Interviewees also emphasised three more significant drawbacks. First, they mentioned that at present electronic journal services provided access to a limited number of back issues of journal titles. 52.8% of the interviewees specified this problem. They would appreciate it if they could find all the issues published in the past in electronic version. Second, the number of journal titles that existed in electronic format was not enough (41.7%), and third, interviewees admitted the lack of trust to publish their papers in an electronic journal (41.7%). They specified that they would hesitate publishing an article in electronic journal title. They would prefer the traditional print journal format.

Other concerns of end-users were the fact that full-text access to information was not always available, the need for computer equipment and skills was required and physical contact with information was not possible. Finally, interviewees mentioned that sometimes they had to deal with some technical problems, such as the time taken for a Web page to be downloaded or the failure of the Internet connection.

4.17 Comparison of print and electronic information

There were supporters of both forms of subscriptions. However, there were more users who were in favour of the electronic than the print version. Results of online questionnaires and interviews showed that 69.5% and 55.6% of the respondents respectively preferred the electronic format to the print format. Regarding genders and age and occupational groups, there were some differences between the findings of questionnaires and interviews. Results of online questionnaires revealed that both males and females had a similar preference for electronic format – 69.9% and 68.6%, respectively. However, interviews showed that women inclined towards the print version. 54.5% of females preferred the print version, while 60% of males showed a preference on the electronic format. Regarding age and occupation groups, questionnaires indicated that those aged 17-54 and all occupational groups selected the electronic subscription. The greatest supporters were those belonging to the 25-34 and 35-44 groups and postgraduate students. However, interviews revealed that only the majority of those aged 25-44 years old and academic staff and postgraduate students liked electronic journals better than traditional ones. The others were in favour of the electronic version. Those aged 55 years and over seemed to support both subscriptions.

The most important reasons provided by respondents who preferred the modern version were, first, that they provided quick and direct access to information and, second, that users are able to print out any data. Therefore, the possibility of printing is identified as an important issue of digital libraries. There were also users who mentioned that electronic journals saved space. This meant that when they had access to the Internet and the appropriate usernames/ passwords they were able to connect to the service from any place. Then, supporters of the traditional form of journals highlighted the importance of the sense of belonging. When end-users obtained print information, they felt as if information was always available to be used. However, electronic information made them feel that when they needed to read a journal issue, it would be difficult to find it. In addition, users identified the possibility of browsing and the fact that printed information is easily transferable as important factors of the traditional form of journal titles. A number of respondents mentioned that their dislike of reading from the monitor made them inclined towards the print format.

4.18 Reasons that might prevent users from accessing digital libraries

The most cited reason that might prevent users from assessing digital libraries is the lack of an adequate amount of information. End-users seem to hesitate using a service if it does not provide enough data relevant to their information needs. Findings of the online questionnaire of the electronic journals service indicated that 51.7% of the respondents specified this factor. Then, results of face-to-face interviews showed that 66.7% of the interviewees specified this reason. Regarding the outcomes of the online questionnaire, both males and females, those aged from 17 to 54 and academic staff, research associates/ visiting lecturers and postgraduate students indicated the lack of relevant information as their most important factor. Then, interviews showed that those who chose the availability of enough data as an important factor were both women and men, aged 25-34, 45-54 and 55-64, and academic and research staff.

In addition, users want to have access to information published in the past. 38.9% of the respondents of the electronic journals service online questionnaire and 44.4% of the interviewees specified that the lack of access to information published in the past might prevent them from using an electronic journals service. Results of the online questionnaire and of interviews showed that research staff and postgraduate students respectively were the

greatest supporters of back issues. Moreover, users do not like to pay in order to gain access to electronic information. 32.5% of the electronic journals service online questionnaire respondents and 55.6% of the interviewees indicated this reason. Undergraduate students seemed to be less willing to pay. It was their most cited reason regarding the online questionnaire, when 35.7% specified this factor as the most cited reason for preventing users from using an electronic journals service.

Furthermore, a great number of respondents mentioned that they did not want to wait for a Web page to be downloaded. They would appreciate it if they could have quick access to information. 24.6% of the electronic journals service online questionnaire respondents and 58.3% of the interviewees indicated this reason. Females were more impatient in expecting a page to be downloaded than males, when the findings of the online questionnaire showed that 31.1% of women and 21.8% of men specified this factor. Similarly, 81.8% of the females and 48% of the males interviewed mentioned this factor as an obstacle to the use of an electronic journals service. Concerning age and occupational groups, those aged 17-24 and 55-64 and academic staff and research staff seemed to be less willing to come to terms with slow loading of Web pages.

Moreover, respondents indicated that if they were not able to print information out they might not use a digital library. Results showed that users printed data out either to read or to store. Some users preferred to store information in print format than to save it on a disk, such as a floppy or hard disk, while some others hated to read information from the monitor. Results of the online questionnaire showed that respondents printed journal articles out because they did not like to read from the monitor rather than because they wanted to store them. 16.3% of the respondents indicated that they would be discouraged from accessing an electronic journals service if they were not able to print articles out to read. But, only 6.4% of them mentioned that they would be discouraged from using the service if they were unable to print information out to store. Research associates / visiting lecturers and undergraduate students considered it a major factor. Regarding interviews, 52.8% and 50% of the respondents specified that the lack of printing for storing and for reading respectively is an important factor in preventing users from using the electronic journals service. The greatest supporters were males, those aged 35-44 and academic staff.

Finally, interviews showed that users appreciated being able to save information on a disk, such as a floppy disk or a CD-ROM. 38.9% of the respondents specified that if they could not save articles on a disk, they would not use a service that provided access to electronic journals.

4.19 Evaluation of services provided by digital libraries

Interviewees of the electronic journals service characterised many features as very important or important. The most important was the provision of a satisfactory amount of current information that is relevant to their information needs. 88.9% of them valued it as a very important service. They also valued the possibility of printing as very important (83.3%) and the provision of a satisfactory amount of information published in the past (80.6%). In addition, there were a great number of users who indicated that it was essential to have quick and easy access to the service from their desktop without being obliged to memorise usernames/ password. Finally, end-users valued the provision of search (77.8%) and browse (61.1%) facilities as very important and also the direct link to other information, such as to the provided bibliography of an electronic paper (66.7%). The services which were characterised as being of less importance were the 24-hour access, the possibility of saving the information, the provision of online help, the provision of online and human help, the possibility of users communicating with authors or users who shared the same interests and the customisation of features provided.

