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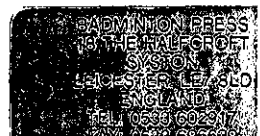
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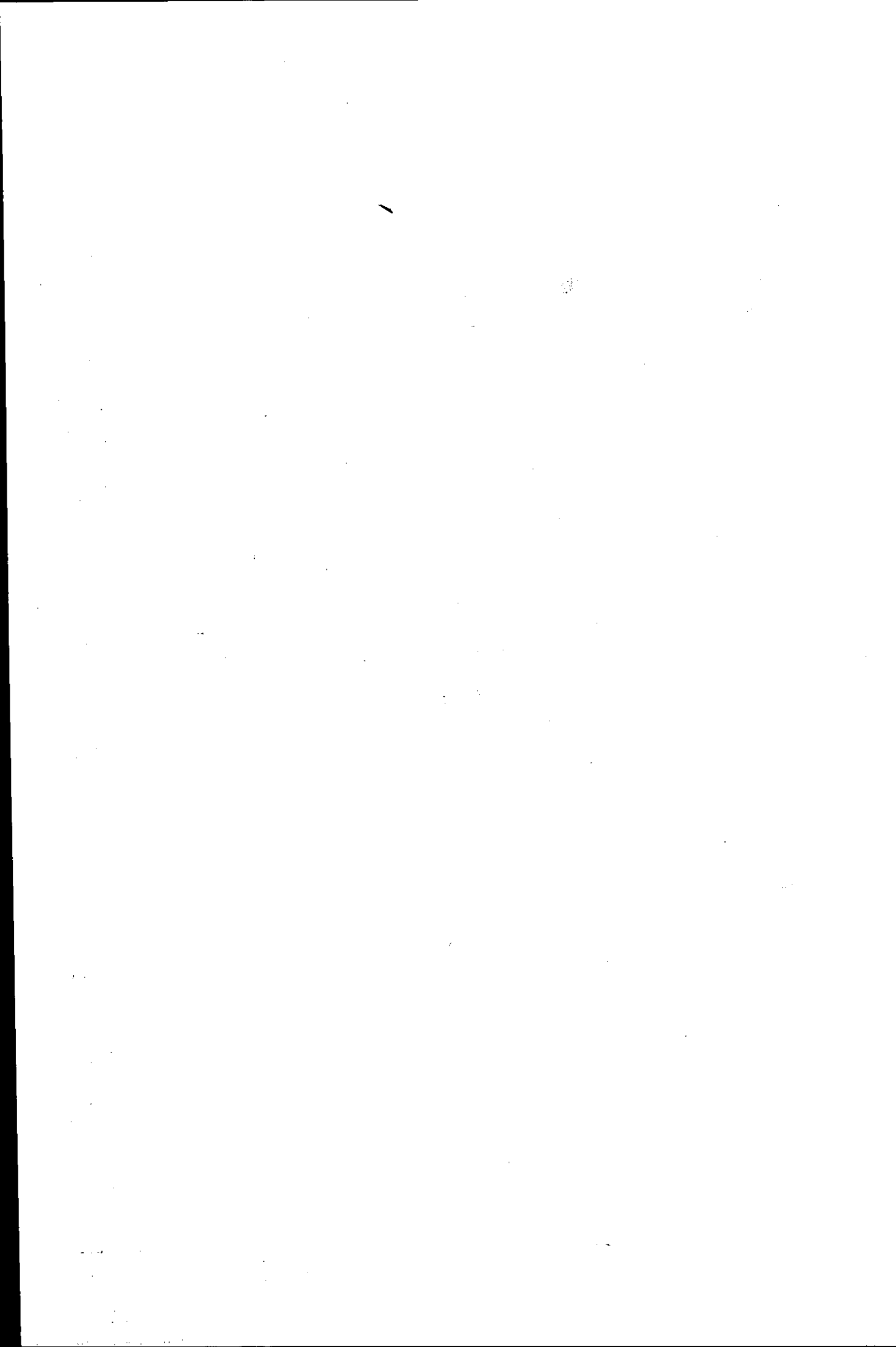
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**The Evaluation of Academic Electronic Bulletin
Boards for Communication and Training:
HCI Factors in the UK and Saudi Arabia**

by

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A Doctoral Thesis
Submitted in partial fulfilment of the requirements
for the award of
Doctor of Philosophy
of the
Loughborough University of Technology
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Dedication

To the people whom I owe so much:

My parents

My brother Abdullah

List of publications

1. The design of electronic bulletin boards, (1991). Journal of Information Science, 17 (4), pp. 247-251.
2. Student reaction to parallel hypertext and menu-based interfaces, (1993). ALT-I, 1 (2), pp. 17-26.

ABSTRACT

Electronic networks services have become essential tools for the academic community. One of the services provided has been academic electronic bulletin boards (EBBs), and the use of EBBs has increased dramatically during the last decade. One question concerns the possible application of EBBs as a means both for communication and for remote training. A series of experiments were conducted during 1991, 1992, and 1993 with the aim of examining the use of EBBs for these purposes. The first experiment was carried out to investigate whether users experience problems in using EBBs. The next extended this to see how students evaluated EBBs for communication and training purposes. The main focus of the work was BUBL. After this second experiment, modifications were made to the BUBL data and a further experiment was carried out. A different group of students looked at the modified material, and also compared it with US data using different software. The fourth experiment compared the usability of a menu-based interface (dBase III+) and a hypertext interface (HyperCard) from a student's viewpoint. It was followed by an investigation of icons to find out how well different icons could be recognised and the possibility of using them for language-independent instructions. Finally, the characteristics and problems of GULFNET users were examined.

The evaluation has demonstrated the general acceptability of EBBs and their likely value for training purposes. This leads to a discussion of how an EBB might best be developed for use in communication and training on GULFNET.

keywords:

Computer academic networks, Electronic bulletin boards, BUBL, INFOSLUG, On-line training, GULFNET, JANET, Human computer interaction, Computer interface design, Icons, dBase III+, Hypertext, Saudi Arabia and United Kingdom.

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INTRODUCTION

Academic computer networks have increased rapidly during the last decade. They enable connected computers to share information, which increases the distribution of information throughout the academic world. McCarthy (1989) noted that academic networks facilitate information exchange and have also become easier to use with menu based system interfaces.

There are several types of communication via computer networks. Each type provides the users with specific services. For example, a File Exchange service enables the users of a network to transfer formatted files with the same format. Another example is the Computer Conferencing service which enables several users to hold a meeting or a discussion via the network. The important service of the network is often Electronic Mail (E-mail). E-mail supports electronic correspondence between individuals. E-mail can be sent by one person and received by many people through the use of the mailing list system. E-mail is very useful as a support tool with the Electronic Bulletin Board (EBB) and Computer Conferencing (CC) systems.

EBB has been defined by Pfaffenberger (1987) as a computerized tool that provides electronic mail with a publicly accessible mailbox instead of a privately accessible mail box. EBBs can be read by a wide audience who have not been identified by name, while E-mail can only be read by people who have already been identified by names or nicknames, etc. The use of the EBB has increased dramatically during the

past decade because of its ability to facilitate communication between interested parties, by passing more information at low cost. James (1992) said that EBBs have become more popular with the advent of low cost computers, easily available communication and large network systems. On-line EBB services are similar in approach to the regular 'face to face, telephone, and postal letters' communication methods. Consequently, there is a heavy use of the EBBs. Groups with a cohesive interest may wish to establish their own EBBs. For example, chemists with the same specialist interests have established their own EBB (Zurer, 1988) which allows them to send their comments and suggestions to the coordinator of the EBB. The coordinator of the EBB receives materials from all the users and he or she selects those appropriate for display on the EBB.

Statement of the study

This study aims to investigate the main principles of the EBBs and the difficulties which have discouraged the users of EBBs, and, at the same time, to investigate the possibility of using the EBBs as mediators of training. Emphasis is put on the use of EBBs for on-line training and ultimately on the way in which GULFNET users can benefit from the use of EBBs for training.

The purpose of this study

Training is an important factor in the improvement of skills. Universities and academic institutions are investing a lot of money into training purposes. Futey (1993) has suggested that users of academic networks should be provided with a guide concerning the use of the networks, and this could include networked training. On-line training is a new trend resulting from the introduction of advanced technology by universities and academic institutions.

GULFNET is an academic network which has not been utilized as fully as was expected (Hoaymani, 1989). Training for the users is urgently needed (Sulaiman, 1991). There is limited training for users in the form of seminars, lectures, workshops, etc. This type of training does not enable many users to attend sessions for several reasons. Firstly, these training sessions are few and only a limited number of people are allowed to attend. Secondly, they are not held at scheduled times, so confusing users. Thirdly, no evaluation of this training has been made or feedback from the trainees obtained. Because of this deficiency in the available face-to-face training, on-line training might prove more suitable for the users of the network, since a training package can be accessible throughout the 24 hours. The availability of a training package also allows many more users to benefit. Finally, the universities connected to GULFNET are located in different cities and countries, and on-line training enables the network users to access the training with no time wasted on travel.

Scope of the study

The six experiments of this study focused on the use of EBBs, especially the bulletin board for library and information specialists (BUBL), and the possibility of using them for online training. The study investigates the difficulties which discourage users from accessing EBBs, the possible contents of an on-line training package, and the needs of GULFNET users to utilize network services. The results of the experiments are applied to consider the provision to GULFNET users of on-line training in how to use the network facilities, and, at the same time, to improve the services of GULFNET and to attract users.

Value of the study

The findings and recommendations of this study should be valuable for the following reasons:-

- i) It should help clarify the difficulties in using EBBs.
- ii) It should help clarify differences between users in the use of computers and network facilities as a function of their background.
- iii) It should identify users' basic needs when using EBBs.
- iv) It should help specify proper interfaces for EBBs.
- v) It should explore which navigational approach 'sequential or non--sequential' is easier for users to use.
- vi) It should help to determine the main requirements of on-line training packages.
- vii) It should provide the GULFNET administrators with a definite proposal on how to train the users of GULFNET.

Objectives

This study was conducted to accomplish the following five main objectives:-

1. To investigate the use of EBBs in terms of:-
 - i) Friendliness of the system.
 - ii) Difficulties faced in using EBBs.
 - iii) The display of materials on EBBs screens.
 - iv) Reading materials on-screen.
 - v) The design of the information display.
 - vi) The amount of information on each screen.
 - vii) Relation of contents to the menu.
 - viii) Instructions on each screen.
 - ix) System responses when mistakes are made.
 - x) Speed to move from one screen to another.

- xi) Paging and numbering.
- xii) Users' expectations of EBB systems.

2. To evaluate the existing on-line training package 'BUBL practical exercise' with consideration of the following points:-

- i) Users' expectation from the training.
- ii) Content of the training.
- iii) Construction of the training materials.
- iv) The language of the training materials.

3. To investigate appropriate navigation and information display in terms of:-

- i) Sequence and free search.
- ii) Information organization in the database.
- iii) The flexibility of seeking information.
- iv) Difficulties encountered in retrieving information.