On the contrary, the service recognised as being of least importance was the possibility of users making comments about a journal article. The majority of users valued it as unimportant (52.8%). However, there were also a significant number of end-users who evaluated as unimportant features the provision of online and human help, the customisation of services (30.6%), the provision of online help only (25%), and the 24-hour access to the service (22.2%).

Search facilities were identified as slightly more important than browse facilities, where 91.7% and 88.9% of interviewees valued search and browse as very important or important, respectively. The possibility of printing was evaluated as more important than the possibility of saving. All respondents said that printing was either very important (83.3%) or important

(16.7%), whereas 47.2% of them valued the possibility of saving as very important, 41.7% as important, and 11.1% as not important.

Regarding communication with authors and other users, 83.3% and 77.8% of the respondents evaluated the possibility of users communicating with authors of journal articles through email and with other users who shared the same interests either as a very important or important service, respectively. More interest was expressed by those aged 45 and over and academic and research staff. But 16.7% and 22.2% of all the interviewees valued them as not important services, respectively. Similarly, the possibility of end-users making comments about a journal title was characterised as a very important or important service (47.3%), as well as an unimportant service (52.8%). Research staff and those aged 45-54 were the greatest supporters.

Concerning the provision of both online and human help, it was characterised by 44.4% of the interviewees as not important, by 47.2% of them as important and only 8.3% of them said that it was a very important service. When asked about the lack of human help and the provision only of online help, 22.2% valued it as very important, 38.9% of them as important, and 25% as not important. Females belonging to the 25-34 and 45-54 age categories and research staff were less interested in the provision of online help. On the contrary, males, undergraduate students and academic staff and those aged 17-24 and 55-64 showed the greatest interest in online help.

4.20 Future use and comments

Results concerning the future use of both gateways and electronic journals service were satisfied. Respondents mentioned that they would use them in the future or they would advise friends or colleagues to do the same. 94.7% of the SOSIG and 69% of the ADAM respondents answered that they would use it again. Regarding the electronic journals service users, 87.8% of them answered that they would advise friends or colleagues to use the e-journals service. Interest in using them and advising them to be used others was expressed by both females and males and all age and occupation groups provided by the questionnaires.

At the end of each questionnaire, end-users were asked whether they would like to add any comments or to mention whether they would expect any more services to be provided. Most

comments were positive, indicating that gateways are very helpful guides for doing research on a number of topics. However, there were some interesting suggestions by the SOSIG respondents. A student mentioned that she would like to have access to more full-text articles or advice on how to get access to them and a member of the academic staff stated that he would appreciate using full text image databases. Moreover, a respondent specified that he would like to communicate with other investigators from his own country and an information scientist would like to be informed by email when new resources were added.

Concerning the electronic journals service, there were four respondents who emphasised the need for teaching. They were new users and they were not aware of any advanced services provided by the 'electronic journals' service. They would appreciate it if someone could teach them how to use the service in a proper way. In addition, end-users complained about the lack of back issues in electronic format and the increased number of journal titles in electronic format. Also, an interviewee mentioned that he would like to have access to electronic journals from home. He commented that when he was at University he was busy; therefore, he could not spend time searching for electronic journal articles.

Chapter 5

Conclusions

This study gained an understanding on how end-users perceive and make use of academic digital libraries. Specifically, it was focused on Subject Based Information Gateways (SBIGs) and electronic journals services. Regarding the way end-users perceive academic digital libraries, this study provided information on whether users make use of them as a supplement of or replacement to the traditional forms of libraries, whether users would advice others (friends or colleagues) to obtain data from them, whether users would obtain data from them again in the future and whether there is an increase or decrease in their use. Finally, this research presented results on how users evaluate digital libraries. For this purpose, they described their advantages and disadvantages over the traditional forms of academic libraries and the usefulness of their services, including searching and browsing functions, support facilities and methods of storing information for future use. For further evaluation, users were asked to compare the electronic and print version of a piece of information and to specify factors that might prevent users from using digital libraries.

Then, concerning the way end-users make use of academic digital libraries, this study collected data on how frequently users obtain data from them, what their reasons for use are, and what places they gain access from. In addition, they specified their preferred methods for searching, their use of support services, the way they store and read information, the types of data they prefer to have access to, and the way they communicate with information scientists, authors, or other users who share the same interests with them.

The overall impression of the study is that end-users of both forms of digital libraries seem to appreciate the implementation of academic digital libraries. Specifically, they identified and

addressed a number of advantages that electronic resources have over the traditional ones. In addition, another positive indicator is that findings revealed that there has been a constant increase in the use of digital libraries since their first appearance. Finally, they would use them again in the future, or they would advise others, such as friends or colleagues to use them in order to search for and obtain information. Though, there are also users who claim the existence of disadvantages. Sometimes, these disadvantages might prevent end-users from using academic digital libraries in the future.

Regarding the way users make use of academic digital libraries, results revealed that a typical user of both gateways and electronic journals services would access them from his office or home for a variety of reasons, such as: for writing up a term paper/project or a thesis/dissertation, writing up a paper for publication, e.g. journal article or conference/workshop paper, keeping up with progress in the relevant subject area, supporting a lecture or for personal reasons. The purpose of use changes according to the occupation of respondents. Concerning the search behaviour of academic end-users, they adopt a relatively unsophisticated, simplistic approach to searching and limited use of Boolean operators or other commands. Direct searching is preferred to browsing, while single keywords are used instead of Boolean operators. Regarding users of e-journals, they prefer to search/ browse and to search for a specific article by keywords. Notwithstanding their low search abilities, they are reluctant to consult the online help function that could support their searches. Sometimes, they prefer to ask a person rather than attempt to use the online help. Generally, there is a negative attitude towards online help and the way it advises end-users.

When they have identified some information and they want to read it, they print it out. But, when they want to store information for the future, either they print it out, or they save it on disk. This information might differ in format, including electronic journals, reports and papers, digitalised books, scholarly mailing lists and archives and educational software. Finally, some users would appreciate the opportunity to communicate with information scientists, authors, or other users who share the same interests with them.