4. To examine the possibility of using icons for frequent on-screen use:-

- i) How easy the icons are to use and to learn.
- ii) The possibility of using icons for communication independent of language.
- iii) The difference between users with different backgrounds in recognizing icons and relating them to their computer functions.

5. To determine GULFNET users' needs for training, and to encourage them to utilize the network services, in terms of:-

- i) Type of training methods the users of GULFNET prefer.
- ii) The contents of a training package on how to use GULFNET.
- iii) Services users want to be available on GULFNET.

The results of the experiments are presented and discussed in the following chapters.

Chapter 1 provides general background about the Kingdom of Saudi Arabia with emphasis on the development of education and electronic academic networks. The use of IT in the United Kingdom and Saudi Arabia is compared.

Chapter 2 concerns the principles of on-line training and teaching. The different types of teaching and training are discussed. However, more emphasis is placed on the use of electronic methods, especially the use of EBBs for teaching and training. The background of the users which might affect their use of IT is discussed. Human Computer Interface factors are considered in this chapter.

Chapter 3 discusses the variables that might affect the participants' performance or responses to the experiments, and discusses the detailed methodology that has been used for collecting the data. The work was carried out in a series of stages - Initial study; BUBL-92; BUBL-93; INFOSLUG; comparison of hypertext and menu;-based interfaces; Icons; GULFNET experiments.

Chapter 4 presents the Initial study, BUBL-92, BUBL-93 and INFOSLUG experimental results. The main aspects of these experiments are the students' view of the features of several EBBs HUMBUL, BUBL, NISS, SBB and INFOSLUG.

Chapter 5 presents two investigations. First, there are the results of a comparison experiment between hypertext and menu-based interfaces. The students' performance and their opinions of the two interfaces are presented. Second, there are the results of the icons experiment, including the students' performance and attitude to using the icons.

Chapter 6 examines the result of the GULFNET study. It looks at users' attitudes to the E-mail services, training methods they would like to use, contents of training, and the services they would like to include on GULFNET.

Finally, chapter 7 presents the analysis and conclusions. This includes discussion of general guidelines for designing EBBs for on-line training and the possibility of using them with GULFNET.

CHAPTER ONE

GENERAL BACKGROUND OF THE STUDY

The Kingdom of Saudi Arabia

The Kingdom of Saudi Arabia was founded in 1925 by the late King Abdulaziz Ibn Saud. It is located in Southwest Asia with an area of about 900,000 square miles. Most of the area is a desert with mountains reaching 10,000 feet at the highest point. The whole country extends about 1,200 miles from south to north and about 1,000 miles from east to west. The population of Saudi Arabia was 12 million in 1987 but had increased to 14,870,000 by 1990. However; about 4,000,000 of the population in 1992 were foreign employees. Saudi Arabia is bounded on the north by Jordan, Iraq and Kuwait; on the south by Yemen; on the west by the Red sea and the Gulf of Aqaba; and on the east by Oman, Qatar, the United Arab Emirates and the Arabian Gulf. The Kingdom is divided into five region;; Najd which includes the capital of the country, Riyadh; the Asir region which has the highest peaks, rising to over 2,743 metres above sea level; the Eastern region which is the richest and has the oil refineries and industry; the Western region which includes Mecca, the holiest city of Islam, and Jeddah, the capital city of trade; finally, the Northern region which has no special features (Saudi Arabia, 1993).

The King is principally responsible for running the government, and is assisted by a council of twenty-seven ministers, along with other organizational bodies. The King is advised by the council of ministers who formulate policy and make recommendations to him. One of these ministers is the Minister of Higher Education who, together with specialist committees in the Ministry of Higher Education, is responsible for the needs of higher education. These committees make recommendations to the Minister of Higher Education who, in turn, passes them to the Council of Ministers in order for them to be submitted to the king for a decision (Hafiz, 1989).

The economy of Saudi Arabia is based mainly on revenues from oil, which was discovered in 1938. Saudi Arabia contains 25% of the world's oil reserves, and is considered to be the world's largest oil exporter. In addition to oil, other natural resources have been found, such as gold, copper and silver. The Saudi Arabian economic system encourages and supports the participation of the private sector which is mainly active in basic industries and agriculture in shaping the economy and growth of the country (Al-Farsy, 1988).

Higher education

The government has established a number of colleges and universities to meet the increasing demand for highly skilled and well educated manpower. The Ministry of Higher Education was formed in 1975 to address the needs of the country's higher education system.

The Ministry of Planning produces development plans every five years. The first plan was for 1970 - 1975, so, subsequently, they have covered 1975 - 1980, 1980 - 1985 and 1985 - 1990. The current plan started in 1990. Each plan discusses the main

objectives of each ministry and leaves the strategies to achieve those objectives to the ministry staff. The Ministry of Planning (1990) stated that the seven universities of Saudi Arabia which are supervised by the Ministry of Higher Education should continue to grow, in terms both of quality and quantity during the Fourth Development Plan period (1985-1990). The numbers of students increased from 7,000 at the beginning of the First Development Plan period in 1970 to 114,000 students in 1990.

Each university has developed its own area of subject specialization. For example, the King Fahad University for Petroleum and Minerals (KFUPM) in Daharan emphasises engineering, science, geology, computer science and industrial management. The Mohammed Ibn Saud University (MSU) in Riyadh emphasises religious, humanities and social science education. The Islamic University (IU) in Medina emphasizes theological education. The King Saud University (KSU) in Riyadh, King Abdulaziz University (KAU) in Jeddah, King Faisal University (KFU) in Dammam and Umm UIQura University (UQU) in Mecca are considered to be general education universities.

Some ministries have established special colleges to meet their specific manpower needs. For example, the Ministry of Education has established several colleges to improve the quality of teachers's skills and to prepare them for specialised tasks. The Ministry of Social Affairs has created several community colleges aimed at building and improving vocational skills. The Ministry of Industry and Electricity has established several technical colleges to meet the manpower needs in industry and technology.

Academic networks

The term 'electronic network' is today used in many different contexts with different meanings. In this study, electronic network means computers or terminals connected to each other to transfer data between them via the network to allow users to contact each other.

The growth of the academic networks came as a result of several factors. The first one was the dramatic growth in Information Technology (IT) ; in terms both of the computer technology and the communication facilities. The second factor related to users' needs, for example for searching databases, information transmission, etc.. The last five decades have seen an information explosion requiring the use of technology and management skills to filter information and to organize it. Without this innovation, scientists and researchers would not be able to cover the mass of information. The new technology and database design have helped to solve this problem (Black, 1987). Network facilities enable people to access databases in different places and to communicate with each other on matters of interest to them. The third factor is an economic one in that the costs of using electronic network facilities can be less than those incurred using traditional methods.

It is evident that, during the 1980s, the academic network concept came to be well established. For example, Bitnet was established in 1981 in the USA, JANET was established in 1984 in the UK, GULFNET was established in 1984 in the Arabian Gulf States and EARN was established in 1984 in Europe. Much thought has been given to the practicability and the functions of these academic networks. There are two types: Local Area Networks (LAN) and Wide Area Networks (WAN). WAN technology has been facilitated by the technology of the telephone system. The target set for transmission speeds in the WAN sector for Europe is 34Mbps after two years

and a standard of 155 Mbps after five years. WAN technology is operating now in the USA with a standard speed of 45 Mbps. The standard transmission capacity of a typical LAN is 10 Mbps, which will be increased to 100 Mbps over 2 - 5 years from 1992. Current problems in transmission should be completely overcome in Europe within five years from 1992 (Ullmann, 1992).

LAN protocols are designed to provide high speed connections within a small, well-defined geographical area. The computer's bus is shared by the CPU and various Input/Output devices which use it to pass data to and from main storage. Their purpose is to overlay existing wiring whenever possible and to support a peer network of terminals and microcomputers. However, WANs are characterized as point to point connections, multidrop circuits. WANs extend the range of LANs across the world. The WANs protocols have robust error protection to ensure that data are not lost. The LANs protocol does not include a robust error protection (Muller, 1990).

Academic networks in Saudi Arabia

The aim of the academic computer networks in Saudi Arabia is to provide to scientists and researchers within the local academic institutions the opportunity to search, exchange and share information with each other, as well as with counterparts abroad.

Recognising the rapid changes in educational development all over the world, the vast amount of information which is generated and the difficulty of handling it in the traditional way, the government of Saudi Arabia created the Saudi Arabian National Centre for Science and Technology (SANCST) in 1977 at Riyadh, the capital of Saudi Arabia. In 1985 SANCST was renamed King Abdulaziz City for Science and Technology (KACST) as an independent scientific organization, administratively attached to the office of the Prime Minister. KACST has national responsibility for

supporting and encouraging scientific research and coordinating the research activities of other organizations.

KACST was expected to formulate national policy for science and technology, develop a suitable plan for the implementation of technology and cooperate with the scientific institutions and research centres in the country. It is engaged in many national and international scientific research projects, and, at the same time, it provides information to scientists and researchers in all the academic institutions in the country. Alghamdi (1988) states that Saudi Arabia is considered to be one of the small group of developing countries committing heavy capital investment to the transfer and development of technology within the country. KASCT was established to shoulder that responsibility and to coordinate the transfer of such technology for the use of academic institutions in Saudi Arabia (Al-Hawaj, 1988). A few ministries have also established their own departments or divisions for improving technology and training their staff on how to apply it to meet their institutional goals.

Saudi Arabia has attached great importance to the development of computer networks in its third and fourth five year development plans. The 7th Saudi National Computer Conference and Exhibition in January 1984, which was held at the Institution of Public Administration (IPA) in Riyadh, under the title, "Utilization and Administration of Computer Networks in the Kingdom of Saudi Arabia" is one indication of the country's commitment to the new technology. In that same year, IBM decided to support the establishment of a major computer network in the Arabian Gulf States - GULFNET. KACST coordinates GULFNET, the first academic computer network in the Middle East, which connects most of the academic institutions in the Gulf states and allows them to contact other academic institutions all over the world.

KACST also operates a National Network, called KACSTNET, which is a dial-up communication network. This links more than 55 research institutions and libraries through lines leased from the Ministry of Saudi Telecommunications. The members of KACSTNET lease telephone lines with a speed of 1200 baud, though some members have special lines with a speed of 2400 baud. All members are able to access the databases available at KACST and the National Computer Centre (NCC) in Riyadh, which is connected to the KACST computer centre (KACST, 1988a).

User training

Training is defined in this study as a systematic process requiring some planning and control rather than random learning from experience. It is concerned, in this case, with changing the skills and attitudes of people in their use of a network (Cowan, 1992). Electronic networks tend to provide their users with training materials, in the form of hand-outs, seminars, lectures and online training. Some groups of network users have established their own training packages to suit their needs - for example, the network of networks 'INTERNET' which is well known among academic people all over the world. The librarians' User Group on INTERNET has initiated its own guide in how to use the network services, especially those relating to libraries and librarians (such as accessing databases on the network or other libraries' catalogues). Librarians and information specialists in the UK have established their own on-line training package on how to use the Joint Academic Network (JANET) facilities. This training package is available on the Bulletin Board for Libraries which is run on JANET.

Training of users of academic networks in Saudi Arabia was considered very important by the administrators, users and non-users of GULFNET in Sulaiman's (1990) study, in order to enable scientists and researchers in local academic

institutions to fully utilize the services. However, no formal training is as yet provided, except in the form of irregular seminars and hand-outs prepared by the node administrators of the networks.

The study of GULFNET by Sulaiman (1990) was a general one to investigate difficulties which might discourage the users of GULFNET from using network facilities. Two questionnaires were distributed to users and non-users of GULFNET, and interviews were also held with the node administrators of the network. It was found there were less than 1000 persons using GULFNET in all the academic institutions which were connected to the network. The users' questionnaire was distributed to 42 users and the response rate was 74%. A Non-user questionnaire was distributed to 300 persons. The response rate was 60%. All the node administrators were interviewed. The results of the study showed that there is urgent need for training the users and non-users of GULFNET. The results showed that 74% of users, 85% of non-users and 100% of the node administrators believe that they were in need of training in how to use the network facilities.

This present study has been carried out to investigate the main factors which need to be considered in designing an on-line training package for GULFNET users. Users of GULFNET at three universities KSU, KFUPM and KAAU were selected to find out if there were any differences of network use in these three universities. These universities were selected for several reasons :-

- i) KSU and KAAU have the largest number of GULFNET members.
- ii) KFUPM leads all the universities in using advanced technology for teaching purposes.
- iii) These three universities are the ones with the largest number of registered

GULFNET users.

King Saud University (KSU)

King Saud University (KSU, formerly the University of Riyadh) was established in 1957 in Riyadh, the capital of Saudi Arabia, which is located in the Middle Region. Its registered users on GULFNET numbered 100 in June 1993. KSU is the largest university in the Kingdom with an enrolment of about 32,000 students and 2700 faculty members in the academic year 1991. The university offers 123 undergraduate majors, 93 majors at master's level and 5 majors at Ph.D. level (Ashoor, 1992).

King Fahad University for Petroleum and Minerals (KFUPM)

King Fahad University for Petroleum and Minerals was founded in 1963 as a College of Petroleum and Minerals in the eastern region of the Kingdom. It was upgraded to a full university in 1975. The main objective of the university is to support the petroleum and minerals industry of Saudi Arabia. KFUPM is a scientific and engineering university with an enrolment of about 5,000 students and 750 faculty members in the academic year 1991. KFUPM offers 24 undergraduate majors, 14 majors at master's level and 8 majors at Ph.D. level. Its registered users on GULFNET also numbered 100 in June 1993. The university is different from the other universities of Saudi Arabia in that it is a technological university and English is the language of instruction, except for Islamic and Arabic Language courses. Most of the faculty members of the university are, therefore, from the USA and UK, or locals who have obtained postgraduate education in these two countries. As a result, the university is a leader in the use of sophisticated technology for which it has acquired a national and international reputation (Ashoor, 1992).

King Abdulaziz University (KAAU)

King Abdulaziz University was established in 1967 in the western region of Saudi Arabia. It was founded as a private university, and started as a College of Economics and Administration. It was converted to a state university in 1971. KAAU is the second largest university in the Kingdom with an enrolment of about 21,000 students and 1000 faculty members during the 1991 academic year. The university offers 87 undergraduate majors, 36 majors at master's level and 9 majors at Ph.D level. Its registered users on GULFNET numbered 59 in June 1993. The university goals are to develop methods and research in university education in various fields of knowledge, upgrading the qualifications of teachers, participating in the development and use of advanced science and technology, and in social, cultural, scientific activities.

GULFNET

GULFNET is a store and forward data communication network "not interactive network". It was established in May 1985 as the first computer network in the Arab world. It links the computer centres of the academic institutions and research organisations in the Gulf States through public leased telephone lines. The network can be used to query remote computerized databases, to transfer files, text, data or programs to other nodes and to receive or send electronic mail to one or more network users. (Bakry, 1989).

History

The academic community in Saudi Arabia started thinking about the need for an academic computer network in the early 1980s. IBM then decided to support the establishment of a research network in the Gulf region, and provided:-

- the network central node located at KACST
- the modems required for using leased telephone lines
- the leasing of lines for a two year period (March 1985 to March 1987).

There were no network users until after March 1987 when the institutions which were members of the network started to share the technology according to a mutually agreed formula. For example, the member institutions in Kuwait shared the cost of leasing a line from KACST as the central node to the nearest institution, then each institute paid for the leased local line. However, KASCT paid the cost of the leased line which connects GULFNET with the American academic network BITNET in Washington, D.C., as a gesture of support and encouragement to the members of GULFNET.

GULFNET is open to non-profit making academic and research institutions in the Arabian Gulf Region, and has 14 institutional members - 10 in Saudi Arabia, three in Kuwait and one in Bahrain. GULFNET is managed by three committees of the member institutions:-

- Steering committee consisting of representatives from participating nodes, who formulate rules and regulations for the operation of the network.
- Technical committee which implements all facilities and services on the network, monitors its performance and maintains statistics on load and lines.
- Awareness committee which is responsible for promoting the use of the network facilities (Alhamidi, 1987; Nawab 1992).

GULFNET users

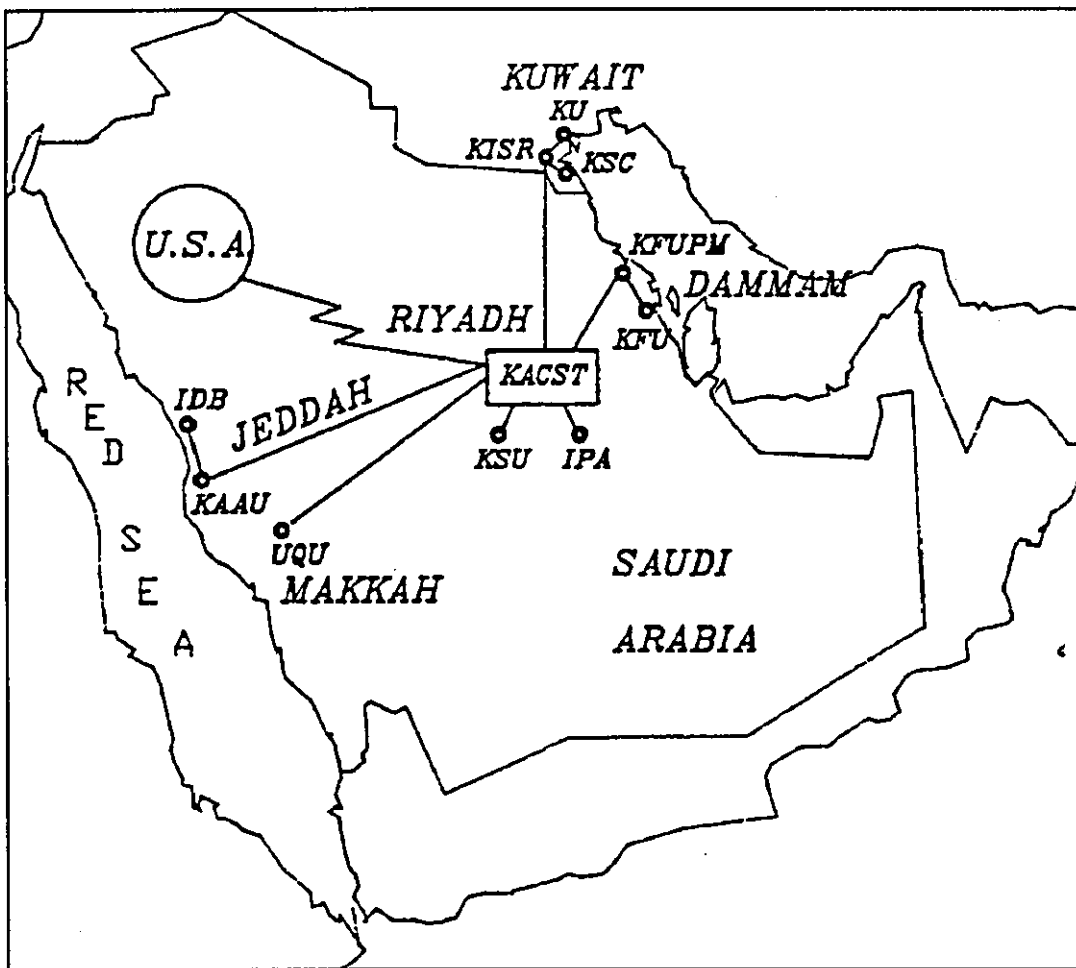
Despite urging (Hoaymani, 1989) GULFNET has not been used as was expected. The administrators of GULFNET do not even know which people are using the

network because there is no system for registering users. However, they know the amount of use made of the system from observing the network traffic. There is an optional list for users to register their names. In June 1993 there were only 332 registered users of GULFNET, though it is believed that there are more users who have not registered their names.

Configuration

GULFNET is a star network, which is one of the most widely used. It is easy to control and the traffic flow is simple. However, it has the problems of data traffic flow and has limited distribution processing capabilities. GULFNET configuration is shown in Figure 1.1.

Figure 1.1



Services

Some 14 services are currently available on GULFNET, as follows :-

- File exchange, which enables the user to send or receive file(s) with the same format.
- Electronic mail.
- Telephone 'Tell'. This service enables users to send short immediate messages to other users who must be on the terminal at the time of sending the message.
- User directory: the users can obtain the names and user ID's of registered users on different lists.
- Search database. Users can access the available databases on GULFNET.
- Notebooks which enable users to save, send or receive documents.
- Nickname. This service allows the users to use nicknames rather than remembering the user's ID.
- Chat. This service enable users to send and receive an immediate message with several users involved.
- File list. Lists the files available on the storage disc.
- Bitnet node list displays the address of BITNET and EARN network centres.
- Local time, displays the time and users' ID of GULFNET nodes.

In general GULFNET services perform three main functions:-

- Processing remote database enquiries.
- Transferring files, text and programs.
- Electronic mail services (KACST, 1989; Nawab, 1992) .

Future plan

GULFNET is planning to encourage users to utilize the facilities which are available now. One thing which is recognised by the GULFNET administrators is the urgent

need for user training. There is also a study investigating the changes that might be needed to develop and improve the network services. For example, accessing more databases might be of interest to the network users, as well as having a regular electronic newsletter with academic community news, and establishing electronic bulletin boards to deal with different subjects and serve people in different areas.

The United Kingdom (UK)

The UK has been selected for this study because it is one of the countries which uses advanced technology in education. The Joint Academic Network (JANET) was established in 1984 to provide the academic communities in the UK with electronic communication. JANET is similar to GULFNET in the basic services, but it is heavily used while GULFNET is not. The two systems therefore provide an interesting comparison, from which some points of value may be derived for GULFNET planning (Smith, 1984).