5.1 How end-users perceive academic digital libraries

Fortunately, end-users generally seem to appreciate the implementation of academic digital libraries. This study seems to justify the results of previous studies that support the view that

users have a positive attitude towards them. Some of the comments provided by respondents describe their perception:

'I see the services provided [by SOSIG] as a clear advantage – monetarily and timely'
(SOSIG user)

'I think SOSIG is very useful for students and it would be good if it were advertised in universities more' (SOSIG user)

'ADAM is an excellent gateway, and I wish it would go on improving and growing'
(ADAM user)

'Great site. One of the best for this area' (ADAM user)

'I think it is a great service - and with the way the Internet is developing, it needs to keep on developing and cataloguing those thousands of new sites, which become available daily' (ADAM user)

'It is a very useful service so I would like to have access from home' (Electronic journals service user)

The ADAM respondents specified that they used digital libraries as a supplement of the traditional forms of obtaining information. In fact, when users were asked to indicate whether they would recommend friends or colleagues to use digital libraries, the majority of the respondents were positive. 94.7% of the SOSIG and 69% of the ADAM respondents answered that they would use it again. Regarding the electronic journals service users, 87.8% of them answered that they would recommend friends or colleagues to use the e-journals service. Interest was expressed by both females and males and all age and occupation groups included in the questionnaires. Moreover, statistics regarding the use of both gateways and the electronic journals service showed that there had been a steady increase since their development. Regarding the SOSIG, in 1994, there were 35,513 file or page requests and in 2002, there 12,189,529 file or page requests. Concerning the ADAM gateway, in 1996, there were 24,496 file or page requests and in 2000, there were 252,735 file or page requests. Finally, for the electronic journals service of the University of Patras, in 2000, there were 34,607 sessions and in 2003, there were 68,777 sessions. However, the number of users was higher during winter and spring months and during working hours. Concerning the subject areas, results of the electronic journals service showed that most accesses occurred in the department of Mechanical Engineering, the Medical School, the department of Electrical Engineering, or the department of Chemical Engineering. Fewer accesses took place in the

department of Theatre Studies, Philosophy, Education and Business Administration. A possible explanation is that according to the information provided by the staff of the Library and Information Service (LIS) of the University of Patras, at the time period that this research took place, there were not many journal titles on social sciences or humanities. Most journal titles provided by the library were for scientists, particularly engineers.

Similarly, findings of the use of BIDS from 1992-1994 (East, Sheppard and Jeal, 1995) concluded that most accesses occurred in the department of Natural and Physical Science, Medicine, Engineering and Technology and Social Sciences. On the contrary, few users accessed BIDS from the department of Humanities, Arts, Education and Business Administration.

The increasing number of academic digital libraries users could be explained by the fact that they offer a number of advantages over the traditional ones. The findings of this study seem to justify the results of previous research on the advantages of digital libraries. They offer 24-hour and direct access to full-text information that can be accessed by many users simultaneously. End-users do not have to commute when desktop access is available. The information provided can vary in its format, such as texts, multimedia or videos. In addition, users are provided with better searching and browsing facilities, using simple or advanced methods according to their searching skills. Data retrieved can be printed out either for reading or for storing for future use. Finally, users are offered some more advanced valued-added services, such as the automatic alert to new issues of journal titles.

Concerning the ranking of these advantages, although the 24-hour access is one of the most important advantages of academic digital libraries, results showed that end-users do not recognise it as an important factor that might prevent them from accessing digital libraries. They are more interested in the information provided rather than in the technical issues that support quick and direct access to data or in some value-added services, such as the possibility of making comments about an electronic resource.

In addition, end-users request quick and direct access to information from their desktop without having to memorise username and password. They do not like to wait for a long time in order for a Web page to be downloaded. They also require to be provided with search and browse facilities. Less interest – apart from the 24-hour access – is expressed in the ability to

save information on disks, the provision of both online and human help and communication with authors and with other users who share the same interests.

Moreover, results revealed that the possibility of printing out information seemed to be an essential service of digital libraries. It could be used as a panacea for some of the factors given when users were asked to specify why they would choose the print version of a journal title to subscribe to rather than the electronic format. Some respondents mentioned that they could not spend a lot of time in front of a monitor in order to read an electronic paper as it was tiring for the eyes. The majority of the respondents specified that they avoided reading from the screen. In addition, some users mentioned that they would like to have the knowledge that data would remain available in the future, and would not disappear. Until they were certain about the sustainability of information, users would print data out. In addition, users identified printing as a primary method of storing information for future use. Finally, printing out electronic information could be used as a solution for those users who claimed that the print version of a journal title was more easily transferable than the electronic one. Carrying printouts is similar to transferring a copy of a journal article.

End-users have also expressed some concern about academic digital libraries. Most of them support the findings of earlier studies on how users perceive digital libraries. Those who are responsible for implementing digital libraries should take these problems into consideration and find ways to eliminate them. For example, results of the electronic journals service of the University of Patras concluded that although the majority of users showed a preference for the electronic version of a journal title, there were end-users who were in favour of the print format. Results of the electronic journals service online questionnaires and interviews showed that 69.5% and 55.6% of the respondents respectively preferred the electronic format to the print format. Supporters of the traditional form of journals emphasised the importance of the sense of belonging. When end-users obtain print information, they feel as if information is always available to be used. On the contrary, electronic information makes them feel that when they need to read a journal issue, it might be difficult to find it. In addition, users identified the possibility of browsing and the fact that printed information is easily transferable as important factors concerning the traditional form of journal titles. Finally, they do not like to read from the screen.

When users were invited to describe the disadvantages of digital libraries, they specified the possibility of paying in order to have access to information, the time spent in front of a monitor, the lack of human support and communication, the limited amount of digital information (past and present), the lack of physical contact with information, the need for computer equipment, the lack of full-text access to digital information, the fact that some authors do not trust publishing their papers on the Internet, and the existence of some technical problems, such as the bad quality of images or sometimes the time it takes for a web site to be downloaded.

Findings showed that some of these disadvantages might prevent users from accessing digital libraries. The most cited reason is the lack of an adequate amount of information. End-users seem to hesitate to use a service if it does not provide enough data relevant to their information needs. In addition, users want to have access to information published in the past. Sometimes, past data is more valuable than up-to-date information. Moreover, they do not like to pay in order to gain access to electronic information. Specifically, undergraduate students seem to be less willing to pay. It was their most cited reason regarding the electronic journals service online questionnaire, where it was specified by 35.7%.