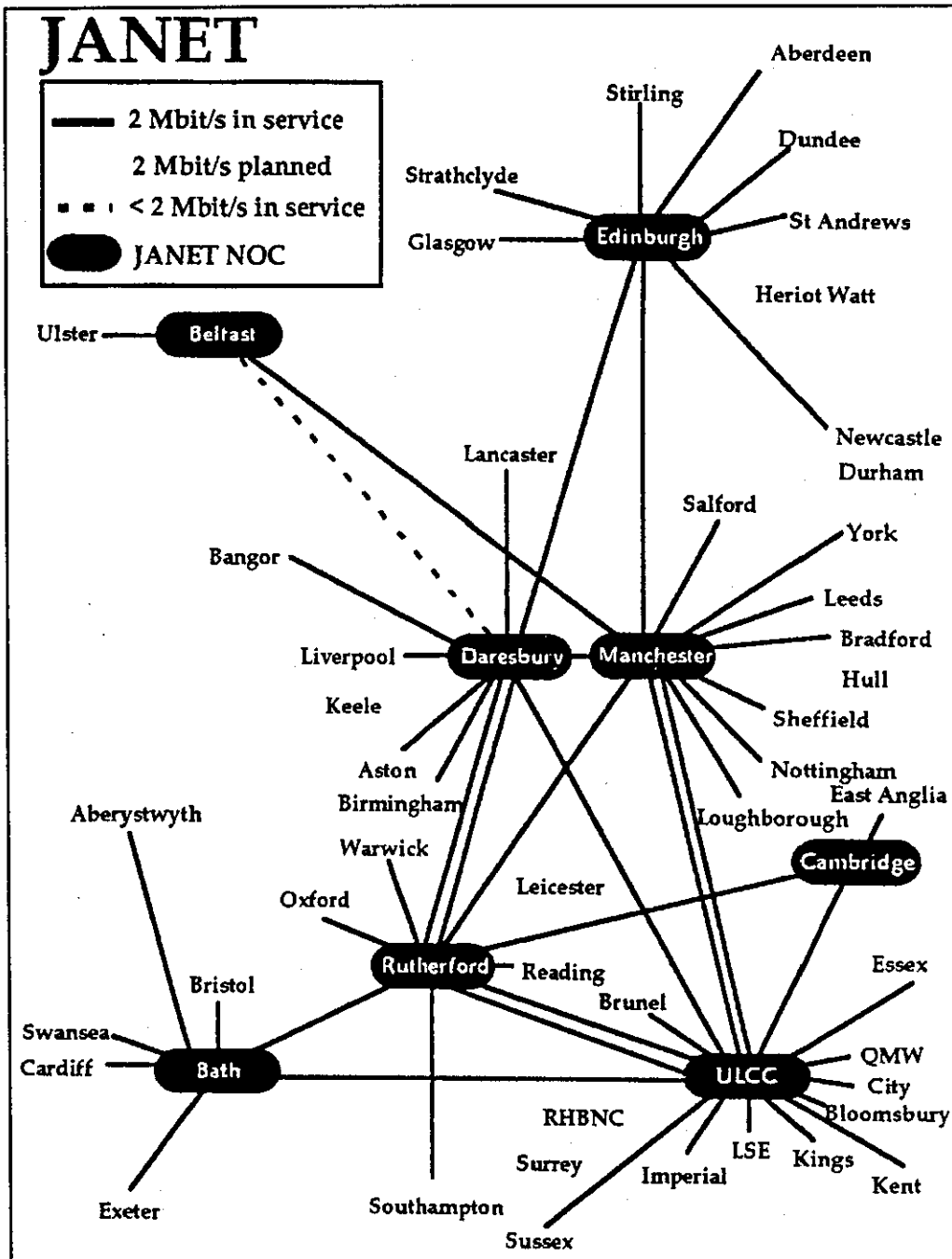
The Joint Academic Network (JANET)

The main objective of JANET is to provide users in academic institutions and research councils with computer connections linking their sites together. JANET satisfies the needs of 100,000 individuals and 130 academic institutions. It was established because of interconnecting difficulties in the growing regional and national networks. It is a network of networks in the sense that most of the sites are served by local-area networks (LANs) which are interconnected by JANET as a wide area network (WAN). A range of external gateways connects JANET to other international networks such as EARN, BITNET and Internet (Hamilton, 1991).

Configuration

JANET is a distributed central network. In this type of network the members are divided into groups. Each group has its own connection which is connected to the other groups via one node as shown in Figure 1.2.

Figure 1.2



Services

JANET is an academic network which provides the users with the basic network services, such as processing remote databases enquiries, file transfer and electronic mail services. JANET also offers services which allow special interest groups to set up their own information services, such as electronic bulletin boards, electronic journals and electronic-mail lists. These services meet the basic needs of all JANET users (Wells, 1986; Wells, 1988; and Foster, 1988).

Future plan

JANET has been improved several times to meet the needs of its users. SuperJANET is the planned universities network for the 1990's. The main development of SuperJANET is to utilize optical fibre technology, which implies potential network performance some thousand times better than that of the current JANET. As a result of this development, at least five areas will benefit directly.

- Teaching: UK higher education has developed a variety of projects using computers in support of teaching and training. Graphics are used in these projects as part of the education process. The network will be used to access remotely the courseware and training materials which are held.
- Super computers: At least two things will be gained in this area. First SuperJANET will ensure a minimum level of performance for the wide area network. Second, graphical outputs can partly replace complex screens of numerals and text.
- Electronic mail: E-mail involves the exchange of graphics and other information which can benefit from improved network performance.
- Conferencing: Telepresence allows people to hold and participate in meetings or conferences without being present. The concept is to move information about rather than people or objects.

- Research: Development of this area will be made more effective if it is easy to integrate resources from different places. Americans use the term 'collaborator' to describe the concept of linking the data from different sources (Hamilton, 1991).

GULFNET and JANET

Although the two networks were established almost at the same time, their levels of performance are totally different. GULFNET has about 14 academic institutions as members while JANET has about 130 academic institutions as members. These figures give some indication of the use of the networks. GULFNET serves a few hundred users while JANET serves about 100,000 users. Consequently the services provided by JANET are much greater than those provided by GULFNET. JANET offers the users many databases which can be accessed free of charge at the point of use, such as the Institute of Scientific Information (ISI) databases. At the same time, the users of JANET can search most university library catalogues in the United Kingdom. There are several electronic bulletin boards (EBB), such as BUBL, HUMBUL, NISS, etc,. Each EBB has been established to serve a specific group of users. For example, BUBL is a bulletin board aimed specifically at library and information professionals.

JANET is more reliable than GULFNET in terms of services, high speed of communication infrastructures and the address control through the New Registration System (NRS), etc. GULFNET does not have immediate plans to develop its services further, though the present plan is to attract people at the academic institutions in the Gulf States to use the network services. However, GULFNET plans to establish several electronic bulletin boards and an online newsletter to encourage users. There are also planned initiatives to develop a training package for the users. It is intended

that this study will contribute new insights into the requirements for a training package for GULFNET users.

Information technology background

Information technology has been applied in education at UK universities since the mid-1970s, when the National Development Programme in Computer Assisted Learning (NDPCAL) initiated on the development of Computer Assisted Learning (CAL) in three areas: education, industrial and military training.

The Computer Board for Universities and Research Councils (now renamed the Joint Information System Committee), established in 1966, has continued to provide financial support and to encourage university in computing. In 1982 the Committee commissioned a study of computer facilities for teaching in universities, in order to plan for the 10 years ahead. The view then was that by the end of this time the universities would be divided into two groups - the 'backward' and 'the advanced'. Some universities were found not to have a strategy for defining goals, such as the scale of provision of terminals for students.

Computers in Teaching Initiative (CTI)

The Computer Board established the Computers in Teaching Initiative (CTI) in 1984 with five pilot projects. CTI launched a major programme with 139 projects as a first phase. Each university hosted at least one project, and the programme initiated the application of computers to undergraduate teaching in almost all disciplines. This phase was completed by the end of the 1980s. In the second phase, CTI centres were established to assist the academic staff to use computers in their teaching, a particularly difficult task since most academics do not often accept advice on how to teach from people outside their specialisms. Twenty CTI centres were established

each staffed by appropriate specialists. Currently, the activities of CTI centres cover most of the subjects in different universities.

The main CTI services consist of providing clients with regular newsletters, publishing resources guides and courseware, providing on-line information via the Joint Academic Network (JANET), giving demonstrations of software, advising on computers to departments, and answering individual questions concerned with the use of computers in teaching. In the UK, CTI has created a growing awareness and there is now a growing international interest in using computers for learning and teaching in higher education (Gardner, 1991; Darby, 1992a).

British universities are well supplied with terminals for students, which was one of the Computer Board's objectives. The average is one terminal per 10 students compared with the average of one terminal to 45 students in the USA and one to 600 students in Germany. Even in a country such as Japan, CAL is used to only a limited extent in higher education (Darby 1992a). The USA has launched a small number of very large-scale projects, one of which started 10 years ago at Carnegie-Mellon University. Another, more recent, project at Massachusetts Institute of Technology (MIT) aims to explore the value of advanced networked graphics terminals throughout MIT's curricula. A few other countries are now experimenting with the use of computers for learning in higher education (Lewis, 1991).

Teaching and Learning Technology Project (TLTP)

TLTP was established in August 1992. The aim of the programme, as stated by the Higher Education Funding Council of England (1993), was to make teaching and learning more productive and efficient by harnessing modern technology. Its use has been encouraged as a way of ensuring that benefits are spread throughout UK

academic institutions. Priority is given to projects which guarantee a high involvement by several institutions or departments. TLTP can help in several ways. It can modernise course delivery and improve the quality of the students' learning experiences; it can help students' learning to be organised on a more flexible basis; it can provide effective ways of dealing with routine areas of work where the use of technology can take the pressure away from staff.

The use of IT in Saudi Arabia and United Kingdom

A study has recently been made of the use of IT by scientists in science departments in Saudi Arabian universities as compared with the use of IT by scientists in similar departments of UK universities. Table 1.1 below shows these differences as percentages of staff who use IT for different activities.

Table 1.1

ACTIVITIES	UK (1986)	UK (1991)	Saudi Arabia (1991)
Word processing	62	95.7	58.8
Data analysis	55	72.4	49.0
Collection of experimental data	40	54.3	41.8
Graphical Display	59	87.2	41.8
Searching on-line database	28	58.4	29.0
Electronic mail	16	70.2	00.0

The results for the UK in 1986 are very similar to those for Saudi Arabia in 1991. There are no significant differences except in two areas - graphical display and

electronic mail. At the same time, all the results in 1991 show significant differences between the UK and Saudi Arabia (Bukhari, 1992).

It can be concluded that development of IT in Saudi Arabian academic institutions is still at an early stage, and there are some serious problems in its adoption, especially where this involves networking. Training in the use of IT is of great importance for universities in Saudi Arabia, and thus each university is trying to provide its staff and students with proper training in how to use the technology. But training remains a long way behind the available IT facilities in the universities Fodah, (1990). Hence, developments in the UK might serve as a model for better utilisation of IT in academic institutions in Saudi Arabia.

CHAPTER TWO

THE STUDY BACKGROUND

Introduction

In this chapter, the principles of on-line training and teaching are reviewed in the context of guidelines for the experiments mentioned in the previous chapter. Since the 1970s microcomputers have created a very big change in educational systems. For example, use of computers in the classroom has increased. There is a slow drift away from the traditional method of "chalk and talk" to new methods using the latest technology.