Finally, users identified the existence of technical problems as a barrier to the use of academic digital libraries. They specified that they did not like to wait for a long time for a web page to be downloaded. Moreover, respondents indicated that if they were not able to print information out they might not use a digital library.

5.2 How end-users make use of academic digital libraries

The use of SOSIG and ADAM gateways was irregular and light. Regarding the SOSIG, 45.8% of the respondents indicated that they accessed SOSIG occasionally. Just over a third used it on a weekly basis, while only 3.1% of the respondents used SOSIG every day. In turn, results of the ADAM showed that 21.5% of the respondents indicated that they accessed it occasionally or hardly ever, while the specific gateway seemed to attract a lot of new users; 38.1% of the respondents stated that that was their first time. Less than 10% of respondents used the service on a frequent basis - daily or weekly. On the contrary, results of the electronic journals service were more satisfactory. Over one-third of the respondents used the service on a daily basis and the majority on a weekly or monthly basis. This is more

surprising – and at the same time encouraging - if we consider that full-text access to the electronic journals service took place only from the university. This could mean that if access was possible from home, use could be much higher. In fact, users expressed the need to be able to use the service from home. Their primary reasons were that when they were at the University they had other things to keep them busy and they shared their office with others, which meant that they could not easily concentrate on searching for information. At home, however, they had their privacy.

Concerning the reasons for using a digital library, results showed that users accessed it for various reasons, although options provided by the questionnaire were limited because of the nature of the target group. They mentioned that they accessed academic digital libraries for writing a term project or dissertation, supporting teaching, publishing a paper, or just keeping up with the new published data. This implies that digital libraries should provide information in order for academics to be able to satisfy all these information needs. Besides, they would find it useful for it to be varied in its formats, including electronic journals, reports and papers, digitised books, scholarly mailing lists and archives, educational software, bibliographical databases, electronic newsletters, datasets, home pages of key organisations and bibliographies.

Relating to the search behaviour of academic end-users, results showed that they searched and browsed. This implies that both methods were important. Supporters of the searching method commented that it was a simple and quick method of retrieving information, providing them with more accurate and direct information. But browsing allowed them to do the equivalent of a 'shelf search' and to identify resources in a specific area. Regarding their searching abilities, findings justified the results of previous studies, that users should become better searchers and learn to use systems in full potential. They seem to adopt a relatively unsophisticated, simplistic approach to searching and a limited use of Boolean operators or other commands. The most frequently used method of searching is 'by keywords'. It is also worth mentioning that some users do not even know about the Boolean operators and some others are not familiar with the meaning of the terms "search and browse". As a solution to this situation, some users emphasised the need for seminars in order to be taught how to use digital libraries in their full potential.

Some interesting comments from end-users were that it is essential for users to be able to search simultaneously by keywords all journal titles they are interested in reading. In addition, they mentioned that they would like to be informed about the publication of articles relevant to their information needs. Finally, some respondents requested to have full-text searching rather than to search for terms included in the title, abstract or keywords.

Notwithstanding the low search abilities of end-users, few people used the online help function, which could support their searches. This finding seems to agree with the results of East, Sheppard and Jeal (1995) and Kemp and Davenport (1998) when they revealed that the use of online help function was very low. When users of this study were asked to specify their reasons for non-use, they provided a range of reasons. Previous studies justified that users were reluctant to use any form of support, because they used to blame non-effective searching on the electronic information system. They were more concerned with improvements in the materials provided than with improvements in their own skills. McCarthy, Krausse and Little (1997) mentioned that when users of the University of Rhode Island Library were asked 'What would help you to become more effective in using the resources of the University Library?', most respondents tended to blame the library resources and staff for their ineffective searches.

The most cited reason provided by the respondents of the SOSIG, ADAM and electronic journals service was that users had not felt the need for support yet. However, it is worth mentioning that a great number of respondents did not hesitate to indicate that they did not know the role of an online help service or – more surprisingly – they were not aware of its existence. Significantly, a large number of end-users did not hesitate to state that online help could replace the help provided by an intermediary, such as an information scientist, and play the role of a human supporter. Despite the high proportion of respondents indicating that online help could replace a human supporter, less than a quarter of them had used the service. Therefore, a possible solution is to familiarise users with online help functions. Some users suggested that they should be taught how to use them. This finding emphasised the role of training sessions and agreed with the results of previous studies on the role of training in the use of electronic resources. For example, findings centered on the use CD-ROMs concluded that libraries should consider support in teaching users how to obtain data from CD-ROMs properly (Stewart and Olsen, 1988; Allen, 1989; Harter and Jackson, 1988). In addition, end-users of most modern services, such as Subject Based Information Gateways specified that

training would improve their searching abilities in order to carry out effective searches (Kemp and Davenport, 1998).

But, the problem seems to be more serious when these seminars cannot be organised. For example, it is not easy to arrange seminars for users who are dispersed in different parts of the world. Those who access gateways are located in geographically different places. On the contrary, it is possible to teach the academic community of a University how to use its digital library in a proper and advanced way. In fact, users of the electronic journals service were enthusiastic about the organisation of seminars in order to learn how to use the specific system. But, when these tutorials are difficult to arrange, online help systems should be provided in a friendly and understandable way in order to attract people to use them and understand how to find a solution to their problem.

When end-users were asked to specify their preferred method of reading electronic information, printing out was identified as the one most favoured. They specified that spending time in front of a monitor in order to read some information was very tiring for the eyes. They try to avoid wasting their time in front of a monitor, and the best way seems to be to print data out. Concerning the methods of storing information for future use, results showed that apart from printing out information, users have also shown a preference for saving it on disk. Digital library systems should provide users with the possibility of saving data on disk, such as a floppy or hard disk.

Regarding the types of information that should be provided by academic digital libraries, it has already been mentioned that the users' primary concern is to have access to a satisfactory amount of information. Specifically, this information should be both current and past. Some users showed a preference for data published in the past rather than for up-to-date data. Besides, they would find it useful for it to be varied in its formats, such as electronic journals, reports, digitised books, scholarly mailing lists and archives, educational software, electronic newsletters, datasets, home pages of key organisations and bibliographies. Home pages of key organisations and electronic journals were used more often than the other resources provided though findings showed that all of them were accessed. 93.1% of the respondents accessed these organisations in order to find valuable information and 87.9% of them used electronic journals. The third choice was reports and papers, which was specified by 86.2% of the respondents. But, digitised books and educational software seemed to be the least used

by end-users. In addition, users indicated that they would appreciate it if digital libraries provided full-text access to the bibliographical references of a resource and searches of other research data. Finally, some users requested to be provided with links to other academic digital libraries whose collections might be useful to them.

Finally, results showed that some end-users required that a digital library should contribute to the communication among users who share the same interests or between users and information scientists. Regarding the communication with other users, 16.7% of ADAM respondents were members of the "ADAM Friends", while 35.7% of those who were members indicated that they joined the "ADAM Friends" in order to identify other users. Other reasons were: to keep informed with ADAM News (64.3%) or to have more help (28.6%). 14.3% of end-users had no specific reason. In addition, some other ADAM users had already been in communication with users on a formal level. They had passed on Web site addresses obtained from ADAM to other people that might be interested in them. 67.9% of the respondents had passed on information.

Some other end-users mentioned the importance of communicating with information scientists. Specifically, they complained that the latter were not available in order to teach them how to use a digital library or just to answer a simple or more advanced question. Therefore, they tended to rely on their own computer skills, which were not always advanced. In addition, results of online questionnaires and interviews revealed that some respondents showed an interest in communicating with other users who shared the same interests or with authors of electronic information.

Finally, there were respondents who emphasised the importance of the communication between users and digital library systems. Some ideas were that users should be able to filter services based on their own preferences (customisation), to provide critical evaluations of the information provided by a digital library, to suggest some new resources and to become members in mailing lists. In addition, respondents showed a great interest in receiving search results through emails. 65.6% of the SOSIG respondents valued it as very important or important.

5.3 Recommendations

With the completion of this study, there are a number of suggestions for future action:

- ❑ Academic digital libraries should take into consideration the way end-users prioritise the importance of services provided in academic digital libraries. They value some services as more important than others and identify them as essential in order for users to keep accessing digital libraries. The most important is the provision of current information that is relevant to their information needs. End-users also value the possibility of printing as very important and the provision of information published in the past. In addition, they evaluate as important the possibility to have quick and easy access to the service from their desktop without being obliged to memorise usernames/ passwords. Finally, end-users evaluate the provision of search and browse facilities as very important and also the direct link to other information, such as to the provided bibliography of an electronic paper.

On the contrary, the service recognised as being of least importance compared to the others is the possibility of users making comments about a journal article. However, there are also a significant number of end-users who evaluate as unimportant features the provision of online and human help, the customisation of services, the provision of online help only, and the 24-hour access to the service. Search facilities are identified as slightly more important than browse facilities and the possibility of printing is evaluated as more important than the possibility of saving.

- ❑ The advantages that end-users identify of academic digital libraries should be standard features/ services of academic digital libraries. These are: the possibility of 24-hour access to the collection, quick and direct access to information and the fact that users are able to have simultaneous access to data. Moreover, another significant advantage identified by interviewees was the possibility of printing out the electronic information.
- ❑ The academic digital libraries should consider their disadvantages and find ways to improve them. The highest scored disadvantage is the possibility of users having to pay in order to have access to information. Respondents are also concerned about the time spent in front of computers, and the lack of human support and communication with other people, such as information scientists or other users who share the same interests. There are three more significant drawbacks. First, there is access to a

information, such as journal titles is not enough, and third, there is lack of trust amongst end-users about publishing their papers in an electronic media.

- ❑ End-users need to advance their searching behaviour, by using more sophisticated searching techniques, such as Boolean operators and thesaurus.
- ❑ Online help function needs to be more friendly, while end-users should be trained how to use it in a proper way.
- ❑ Training needs to be available to users in order to be able to search for and obtain information provided by academic digital libraries.

APPENDIX A

- ❑ **Social Sciences Information Gateway (SOSIG) – Online Questionnaire**
- ❑ **Art, Design, Architecture and Media Gateway (ADAM) – Online Questionnaire**
- ❑ **The Electronic Journals Service (LIS, University of Patras) - Online questionnaire**
- ❑ **The Electronic Journals Service (LIS, University of Patras) - Face-to-face interviews**

The purpose of this survey is to discover your interest and experience of obtaining information in digital form. This research is being carried out by Maria Monopoli as part of her research studies on digital libraries at the department of Information Science, City University.

Your serious attention in completing the questionnaire will be highly appreciated. It should not take more than a few minutes of your time. Because I am working to a tight timetable I would be grateful if you could complete the questionnaire by **15th October** at the latest.

All those who complete the questionnaire will be entered into a prize draw for a £40 Gift Certificate for Amazon Books, we will need your email address to enter you in the prize draw. However, your answers will still be treated anonymously. The winner will be notified at the end of October.

PART A - BACKGROUND INFORMATION ON INTERNET ACCESS

1. Sex: ☐ Male ☐ Female

Age: ☐ 17-24 ☐ 25-34 ☐ 35-44 ☐ 45-54 ☐ 55-64 ☐ 65+

2. What is your job description and subject area?

3. How often do you access the Internet? (please select one)

☐ Daily ☐ Occasionally ☐ Weekly ☐ Monthly ☐ Never

4. How would you describe the process of obtaining information from the Internet? (please select one)

☐ It is easy - please go to question 6

☐ It is easy, however I have encountered some difficulties

☐ It is quite difficult to obtain the information required

5. What kind of difficulties have you encountered in obtaining information from the Internet? (select all that apply)

☐ Lack of any online help

☐ Unfamiliarity with the search methods

☐ Too much information available

☐ Lack of the time required searching for information

☐ Speed of access

☐ Cost

☐ Other - please specify:

PART B - SOSIG EXPERIENCE

6. Approximately, how often do you use the SOSIG service? (please select one)

☐ Daily

☐ Weekly

☐ Monthly

☐ Occasionally

7. What do you use SOSIG for? (please select all that apply)

☐ Personal use

☐ Research

☐ Teaching

☐ Identifying resources to support teaching

☐ Other - please specify:

8. What are your impressions of using the SOSIG service? (please select one)

☐ Easy to use - please go to question 10

☐ Moderately easy

☐ Difficult to use

9. What kind of difficulties have you encountered? (please specify)

10. The SOSIG service provides the following advanced search or browse options, which

do you use? (please rank all that apply - 1 is most)

Click to rank	<input type="text"/>	TITLE
Click to rank	<input type="text"/>	DESCRIPTION
Click to rank	<input type="text"/>	KEYWORDS
Click to rank	<input type="text"/>	COUNTRY (in which the computer hosting the resource is located)
Click to rank	<input type="text"/>	LANGUAGE
Click to rank	<input type="text"/>	RESOURCE TYPE

11. Would you prefer other search options? (please select one)

☐ No

☐ Yes - if yes, please specify:

12. Do you prefer using the browsing or the searching facilities? (please select one)

☐ Browse - please specify the reasons:

☐ Search - please specify the reasons:

13. The SOSIG service provides access to the following information resources, please could you rank them according to your use.