Network services have become essential tools for academic community services. However, users of academic networks still encounter problems caused by the hardware itself, software, connections between the computer and modem, telephone lines, lines between nodes of the network and gateways, and so on. These are difficult to solve for a wide range of users on the basis of consultation and documentation only. The ideal solution is to develop training courses which help users to develop networking skills (Martin, 1989).

Academic networks are valuable for academic communities because they facilitate the sharing and exchange of information between them. There are three levels of services

which users need to learn about :-

- i) Basic services which enable beginners to use library OPACs and electronic bulletin boards.
- ii) Intermediate services such as sending electronic mail, subscribing to mailing lists, posting from the available bulletin boards to the user's electronic mail address.
- iii) Advanced services require that users have good skills in how to use the network facilities. At this level users should be able to use the network gateways to transfer files, to send a program via electronic mail and to use the more complicated services available on the network. Martin (1989) points out the importance for this progress of proper training in how to use the networks

Training and teaching methods

Training is a planned process concerned with skills acquisition, concepts and attitudes. There are many methods which can be used in teaching and training. In this section, some of the most popular methods are briefly discussed - Lectures, Film and Video presentations, Broadcasting, Practical activities, Multimedia, Computer Assisted Learning (CAL) & Computer Assisted Instruction (CAI), and On-line teaching and training.

Lectures

Lectures cover any situation in which a teacher or instructor talks to a class of students or trainees. The face to face lecture still holds a central position at many levels of education. Little is known about the educational effectiveness of lectures. The advantages of this method are that it is cost effective, in the sense that the lecturer gives the lecture and students listen whether they are few or many. Many teachers feel comfortable with the lecture method, and it also appears to be popular with students. The disadvantages are that its effectiveness is dependent on the skills

of the individual lecturer. At the same time, the effectiveness of lectures depends on the ability of the students in terms of how much they can learn from them. Some research, for instance by Percival (1988), indicates that lectures are not effective in developing a high level of thought as compared with other learning methods, such as discussion which involves more student activity. This method is not the most appropriate for training large numbers of users of an academic network for the following reasons:-

- i) Students are usually passive participants in the learning process.
- ii) It is difficult to replicate the course at every university and ensure that learners have access to it every time.
- iii) In terms of time, it is difficult to bring together large numbers of network users to attend training sessions at specific times or at specific locations.
- iv) It is a difficult and time-consuming way of informing old users about new changes to the system.
- v) The effectiveness of this teaching method is not guaranteed.

Despite this, the lecture method could be used for introductory sessions to introduce new users to the network facilities and to explain to them how the training programme is organized.

Film and video presentations

This method is widely used in education, more commonly in training in practical skills. In addition to being used as a separate teaching method, short films and video clips can be incorporated into lectures. They can often be used in education or training as an effective lecture-substitute, and can also be used to impress upon the learners that they are not restricted to a classroom environment only Percival (1988). The disadvantages are that they may be used for convenience rather than for sound

educational reasons, equipment may not always be available, and a professional technician may be needed to help in operating the equipment. It is also expensive to produce the materials. This method is not the most appropriate for training users of networks, for the following reasons:-

- i) Production costs are high.
- ii) Equipment for film and video presentation may not be always available to every one.
- iii) It is time-consuming and expensive to update the training material and it is difficult to inform old users about new changes in this.

In spite of these disadvantages, this method can be used for introductory sessions on network services to explain to new users the training procedure and how to use the network services. An introductory session of this sort can also be used to publicise the network.

Broadcasting

Radio broadcasts and television have been used since the mid-1960s for education and training, for example, in the UK by the Open University. The advantages of this method are that it can be used as an effective lecture substitute, it can create an impression of life outside the classroom, and many people can benefit from it in their continuing education without attending classes. There are some disadvantages though with this method. First, poor quality of production or broadcasting can affect its teaching effectiveness. Second, timing of broadcasts is fixed and therefore audiences may need to arrange their time to suit the broadcasting schedule. Third, it is expensive to produce and broadcast materials Percival (1988). This method is not economically and practically appropriate for training network users because:-

- i) It is expensive to produce and broadcast materials.

- ii) It is difficult to obtain easy feedback from students or trainees.
- iii) There is no guarantee that all users will be reached.

However, the method can be used in a supporting way to publicise network facilities and to give users some idea of the network functions and the benefits that can be obtained using network facilities.

Practical activities

This type of teaching method is common both for providing hands-on skills and for demonstrating the theoretical basis of a subject. It is an excellent method for training small numbers of people. Students generally enjoy the participative activity which gives them a feel for real-life applications. The disadvantages are that its use tends to be expensive in terms of manpower, equipment, time and materials. The number of students must be carefully planned beforehand Percival (1988).

This method is not appropriate for training network users because:-

- i) It is expensive to provide large numbers of users with practical training.
- ii) It requires much time to arrange practical training sessions for large numbers of people.

At the same time, it may be an appropriate way of training representatives from departments or academic institutions who, in turn, can use their skills to support the user training needs of their departments or institutions.

Multimedia

Multimedia methods encompass the use of various media - such as video, sound and animation - that can be accessed and controlled by a computer. CD-ROM is usually

used to store multimedia databases. A multimedia system combines a computer with a high resolution colour screen. The advantages are that it provides good facilities for users in the form of pictures and sound. The disadvantages are that the equipment is not always available, it is expensive to produce the materials and it is difficult to update Heath (1990). This method is not, at present, an appropriate one for training users of the network for the following reasons :-

- i) It is too expensive.
- ii) It is difficult and costly to up-date the materials.
- iii) Multimedia equipment is not always available in all departments or institutions.
- iv) Multimedia equipment needs specialist skills to operate and maintain.

The above approach may ultimately be ideal for training a large number of people. However, since the multimedia technology is not yet available to everyone, its adoption needs to be considered carefully.

Computer Assisted Learning (CAL) & Computer Assisted Instruction (CAI)

CAL and CAI are thought to have begun with developments at IBM in the late 1950s (Heath, 1990) as part of a project concerned with basic psychological research into memory and learning. The Americans use CAI to denote a supportive part of higher education courses. CAL is a more used term in the UK, where it has been employed since the 1960s, especially in secondary education courses with support from post-secondary institutions (Hooper, 1975; Rushby 1979). Heath (1990) distinguishes between CAL and CAI, saying that, in CAI, a computer presents students with a piece of text, followed by one or more questions; depending on the response, the student is routed to a second segment of text and question. CAL refers more generally to the use of the computer as a learning resource to assist students in the totality of their tasks. Hence, Heath considers CAI to be a subset of CAL.

The use of computers in education has increased dramatically during the past decade. The UK, as one of the leading countries in the use of computers in education, has examined long-term plans to apply computers in all academic institutions and departments. This aspect is discussed in more detail in Chapter One (Eberts, 1988; Dean, 1992). Several factors have led to the growth of the use of computers in education. First, fast changing Information Technology provides academic institutions with increasingly appropriate facilities. Second, terminals and microcomputers tend to be available for users in their work places and therefore more people have become accustomed to such facilities. Third, academic institutions and companies can offer in-house training, thereby minimising the cost of sending their trainees out for training.

Askar (1992) carried out a study to investigate students' perceptions of a CAI environment and their attitudes towards CAL. The results show that all students were in favour of CAI, rather than regular classroom teaching alone. Comments from the students showed that their rate of teacher help during the use of CAI was decreased, they reported that self-evaluation and concentration were increased, and that they learned better than in conventional lessons. The study found that the students who especially favoured CAI were also particularly interested in CAL.

The use of CAL is being considered here because its methods are relevant to the development of an on-line training package for GULFNET users. The advantages of using CAL for training have been stated as (Dean, 1992; Kirk, 1993) :-

- i) CAL allows academic staff to function more as learning facilitators and to manage the learning process of their students.
- ii) CAL keeps academic staff up-to-date with new IT and its potential for application.

- iii) CAL encourages students to be self-directed and independent.
- iv) CAL packages can be accessed outside class time, which allows learners to select the time most convenient to them.
- v) CAL enables learners with different skills and knowledge to access the system based on their own needs and backgrounds. The methods of using CAL for interactive training are discussed in this chapter under the On-line teaching and training section.

CAL could be used effectively for training GULFNET users provided there is co-operation from the academic institutions and departments in the Gulf States. Each institution or department can obtain a copy of the training package on a floppy diskette and distribute it to the GULFNET users in their institutions or departments. However, there are several problems which might occur in using CAL on a floppy diskette. It would be costly to provide every user with a full training package, since there are expected to be > 10,000 users of the network. Equipment might not be readily available for every user - limitations on using this training method - and it would not be easy to inform users about changes in the training package. Consequently, its success depends on full cooperation between the departments and academic institutions connected to GULFNET.

On-line teaching and training

This method uses network and computer facilities for training and teaching purposes. A database of training or teaching materials is constructed and made accessible, usually interactively, to students. Computer Conferencing, Electronic Mail, Electronic Mailing lists and Electronic Bulletin Boards can be used as computerised mediators of this method. There are various advantages of this method. It can be accessed from a distance at any time by users of network facilities. Hence, the

method can encourage users to continue their education and training. Materials can readily be updated and made available to users. It is easy to inform old users of new materials by sending them electronic mail or electronic notices. There are, however, a number of disadvantages to this method. Online systems are sometimes not user-friendly, and may cause some difficulty for naive computer users, particularly in accessing or using the database. The network facilities are not always available to all students, and, currently, there may be some difficulties in demonstrating graphics via the network. Fodah (1990) suggests that faculty members in academic institutions all need to be introduced to such computer tools as word processing and database to make them computer literate. Since some academic staff in Saudi Arabian universities still have difficulties in using computers it will be difficult for them to use an on-line training package.

However, this method is probably the most appropriate for users who are familiar with computer facilities for the following reasons:-

- i) There is flexibility of accessing the training materials.
- ii) There is the possibility of contacting users by requiring them to register their names and addresses when they use the training package for the first time.
- iii) It is easy to contact old users and update them with the new facilities which are available on the network via their electronic mail addresses.
- iv) There is flexibility in updating the materials.
- v) It is easy to get quick feedback from users by providing them with electronic post facilities which enable them to send their messages to the course coordinator.
- vi) Romiszowski (1991) observes that facilities of this type are preferred by students.

Two interactive learning/teaching methods were used by Romiszowski, (1991), as indicated in Table 1. Both paradigms - one based on formal instruction and one on

informal conversation - used computer-mediated communication.

Table 3.1

A comparison of the Instructional and Conversational Paradigms

PARADIGM	INSTRUCTION	CONVERSATION
OBJECTIVES: (output) why?	specific pre-defined products standard	general negotiable processes variable
MESSAGES: (input) what? when? who? whom?	designed by instructor pre-prepared instructor one-to-many	created by participants on-line participants many-to-many
INTERACTION: process focus analysis feedback complexity	behaviours criterion-ref. corrective one-layer-thick	ideas content/structure constructive interwoven layers
DISTANCE EDUCATION (example)	CORRESPONDENCE COURSES	TELECONFERENCING VIDEOCONFERCING
	COMPUTER-MEDIATED COMMUNICATION	

The two teaching methods were used in different parts of the course, each aimed at achieving a specific objective of the course. From the final tests covering all courses, it was found that all the students got a similar view of the topics of the courses they

had discussed, and that they had a similar view about the relationships existing between the topics regardless of the teaching method used. However, students' preferences were 2:1 in favour of computer-based seminar discussion over face-to-face seminars. The results showed that use of the computer-based system during the semester increased the level of students' participation from a few short, superficial messages per student at the beginning of the class to much richer messages later on. It is important to note that the communication abilities of foreign students improved greatly and they demonstrated better discussion skills with online systems: so much so that they became indistinguishable from the American students. These results indicate that networking and electronic educational approaches could be used efficiently in academic institutions for training and teaching purposes.