Click to rank	<input type="text"/>	Electronic Journals
Click to rank	<input type="text"/>	Digitised Books
Click to rank	<input type="text"/>	Reports and Papers
Click to rank	<input type="text"/>	Scholarly Mailing Lists and Archives
Click to rank	<input type="text"/>	Educational Software
Click to rank	<input type="text"/>	Bibliographic Databases
Click to rank	<input type="text"/>	Electronic Newsletters
Click to rank	<input type="text"/>	Datasets
Click to rank	<input type="text"/>	Home Pages of Key Social Science Organisations
Click to rank	<input type="text"/>	Bibliographies

14. Does the SOSIG service cover the range of resources you expected? (please select one)

☐ Yes - if yes, please go to question 16

☐ No

15. What other resources would you expect? (please specify)

16. Have you used the online Help? (please select one)

☐ Yes

☐ No - if no, please go to question 19

17. How did you find the Help information supplied? (please select one)

☐ Helpful - please go to question 19

☐ Moderately helpful

☐ Not helpful

18. What other information did you need? (please specify)

19. Could you please rank the importance of the following SOSIG services from 1 (very important) to 5 (unimportant) and add any comments you may have regarding any service.

Online Help ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Browse facilities ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Search facilities ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Mailing list ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Ability to suggest new resources ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Thesaurus ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

20. Please rank the importance of the following services which may be added to SOSIG in the future:

Filtered services based on your own preferences ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Conference and course announcements ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

CVs for social science researchers ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Emailing search results ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Searches of other social science research data ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

21. Would you expect any more services from SOSIG? (please select one)

☐ No

☐ Yes - please specify:

22. Do you plan to use the SOSIG service again? (please select one)

☐ Yes

☐ No - If no, please specify your reasons:

23. What do you think SOSIG is? (please select one)

☐ A collection of information

☐ A collection of organised information

☐ A collection of organised information in digital form

24. The following table lists a number of advantages and disadvantages concerning accessing information in digital form. For each line, please weight the statement on a scale of 1-5, where 1 is an advantage and 5 is a disadvantage.

Library holding information in digital form

No need for commuting

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

No librarian to teach how to use the equipment

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

Possibility of 24-hour access to the collection

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

No personal contact with other users

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

Quick and direct access to information

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

No librarian to assess user's background and information needs

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

Limited wear of the collection

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

Adequate knowledge of computer skills is required

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

No physical contact with information

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

Information can be held in more than one place

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

There is access to unique historical information where physical access is not allowed

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

It might cost to have access to information

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

There is the possibility of unrestricted number of "loans"

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

Information is available in a variety of formats

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

Computer equipment is required

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

Time spent in front of monitor

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

Information can be accessed by many users simultaneously

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

Privacy

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

Online help

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
☐ don't know

If you would like to expand on any of the answers given, please note additional comments here.

If you would be willing to participate further in my research through follow-up interviews (by phone) please provide name and contact details below.

Name:

Address:

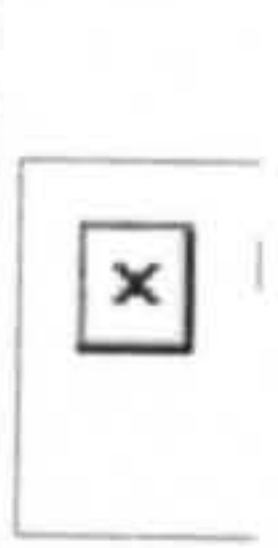
Tel:

If you would like to be entered into the prize draw please provide your email address:

Email:

Thank you very much for taking the time to complete this questionnaire

Submit Questionnaire



ADAM Questionnaire

The purpose of this survey is to discover how you use and obtain information in digital form. This research is being carried out by Maria Monopoli as part of her research studies on digital libraries at the Department of Information Science, City University.

Your co-operation in completing the questionnaire will be greatly appreciated. It should not take more than a few minutes of your time. I would be grateful if you could complete the questionnaire by 31st May at the latest.

All those who complete the questionnaire will be entered into a prize draw for a £50 Gift Certificate for Amazon Books. We will need your email or contact address to enter you in the prize draw. However, your answers will still be treated anonymously. The winner will be notified at the end of June.

PART A: Personal Questions

1. Sex: ☐ Male
☐ Female

- Age: ☐ 17-24
☐ 25-34
☐ 35-44
☐ 45-54
☐ 55-64
☐ 65+

2. What is your current employment?

- Student:** ☐ Undergraduate
☐ Postgraduate
- Research Student:** ☐ MPhil
☐ PhD
- Research Staff:** ☐ Research Assistant
☐ Research Fellow
- Academic Staff:** ☐ Lecturer
☐ Senior Lecturer
☐ Professor
☐ Head of Department

Other (please specify):

PART B: ADAM Use

3. How many times have you used ADAM in the last month?

- ☐ None
- ☐ Once
- ☐ 2-3 times
- ☐ 4-10 times
- ☐ 11+ times

4. Is this typical of your ADAM use?

- ☐ Yes
- ☐ No

5. Do you use ADAM regularly?

Yes:

- ☐ Daily
- ☐ Weekly
- ☐ Monthly

No:

- ☐ Occasionally
- ☐ Hardly ever
- ☐ First time

6. Where do you access the ADAM service from?

- ☐ Home
- ☐ University
- ☐ Both
- ☐ Other (please specify):

7. ADAM provides the following services to support your searching. Which services do you use? (please select all that apply)

- ☐ Online Help
- ☐ Browse Facilities
- ☐ Search Facilities
- ☐ ADAM Subject Headings
- ☐ Art & Architecture Thesaurus
- ☐ List of Historical Periods (e.g., 1910-1919 AD)
- ☐ List of Resource Type (e.g., journals)
- ☐ List of Place Names (e.g., Asia)

8. Please rate the usefulness of the following services that may be added to ADAM in the future. On each line, please weight the service on a scale of 1-4, where **1 is an Unhelpful service** and **4 is a Helpful service**.