Target background

One important aspect to be considered in the design of training packages is the background of the target audience. Hammond (1984), Rowntree (1990) and Dean (1992) all discuss how the characteristics of the learners can be helpful in deciding the style of training. Such factors as age, sex, experience and language can be useful as common points of reference in a learning package.

Age

The age of learners has been found to be a significant variable. Ramaiah (1993) found that students of different age groups varied significantly in the time they took to retrieve information from hypertext and menu-based interfaces. However, he emphasized that although the ability of students may vary with age, differences due to past experience were also likely to be important.

Sex

Sex differences have been investigated by several authors. Apple (1992); Beynon (1992); Grint (1992) and Ramaiah (1993) have all found that the performance of male and female participants is significantly different when using computer facilities. For example, Ramaiah (1993) found that in an experiment on the comparison between HyperCard and dBaseIII+ interfaces, male participants performed significantly better than female participants in the terms of time taken for answering a series of questions. Beynon (1992) emphasized that men tend to control the technology better than women. Apple (1992) remarked that gender differences are visible in terms of the greater proportion of boys learning about computers. At the same time, girls tend to be found in the introductory courses, not the advanced level ones. Grint (1992) has commented that networks involving male students appear to be more active than those with female students. Similar results were found by Askar (1992) in an experiment which investigated attitudes towards computer assisted learning and the perception of the CAI environment and the conventional classroom. But, in terms of actual scores, the differences between the sexes were not significant.

Computer experience

Over the last three decades there has been an increasing use of computers in teaching and training . Their use has varied from person to person depending on the amount and type of use. Studies conducted by Fenichel (1981), Borgman (1986) and Ramaiah (1993) show significant differences arising from the degree of experience with the system. For example, Fenichel (1981) found that novice users searched the ERIC database more slowly and made more errors than experienced searchers. At the same time, she found that searchers with extensive experience of both the system and the database achieved better results than searchers who had experience of the system, but not of the database.

Language

The language of training is another important factor which should be considered. It has been investigated in two ways. First, is the use of the learner's native language. This has been discussed by Burpee (1990), who investigated the use of Computer Assisted Learning (CAL) in schools in Canada. Canada has more than one native language. The author found that in order to give students and teachers in Canadian schools equal opportunity to use CAL the systems must involve all the languages used. Similar observations were made by Ramaiah (1993), who found that the English native speakers performed significantly better than the non-native speakers. Clearly, differences depend on the clarity of the language used (Shire, 1992; Shneiderman, 1992).

Grouping

Group learning techniques can be used in teaching and learning. The size of the group varies with the needs for the training: each particular situation has its own requirements and size of group. Percival (1988) has claimed that the size of a group should be not more than ten. Ramaiah (1993) has commented that 60% of the students preferred to work in pairs at a computer, rather than individually. Some students indicated that working in pairs allowed them to discuss problems when they got stuck. The other factor which should be considered in selecting groups is the participants' backgrounds. Ramaiah (1993) found that groups with similar backgrounds are more cohesive than those with different backgrounds: indeed, some students made the comment that they would like to be in a group with a similar background. Thus, it appears that, for training sessions, groups should contain about ten students and sub-groups can be formed of two students when using a computer for teaching or training.

Network training

There is evidence to show that advanced technology has helped train many people who were not able to continue with their education after school. One example is the Open University where students can communicate with their teachers using methods such as communication via computer networks. In seeking to use online teaching packages, three main design factors need to be considered - curriculum development, teacher training and resource organization and support. Networks are already in use for training from a distance and Rapaport (1991) identifies several methods which have been used, such as computer teleconferencing, electronic mail and electronic bulletin boards.

Two factors are found to have led to an increased use of electronic networking in education and training: educational need and economics. The educational factor is that networking can be used in distance education to enable more people who are not able to attend classes to continue their education by using network facilities. Network access facilitates discussion between teachers and students, as well as between the students themselves. The second factor is economic: organizations are increasingly using electronic communications for many of their operations, including education and training. They feel able to save money by providing staff training in their workplace using electronic telecommunications networks, instead of having staff trained outside, which is often costly. This not only saves the money for travel, etc., but, more importantly, employees can be trained while continuing to do their duties (Romiszowski, 1991).

It was noted earlier that there are several tools which can be used for online teaching and training. These include Electronic Mail, Electronic Mailing Lists, Computer Conferencing and Electronic Bulletin Boards. The advantages and disadvantages of

each of these tools are now discussed.

Electronic mail (E-mail)

Electronic mail has been defined as the transmission, storage and reception of letters, memos and other documents via computer. Electronic mail is typically a one way, one-to-one form of communication and the message travels in one direction from sender to one or multi-receivers.

Electronic mail has been used in education as a support tool. For example, a class teacher can communicate with his/her students by sending them some materials or receiving materials from them via the networks. Students can also communicate with each other. The disadvantage is that new users of electronic mail can only receive new messages which means that they will have missed all previous messages, and the sender must know the receiver's electronic address. This tool is not usually the most appropriate for training because:-

- i) It is difficult to identify the users who are in need of training.
- ii) Novice users are more likely to face difficulties in sending their questions to the coordinator or the person in charge of training.
- iii) Updating of materials can confuse some users because they need to add the new materials to the previous material and then reorganize them. However, E-mail can be used in a supportive way by administrators of the network to send messages to users (e.g., to inform them about any new changes in the network services).

Electronic Mailing List (EML)

The EML is a network service similar to electronic mail services for the transmission, storage and reception of letters, memos, etc., via a computer network.

The idea of EML is to enable people with the same interests to communicate and share ideas among themselves. For example, a group of people who are interested in using computers for training purposes can have their own EML, with its own electronic address to which participants must subscribe. Every one of the subscribers can send a message to all others. The disadvantages of EML are that anyone who wants to subscribe must know the address of the EML and new users can only get messages and information after they have made their subscription. As with E-mail, this is not the most appropriate tool for the purpose of the study because:-

- i) Users must know the address to which to subscribe, and this can be especially difficult for new users.
- ii) New users can only receive messages which come after their subscription: they therefore face problems in obtaining all the information about the training materials.
- iii) Individual users can receive many messages and questions from other users, which can sometimes cause confusion especially among new users of the network.
- iv) Updating of materials can sometimes be confusing, since users need to add new materials to the previous ones and then reorganize the materials again. At the same time, EML is a good tool for use among participants with the same interest. They can discuss problems faced during their use of the network, especially questions of access to similar databases or use of similar services.

Computer Conferencing (CC)

The basic idea of Computer Conferencing is that, instead of a face-to-face meeting in which only one person can talk at a time, but all must be present, it is possible for individuals to access a host computer and receive the conferences and messages at their own pace and at the place and time of their own choosing. Computer conferencing and electronic bulletin boards share the same basic technologies in terms

of computers, computer networks, storage facilities and input-output facilities. In both, the designer can create facilities which restrict or regulate the way the package is used. For example, in both systems the designer can limit the use of the package to certain people by using a pass-word.

Access to the systems can be defined at several levels. For example, in computer Conferencing participants can be divided into three or more levels. Thus the first level could be participants who can only read papers. The second level could be participants who can read the papers and write comments for other participants. The third level could read, write and coordinate participants' comments.

Computer conferencing has been used successfully for teaching and training. For example, Rapaport (1991) reports that the University of Michigan has used computer conferencing to extend classroom interaction in the medical ethics course beyond the space and the time of the class. Discussion via the system helped make students active thoughtful participants and also aided discussion. It is important to note that computer conferences provide users with extra facilities which enable many people to communicate with one another. However, there are some disadvantages of using CC in education and training. Problems can arise when too many messages are received by participants. For example, in a class of 40 students or more , a few may sometimes generate 20 to 30 messages a day. This endless stream can discourage others from participating, because so much time is wasted reading through the existing material. Even if each student sends only one to two messages a day, the average participant would read about 50 messages for every one he/she posts. This tool is not entirely appropriate for training people in the present case because:-

- i) GULFNET does not have this facility yet (Nawab, 1992).
- ii) CC facilities allow users extensive freedom to comment and make suggestions,

which might cause confusion to users. At the same time, CC can be used to discuss user needs for new services and their expectations of the network.

Electronic Bulletin Boards (EBB)

It has been recognized that there has been a dramatic increase in the use of EBBs during the past decade, especially in countries with more advanced technologies and low telecommunications costs. In countries like the USA and the countries of the European Community, use of bulletin boards now proliferate. Such services have been targeted at both professionals and the general public. Kearsley (1988) sees bulletin boards as providing the most flexible and quickest means of maintaining communication between people of common interests situated far apart. Some bulletin boards are meant to serve audiences with specific purposes. Four examples of EBBs are outlined below to show how EBBs can be used for different purposes.

The first example is at the University of Georgia, USA, which has operated a doctoral programme for health professionals at the College of Education on the campus at Armstrong State College in Savannah, Georgia, for some years. Fourteen doctoral students participated in the program using a bulletin board for their academic revision work. The bulletin board was introduced to the students after finishing the course and when they were waiting to sit for their written and oral exams. In short, the electronic bulletin board was introduced at a very stressful time for students. Half of the students used the bulletin board in the first quarter, though they were unfamiliar with the bulletin board and lacked knowledge of this new technology (Gardner, 1986).

The second example is the Reynolds High School bulletin board in Greenville, Pennsylvania, USA. This bulletin board was designed for the students, parents and

teachers in the schools. After the bulletin board had been used for some time and its benefits were obvious, the Director of the Computer Centre and the bulletin board applied for a grant to create a fairly sizeable computer laboratory to serve the whole community and schools in the rural district. The bulletin board serves four elementary schools, a Junior High and Reynolds High School. The bulletin board contained everything timetabled for the next week, such as lunch times, basketball schedules, examinations and school activities. A newsletter was produced to explain what the bulletin board system was about, and how it could be used after school hours (Low, 1986).

The next example is the electronic bulletin board for chemists the aim of which is to improve communication between organic chemists. It was developed jointly by the American Chemical Society's Division of Organic Chemistry, the Chemical Abstracts Service, and STN International. The services offered by this bulletin board were developed in response to input from users. It allows users to send messages either to individuals or groups, so that, for specific problems, a user can send his or her messages to an individual or a group with the same interest. There is also a sub-bulletin board available for the users sharing the same interest, so that they can hold their meetings or send messages to each other. The bulletin board can be used for various purposes:-

"The system incorporates several different but related functions. Electronic mail lets chemists avoid "telephone tag". A message can be sent to a single colleague, a group, or all users. Users are alerted if any mail is waiting when they connect to the bulletin board. On-line meetings allow collaborators to communicate without having to travel to a single location (Zurer, 1988, p. 32).

For example, the director of medicinal chemistry research at Du Pont Pharmaceutical runs his administrative activities over the bulletin board. All divisional executive committee meetings are conducted using electronic communication. Sub-bulletin boards, called 'conferences', can either be open to all users of the system or limited to those with an interest in a special topic. One such conference is called the "IBM and PC- compatible conference". Participants discuss and share software for computers that use the MS-DOS operating system. The system also serves as a true bulletin board, acting as a forum for the exchange of information of interest to chemists. One file lists job openings; another contains resumes of job candidates (Zurer, 1988).

The fourth example is the Space Environment Laboratory in Boulder, Colorado, which gathers information about conditions in the space environment near to our planet. In 1984 one scientist suggested making some of this information available to the public. So, scientists in the Space Environment Laboratory worked together to find out what kind of information would be valuable to the largest numbers of users. It was recommended that the most appropriate activity might be to provide data to radio amateurs via a bulletin board. As a result, a public bulletin board system came into operation in 1987. The information on high-frequency radio waves in space is updated regularly. Comments and queries from radio amateurs on the bulletin board have been strongly encouraged. The bulletin board is primarily concerned, however, with the central provision of information, rather than with interaction between users of its services (Rosenthal, 1989).

The above examples give some idea of how electronic bulletin boards can be used for different purposes, according to the users' and designers' objectives in establishing them. The training uses of these electronic bulletin boards suggest it is a tool that can:

- i. Make optimum use of available trained personnel to teach users or trainers.
- ii. Encourage information sharing among educators at different levels through the development and use of the electronic bulletin board.
- iii. Meet the needs of users or trainers of adult learners by providing opportunities for professional development.

In consequence, the approach via an EBB has been selected as the most appropriate one to train users of an academic network. It has been chosen for several reasons :-

- i) It has been used successfully for teaching and training (Kelly, 1987).
- ii) This service is available on GULFNET.
- iii) It is easy to update the materials and to inform all the users about it.
- iv) The post facility which is available on the EBBs enables the users to send their comments and suggestions to the coordinator of training, which helps in improving the training effectiveness.
- v) Appropriate BBs are available for use and study from both Saudi Arabia and the UK.

Human Computer Interface (HCI)

It is important for the designer of the training programme to consider the behaviour of the trainees. The other important factor is the learners' background, experiences and skills. There are likely to be individual differences in terms of training delivery. Thus, some users might like to have the training presented in detail and step by step while others might like to have a summary of the training first, then go through the items they think they need (Olfman, 1990). Effective on-line training requires good planning, implementation and evaluation of the training effectiveness.

Human computer interface design is an area of Human Computer Interaction. It is an interdisciplinary subject in which software engineers, hardware and software designers, systems analysts, programmers, psychologists, sociologists, ergonomists and end users all have a role. There is no one definition of interface design which can satisfy all the users, but the following seems generally useful:-

"A good interface is one which allows the {users} to accomplish their computer based task with a minimum of stress and a maximum of efficiency. Stress can be generated either by the difficulty which the {users} experience in accomplishing their task, the inability of the {users} to accomplish their task, or even the facility with which they make mistakes in the attempt (Hayes, 1989, p. 3).

The present study investigates the usability, organisation, presentation of text, navigation and user psychology of using EBBs. To achieve a good computer interface, two things should be considered in the design:

- i) There must be an understanding of what user behaviour can affect their interaction with the computer: of the users' requirements for using the computer; how it

should function; how it should respond to the users; and how it should present information.

- ii) The system forms another factor in this. It should be flexible, so as to allow it to be friendly for all types of users. A good interface design can save money and time, and increase productivity, while a bad interface can lead to user frustration and low productivity and can often cause stress (Sutcliffe, 1988).

Types of computer interface

Many types of interface to electronic databases now exist. Interfaces have been grouped into a small number of categories. Shneiderman (1991) has suggested a taxonomy which identifies five styles of interaction. This classification can be used as a convenient basis for considering and comparing the properties of different types of interface. Interfaces aimed at beginners in electronic information retrieval typically rely heavily on computer-initiated interaction with users. Each type of interface is good for particular purposes and for specific users. Sutcliffe (1988) Maguire (1990) and Shneiderman (1992) are among many authors who have carried out research on this topic.

Question and answer

This type of interface poses a sequence of questions followed by human responses. It is suitable for naive and novice users. The question and answer dialogues are easy to use and learn because they give the user a list of valid responses. Usually the user answers by 'Yes' or 'No' to the system question. For example, a bank using this type of interface will ask the user if he/she wants to have specific services which are listed on the screen. When the user finishes his/her inquiry from that service, then the system will ask 'Do you want another service?'. The user should answer 'Yes' or 'No'.

This type of system is easy to program in that the programmer can give simple condition statements, or make construct a small look-up table. The advantages of using this system are that it is easy to learn, easy to use, and easy to program. The disadvantages are that the system is unsophisticated and slow to use.

Menus

A menu interface is a simple dialogue suitable for experienced and novice users. The philosophy of this type is that all the available choices are displayed and the users can select one choice by either a single letter or number. The number of choices displayed are limited on each screen, often to less than ten choices. These types of menus are organised in hierarchical sequence to provide users with logical access.

A menu organisation is easy to use, especially by novice users, but it is slow when the system is large. For example, a travel agent who has a database with such a menu interface, in order to satisfy the needs of a customer who wants to have information about the hotels in Bloomington, Indiana, USA, would have to perform as follows. First, the agent selects Accommodation from the main menu which might include, Airlines, Transportation, Accommodation, etc. Second, the agent selects Hotels from the second screen, which might include Hotels, Flats, Houses, etc. Third, he selects the continent; fourth, the country fifth, the state. Sixth, he selects the city and finds suitable hotels for the customer. By looking at this sequence it can be seen that it takes a long time to reach the specific information. The advantages of using such a system are that it is easy to use, easy to learn and easy to program, while the disadvantage is that it is slow for experienced users.

Form filling

This type of interface is suitable for all user types. It is mostly used for data entry, retrieval and editing, for example, by big stores. The screen display is similar to paper-based forms and the user only needs to fill in the fields - Name, Position, Customer code, etc. The advantages of this type are that it is easy to use, easy to learn, and quick to use. The disadvantages are that it has an unsophisticated interface and is primarily suitable for data entry.

Command language

This type of interface is suitable for expert users who can handle complicated command interfaces. It is very economical in use of screen space and in data transmission. The system command invokes the operation which the user requires; when the operation is complete and the information displayed, the command prompt appears again. The advantages of this type are that it is quick to use; it is a sophisticated system and extensible. The disadvantages are that it is difficult to learn, difficult to program and difficult for naive users to use.

Natural language

Natural language is the ideal human computer interface. It is suitable for novice and naive users. In this type of interface, commands may be input directly by speech or by keyword. Unfortunately, current recognition of phrases and words is limited. The advantages of this type of interface are that it is a natural form of communication and no learning is required. The disadvantages are that it is difficult to program, needs a knowledge base relating to the data items, and is restricted linguistically, and can sometimes be ambiguous.

Direct manipulation

Direct manipulation is an interface style in which the user can point at a visual representation of the task, manipulate it and immediately observe the result. It is suitable for all types of users. This type could be divided into two sub-types. First, is the one which is essentially WYSIWYG - 'What You See Is What You Get'. This type allows for editing of the document and enables users to point to the text or graphic and insert, delete or move marked text or graphics.

The second type is similar to the Macintosh and Windows approach. It is often referred to as WIMPS, which stands for Windows, Icons, Mouse and Pull-down menus. The user can access a document by pulling down from the header bar, then clicking the proper position which corresponds to the desired command action. The advantages of this type are that it is easy to learn, and more direct to target. The disadvantage is that it is slow for experienced typists.

The above two types seem to be similar, but there are some differences. First, users of WYSIWYG see exactly the text or the graphic, then, when they click the icon, the system displays what has been seen before as a preview of text when it is printed out.

Users get the same format, size, etc. as shown in the preview. WIMPS does not work exactly like that. For example, when the user wants to use a word processor, he needs to click on the word processor icon, then select the function, such as the type of font, appearance and size. Sometimes, the user of WIMPS can be misled and get lost because of the visual appearance of the icon. Shneiderman (1992) has remarked that the visual representation may be misleading. Users may understand the similarity in representation of the picture, but then draw incorrect conclusions about acceptable action.

Icons

This type of interface is similar to WIMPS as a direct manipulation interface. An icon is a pictorial representation of an object, such as office tools or storage locations, or of actions. Dean (1992) observes that their important mnemonic qualities are meant to jog the user's memory in the selection of commands and navigation.

The designs of computer interfaces are increasingly incorporating images as well as text. Images can function as symbols, pictures and signs. The advantages of icons are that they are very easy to learn, easy to use, language independent and easy to program. The disadvantages are that they are not economic in space, need some text for identification, require graphics hardware, and need icon builder software. Icons are used to represent functions on a menu-like display. It is a very effective technique to be used in learning. Realistic icons will reduce the time of learning: their manipulation is also easy for both experienced and non-experienced users (Sutcliffe, 1988).

Usability of icons

The usability of icons depends on several factors (Maguire, 1989; Shneiderman, 1992). These are:-

i) Familiarity, which means that the icon should be easily identifiable by users.

Familiarity with the icon and its objectives helps to reduce learning time.

ii) Directness of the intended links is a factor that affects the design of icons and how well they convey their intended meaning. For concrete objects and actions, the designer can use direct, simple and clear icons.

iii) Context is another important factor which can change the meaning of the icons.

For example, when there is a sign of an animal on a main road it could mean either you are passing a farm, or you should be careful that animals might cross the road.

iv) Complexity is another important factor in the usability of icons. The more abstract or complex the icons, the more difficult it is to interpret what they mean.

v) Expectations are a vital factor in icon design. The icons used should be ones that might be expected by the users of the system.

vi) The icons chosen must be visually distinguishable from other icons.

Icons as an international language

Icons can be used as a common and easy language for different users of the system. One symbol should represent one word in natural language. Icons can, in principle, be used as writing tools for communication between nations. Two things should be considered for generating the vocabulary of an international picture language. First, reduction in the number of icons for determining individual signs, second, consistency in the grouping of signs (Beardon, 1993).

HCI design factors

Several factors which need to be considered in human computer interface design:- (1) User psychology, (2) Usability of the system, (3) Organisation of the system, (4) Presentation of information, (5) Task and performance.

User psychology

It is generally understood in the psychology of learning that learning styles are different from one person to another. Each student must therefore be taught using specific methods. Foley (1990) stated that research by psychologists on different strategies in the information process emphasises two factors, perception and cognition. Perception is considered as the process of receiving information, while cognition is a mental activity, involving problem-solving, thinking and learning. Learning styles are an important consideration for interface designers. The concept of learning style, as defined by Daon (1985), refers to the pattern of processing activities which the individual typically engages in during learning. One expects stable individual differences between different learning styles.