There will be access to additional Internet information gateways

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Don't know

ADAM Users will be provided with a list of art and design newsgroups where they will be able to become members

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Don't know

ADAM Users will be allowed to make critical evaluation of Web sites

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Don't know

Full-text searching: ADAM Users will be able to search the content of Web Sites as well as a database of Internet resource records that has been created by the ADAM Team

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Don't know

9. Do you prefer using the browsing or the searching facilities?

☐ Browse (please specify why)

☐ Search (please specify why)

☐ Both (please specify why)

10. Having specified whether you prefer to browse, search or both, please indicate which search or browse strategies provided by ADAM you adopt (please select all that apply)

Search strategies:

- ☐ Simple Search
☐ Option Search
☐ Advanced Search

Browse strategies:

- ☐ ADAM Browser
☐ Multi Option
☐ Place Browser

- | | |
|--------------------------------------------|---------------------------------------|
| <input type="checkbox"/> Proximity Search | <input type="checkbox"/> Name Browser |
| <input type="checkbox"/> What's New Search | <input type="checkbox"/> I don't know |
| <input type="checkbox"/> I don't know | |

11. Have you used the ADAM online help function?

☐ Yes

No - please give your reasons:

- ☐ I did not know that online help function could help my searching
- ☐ I did not know that online help function exists
- ☐ I knew about the existence of the online help, but I have not felt the need for help yet
- ☐ I prefer asking a person to help me
- ☐ Other (please specify)

12. Do you think that the online help function can replace the help provided by a person such as librarian?

- ☐ Yes
- ☐ No (please specify why)

13. You are doing your search and ADAM provides you with a list of search results (hits), what is your next step?

- ☐ I directly link up to the Web pages suggested by ADAM
- ☐ I firstly read the information provided by ADAM concerning the content of suggested Web pages and then I link up to them
- ☐ I do both, it depends on searching
- ☐ Other (please specify)

14. When you have identified a Web page that you are interested in and you decide you want a copy for future use, how do you **store** it? Please, bear in mind that adding a Web page into "favorites" is not considered to be a permanent storage because the link to this is only allowed as long as the Web page is in the Internet.

Please rate the following options when 1 is your first option, 2 is your second option and so on. If you would never follow an option, please leave it blank.

If you adopt two or more options equally, please select the same rating number

By saving it on a disk, e.g. floppy disk, hard disk

By printing it out as a hard copy

By making notes from the screen

Other (please specify)

15. How have you used the information provided by ADAM? (please select all that apply)

- ☐ Writing up a term paper/project
- ☐ Writing up a thesis/dissertation
- ☐ Writing up a paper for publication, e.g., journal article or conference/workshop paper
- ☐ Supporting a teaching lecture
- ☐ Other - please specify:

16. Do you ever pass on Web site addresses obtained from ADAM to other people who would be interested in them?

Yes - by:

- ☐ Fax
- ☐ Email
- ☐ Hand
- ☐ Other (please specify)

☐ **No**

17. Are there any disadvantages of using ADAM over a traditional library?

☐ Yes (please specify)

☐ No

18. Are there any advantages of using ADAM over a traditional library?

☐ Yes (please specify)

☐ No

19. To what extent do you agree with the following description of ADAM?

ADAM is a library based on the Internet that provides you with a collection of information that is organised, digitised, and specialised in a specific subject area.

☐ I totally agree

☐ I partly agree (please specify why)

☐ I disagree (please specify why)

20. How do you use ADAM?

☐ As a supplement for the traditional modes of communication such as visiting a library

☐ As a replacement to the traditional modes of communication such as visiting a library

21. Are you a member of the "ADAM Friends"?

Yes - please specify why by selecting all that apply:

☐ I think that it will help me to identify some other users of ADAM

☐ I think that I will have some more help when I carry out my search

☐ I think that the ADAM Team will keep me informed with ADAM News

- ☐ No specific reason
- ☐ Other (please specify)

No (please specify why)

- ☐ I did not know that "ADAM Friends" exists
- ☐ I knew about the existence of "ADAM Friends", but I am not interested in becoming a member
- ☐ I knew about the existence of 'ADAM Friends', but I am not aware about what it can offer me if I become a member.
- ☐ Other (please specify)

22. Will you use ADAM again? Please indicate your opinion on a scale of 1-4, where **1 is Unlikely and 4 is Likely**.

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Don't Know

23. Do you have any additional comments that you wish to make?

If you would be willing to participate further in my research through follow-up interviews, please tick and provide name and contact details below.

Name:

Address:

Tel:

Email:

If you would like to be entered into the prize draw please provide your email address:

Email:

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[Conditions of Use](#) are available.

***The Electronic Journals Service of
the Library and Information Services (LIS)
of the University of Patras***

- Online questionnaire -

The purpose of this survey is to discover how you use and obtain information in digital form. This research is being carried out by Maria Monopoli as part of her research studies on digital libraries at the Department of Information Science, City University.

Your co-operation in completing the questionnaire will be greatly appreciated. It should not take more than a few minutes of your time. I would be grateful if you could complete the questionnaire by 31st December at the latest.

All those who complete the questionnaire will be entered into a prize draw for a £40 Gift Certificate for Books or CDs. We will need your email or contact address to enter you in the prize draw. However, your answers will still be treated anonymously. The winner will be notified at the end of January.

Q1. Sex

Female
Male

Q2. Age

17-24
25-34
35-44
45-54
55-64
65+

Q3. Occupation

Academic Staff
Research Associate/ Visiting Lecturer
Research Staff

Postgraduate Student
Undergraduate Student
Other – please specify:

Q4. Department

Department of Biology
Department of Geology
Department of Mathematics
Department of Physics
Department of Chemistry
Department of Engineering Research (A department for Doctoral Studies on Basic Mathematics and Physics)
Department of Architecture
Department of Electrical and Computer Engineering
Department of Computer Engineering and Informatics
Department of Mechanical and Aeronautical Engineering
Department of Civil Engineering
Department of Chemical Engineering
Department of Medicine
Department of Pharmacy
Department of Primary Education
Department of Pre-School Education
Department of Theatre Studies
Department of Greek Literature
Department of Philosophy
Department of Economics
I don't belong to any department

Q5. Please specify (if you remember) the titles of the electronic journals you read.

Q6. How often do you access the 'electronic journals' service?

Daily
Weekly
Monthly
Occasionally
Only when I know that an interesting article has been published
I have only accessed once or twice

Q7. Where do you access the 'electronic journals' service from?

Office
Main Library
Computer labs
Library of my department
Other – please specify:

***Q8. How have you used the information provided by the 'electronic journals' service?
(please select all that apply)***

Teaching
Article/Publications
Thesis/Dissertations/Coursework
Scientific documentation
Other – please specify:

Q9. How do you search the 'electronic journals' service? (please select all that apply)

Author
Keywords
Subject
Date of publication
Journal title
Title of article
Table of contents
Abstract
Other – please specify:

Q10. Have you used the online help function provided by any electronic journal?

Yes – how would you value it?
Useful service, but I prefer asking a person to help me
Useful service and easy to use
Useful service but difficult to use
Not useful service

No – please give your reasons:
I don't know what online help is
I have not felt the need for help yet
I did not know that online help could help my search
I know about the existence and the role of online help, but I did not know that online help exists at the specific e-journals I use
I prefer asking a person to help me

Q11. When you have identified an article that you are interested in and you decide you want a copy for future use, how do you store it?

By saving it on a disk, e.g. floppy disk, hard disk
By printing it out as a hard copy
By making notes from the screen
Other – please specify:

Q12. If you had the chance of reading between the electronic and the print version of a journal title, which one would you choose?

The PRINT version
The ELECTRONIC version

Q13. Which of the following reasons might prevent you from using the 'electronic journals' service (please select all that apply)

If there is not enough information relevant to my subject
If it takes time for a Web page to be downloaded
If I need to pay in order to have access to information
If I do not feel familiar with how to search the 'electronic journals' service
If there is no human help
If there is not a way to identify other users of the 'electronic journals' service
If I am not able to print an article for reading
If I am not able to print an article for storing
If I am not able to save an article in a disk, e.g. floppy disk, hard disk, CD-ROM
If there is no 24-hour access to the 'electronic journals' service
If there is no access from my desktop
If there is no access to information published in the past
If I need to memorize username and password to log in
Other(s) – please specify:
None

Q14. Will you advice friends or colleagues to use the 'electronic journals' service?

Yes
No

Q15. Do you have any additional comments that you wish to make?

***The Electronic Journals Service of
the Library and Information Services (LIS)
of the University of Patras***

- Face-to-face interviews -

1. Gender Female Male
2. Age 17-24 25-34 35-44 45-54 55-64 65+
3. Occupation Research Associate/ Visiting Lecturer Academic Staff Research Staff Postgraduate Student Undergraduate Student Other – please specify:
4. Approximately, how often do you access the 'electronic journals'? Daily Weekly Monthly Occasionally When I know that an interesting article has been published I have used them once or twice
5. Where do you access the 'electronic journals' service from? Office Main Library Computer Lab Departmental Library Other – please specify: 5a. If you were able to access the 'electronic journals' service from home, would you use it? Please also provide the reasons for your answer.

<p>6. How did you first be informed about the 'electronic journals' service? (please select all that apply)</p>
<p>7. How have you used the information provided by the 'electronic journals' service? (please select all that apply)</p> <p>Supporting a lecture</p> <p>Writing up a paper for publications, e.g. journal article or conference/ workshop paper</p> <p>Writing up a term paper/ project or a thesis/ dissertation</p> <p>Keeping up with the progress in the relevant subject area</p> <p>Other – please specify:</p>
<p>8. Searching Methods:</p> <p>Do you use the 'electronic journals' service only for searching for a specific journal article or just for browsing?</p> <p>Do you know the meaning of the terms Search and Browse?</p> <p>Do you know Boolean Operators (and, not, or)?</p> <p>Do you use the Boolean Operators (and, not, or)?</p>
<p>9. Have you use the Online Help function?</p> <p>9a. Why have not you used the Online Help function since now?</p> <p>9b. If you had the chance to decide between an online help and a human help, which one would you choose? Please also provide the reasons for your answer.</p> <p>9c. Comments on the Online Help function</p>
<p>10. When you have identified an article that you are interested in and you decide you want a copy for future use, how do you store it? (please select all that apply)</p> <p>Making hard copy</p> <p>Saving into a disk</p> <p>Both</p>
<p>11. When you have identified an article and you would like to read it immediately, how would read it? (please select all that apply)</p> <p>Reading from the screen</p> <p>Making hard copy</p>
<p>12. If you had the chance of being provided with a free subscription of a journal title, which format would you choose, the electronic or print? Please also provide the reasons for your answer.</p>
<p>13. Would you attend a seminar to use the 'electronic journals service'? Please also provide the reasons for your answer.</p>

14. Which of the following reasons might prevent you from using the 'electronic journals' service (please select all that apply)

- If there is not enough information relevant to my subject
- If it takes time for a Web page to be downloaded
- If I need to pay in order to have access to information
- If I do not feel familiar with how to search the 'electronic journals' service
- If there is no human help
- If there is not a way to identify other users of the 'electronic journals' service
- If I am not able to print an article for reading it
- If I am not able to print an article for storing it
- If I am not able to save an article on a disk, e.g. floppy disk, hard disk, CD-ROM
- If there is no 24-hour access to the 'electronic journals' service
- If there is no access from my desktop
- If there is no access to information published in the past
- If I need to memorise username and password to log in
- Other(s) – please specify:
- None

15. Please evaluate the following services:

- Satisfactory amount of relevant current information
- Satisfactory amount of relevant past information
- Direct access to information provided as bibliography
- 24-hour access to the service
- Access to the service without memorizing username/ password
- Quick access to the service
- Access to the service from users' desktop
- Easy access to the service
- Provision of Search facilities
- Provision of Browse facilities
- Provision of Online Help
- Provision of Electronic and Human Help
- Customization of services
- Possibility of saving information
- Possibility of printing information
- Provision of links to other information
- Possibility of users making online comments for a journal article
- Possibility of users communicating with authors of journal articles through emails
- Possibility of users communicating with other users who share the same interests

16. Comments