Consistency of system commands is very important for users because it helps them to memorize the commands and to use the system easily. Similar items are better grouped in categories in order to help the user to find the information he needs without any difficulty. A system may be easy to use and learn, but if it does not do what the user wants it will be useless. Designers have to provide users with what they require in order to fulfil their objectives. In other words, user requirements must be matched to the facilities provided in the system. Task fit thus relates to the mental models representing the user's expectation of reality, on the one hand, and what he/she gets, on the other.

Usability of the system

To achieve usability, two things must be considered in designing an HCI: one is user requirements and the other is the reason for designing the system. It seems that the issue of usability is becoming more important as greater numbers of competing systems are made available to a wide range of people, especially first-time (naive)

users.

Several aspects of usability have been considered by computer scientists. Some consider the end user to be the main factor in determining the usability of the system, while others take account of additional participants, such as systems engineers, programmers, installation engineers and the people who advise the users on how to use the system efficiently. The system interface, presentation of information, etc, are all factors which affect the total usability of the system. Booth (1989) stresses the importance of collective responsibility among specialists responsible for the product, and that their most important aim should be to produce a product which the user can handle with ease. From the user's point of view, three things appear to be crucial in evaluating a system - the time spent on a task, the percentage of tasks completed and the system's friendliness (Booth, 1989).

Organisation of the system

Several studies, eg. Galitz (1989), Shneiderman (1992) and Shires (1992), have discussed the general principles of HCI construction. Commands are an important factor in screen display: it is clear that distinct and dissimilar commands must be used. Consistency is important in selecting command abbreviations, and commands that clearly and concisely describe the operations should be used (Crawford, 1987; Shires, 1992).

It has been suggested by the authors cited above that the starting point for English Language communications should be in the obvious upper-left corner of the screen. It follows that, in the Arabic Language, it should be in the upper-right corner of the screen. The instructions should be at the bottom of the screen and should be separated from the text. It should be clear, and users should be able to return to it from any

point of the system. The menu should be differentiated from the other screens and should be consistent and logical in ordering options.

Navigation

Two types can be distinguished here - sequential and non-sequential.

Sequential and Non-sequential organisation

Menu-based and Hypertext represent the two types of system. Franklin (1989) has made a comparison of hypertext as an Associative Information Management System (AIMS) and a Database Management System (DBMS), as shown in Table 2.2 below.

Table 2.2
A comparison of AIMS and DBMS software

System function	AIMS	DBMS
Information Structure	Content-Driven	Imposed
Basic Unit	Node	Field
Connections	Link	Relations
Information Focus	Divergent	Convergent
Retrieval Method	Browsing	Sorting
Design Philosophy	Open	Closed
User-Data Relationship	Interdependent	Independent

The differences between these interfaces correspond to two differing interaction styles (Shneiderman, 1991). DBMS come within his 'menu selection group', whilst the AIMS system is classified under his 'direct manipulation'. The two

styles differ in their advantages and disadvantages, as indicated below in Table 2.3.

Table 2.3

Advantages/disadvantages of different interaction styles

Style	Advantages	Disadvantages
Menu selection	Little training required	Access via a sequence of menus may be irritating
	Easy structure for decision-making	Lack of flexibility
Direct Manipulation	Easy to remember	May be cumbersome to initiate action
	High subjective satisfaction rating	Navigation may be difficult

As these two tables show, Franklin (1989) and Shneiderman (1991) essentially agree about systems facilities. Franklin represented the differing features of AIMS and DBMS. These features can be considered as advantages or disadvantages of the systems according to Shneiderman (1991), depending on the circumstances. The AIMS Information structure is content-driven which can be an advantage for experienced users and a disadvantage for novice users. At the same time, the Information structure of the DBMS is imposed, which can be an advantage for novice users, but a disadvantage for experienced users.

Error message

An error message has been defined by Pfaffenberger (1987) as a message displayed on the screen telling the user that a mistake has occurred and that the computer is not

able to carry out an operation.

Several studies, e.g. Bailey (1983), Pfaffenberger (1987), Galitz (1989) and Powell (1990), have indicated that error handling routines must help users to be safe rather than sorry. Novices need specific messages to help them understand their mistake and how to correct it. An error message must be in a consistent, eye-catching position on the screen, and should fully explain what the user needs to do, as well as provide the correct input. For users to correct errors efficiently, system designers must provide three things - error messages, error correction strategies and error re-entry procedures. It can be concluded that error messages must be clear, simple, able to attract the user's attention, and should be located outside the central part of the screen. They must also use contrasting display features, special symbols and consistent locations.

Presentation of information

Considerable research has been done, for instance by Rehe (1974) and Bouma (1980), into text presentation in hard copy. However, less research has been done about text presentation on the computer screen. There is some disagreement, for example, on the amount of information to be included on each screen (Shires, 1992), though the amount of information on a screen is one of the most important factors of screen design. Guidelines given by several authors specify that the total amount of information should not exceed a maximum of 60% of the space on the screen. Several authors have taken this idea a step further and specified a percentage screen density. For example, Danchak (1976) recommends 25% of the active screen area should be used, Tullis (1988) reports that NASA stated the density should not exceed 60% of a screen; Crawford (1987) notes that a medium length display of information on screen commonly takes up 22-30 percent of the screen; Galtiz (1989) suggests 30%

of screen at most should be used. Consequently, the recommended amount of information ranges from 22% to 60% of the screen. This disagreement gives room for the designer to provide varying amounts of information within this range, based on the needs of users and flexibility of the system.

Screen format

Screen format is an important factor in HCI. However, there is no standard form of text presentation on a screen which can be said to be the right one. Several studies, eg. Galtz (1989), Shneiderman (1992) and Shires (1992), note that more investigation in this field is needed.

Letter case is one aspect which has been discussed in many studies. Guidelines in most texts recommend using both upper and lower case for presentation of most textual material. Most guidelines recommend using upper case letters for items that need to attract attention (Tullis, 1988). It is estimated that normal upper and lower case text is read about 13% faster than text all in upper case (Poulton, 1986).

Justification and spacing between words is the another significant aspect of text presentation. Most studies recommend left justification, whilst the right margins can be ragged. The reason is that, when a text is justified on both sides, it may cause inconsistent spacing between the words. A study by Tullis (1988) found that justified text took about 11% longer to read than unjustified text.

The general conclusion from the available literature is that the display on a screen should use between 30% to 60% percent of the screen area. Standard alphabetic characters with upper and lower case letters should be used. Text should be centred on the screen and left margins justified while leaving the right margins ragged.

Double space text and use of blank lines between paragraphs and sections are recommended.

Task and performance

Task and performance have strong correlations in that one effects the other. A task can be affected by two things. First is the design of the system and how easy it is to use and how fast it is to execute the commands. Experience in using computers and the system can effect the performance of the users. The system should be user-friendly, especially for novice users, and should respond quickly to the users' action. The response time was defined by Shneiderman (1992) as the number of seconds it takes from the moment users initiate an activity until the computer begins to present results on the display or printer. Another factor which might affect task performance is the enquiry itself. Some enquiries are complex and take a long time to think about and to decide on the method which can be used to find the answers. This also depends on the users' experience of the system. Enquiries which are simple and straightforward require less time to think about. This aspect has been discussed by Card (1990) and Shneiderman (1992) who say that a unit task has two stages. First comes the acquisition of the task, which is the time taken by the user to build up a mental presentation of the task. The acquisition of the task depends on the characteristics of the task and the knowledge users have of the system and the subject. Second, there is the execution time which the system needs to operate on the enquiries. Both authors presented the formula:-

$$"T_{task} = T_{acquire} + T_{execute}"$$

There is no fixed time for the task. Only the users' expectations determine whether the system is fast or not. Shneiderman (1992) specified three things that affect this

perception. First, there are people's expectations based on their past experience of the time required to complete a given task. Second, there is the individual's degree of tolerance for delays. For example, a novice computer user may be willing to wait much longer than an experienced user. Third is whether people are adaptable. Although they may be able to accommodate long or variable delays, these may affect their performance and satisfaction.

It can be concluded that there is a strong correlation between the performance of a task and the user's background, especially the level of experience in using the system. It is evident that experienced users can complete a task in a shorter time and with fewer errors than novice computer users. Fenichel (1981) found that users with experience in using a system and a database performed better than users who only had experience with the system, and not with the database.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter deals with the overall methodology applied in this study. Different methods were used for each of the following six experiments:-

- i) The initial study which was an evaluation of the students' perceptions of using four EBBs.

- ii) BUBL-92: an experiment evaluating the Bulletin Board for Libraries (BUBL) with emphasis on the practical exercise for librarians on how to use JANET services.

- iii) BUBL-93 and INFOSLUG: an experiment evaluating BUBL after making modifications in the light of the BUBL-92 results. At the same time, the BUBL-93 system was compared with a Gopher bulletin board, represented by InfoSlug.

- vi) dBase III+ and HyperCard: an experiment investigating the differences between two interfaces: (1) Menu-based, (2) Hypertext.

- v) Icons: an experiment investigating the possibility of using icons instead of numbers and or letters.

- iv) GULFNET : an experiment (1) dealing with GULFNET user needs, (2) providing evidence that electronic communication between GULFNET and other international academic networks can be exploited.

These experiments involved the use of Electronic Bulletin Boards (EBBs) for training and teaching purposes. The first five experiments were designed to examine one basic problem from different angles. The sixth experiment was designed to investigate the possibility of using an EBB to train GULFNET users in how to use network facilities.

Several EBBs were examined - BUBL, HUMBUL, NISS, SBB and INFOSLUG - which are discussed below. The aim was to compare these EBBs on the basis of students' perceptions. BUBL, HUMBUL and NISS use 'USERBUL' software; SBB uses a simple program produced in house using Unix script software; INFOSLUG uses Gopher software.

HUMBUL

The Humanities On-line Bulletin Board (HUMBUL) began as a research project in 1985 at the Office for Humanities Communication (OHC) at Leicester University. HUMBUL services were aimed at the Arts and Humanities community in universities. HUMBUL is now hosted by Oxford University and is administered by the CTI Centre for Textual Studies and the Office for Humanities Communication. HUMBUL was made available to all humanities researchers in the UK, but it has regular overseas users (Booth, 1987). It provides users with several services, such as News, Diary and Conferences, British Library News, Grants Awards, Major Projects, Ongoing Research, Completed Research, Software and Networked Information. Each section of these services contains sub-sections which give more detail. HUMBUL includes a registration file and a usage file which notes the sections viewed by each user.

BUBL

BUBL is aimed specifically at University Library and Information Professionals. It is one of the major Bulletin Board services on JANET. BUBL in its initial phase has used the USERBUL software produced by Leicester University for HUMBUL. The system allows the users to move easily between the BUBL files. It has a hierarchical structure with flexible facilities which allow the users to move from section to section by typing the number of the section they want to access. Users can go back to the Main menu from any screen by typing M.

BUBL provides users with a variety of services and information, such as information about JANET itself, information about other networks, information about major JANET organisations (such as NISS, 'National Information on Software and Services'), Network terminology, Directory of OPACs, Lists of Campus Wide Information Services, List of electronic journals and news letters, How to use JANET, and others.

BUBL allows other organisations to take responsibility for a section of the Bulletin Board. BAILER is the British Association for Information and Library Education and Research and has a section on BUBL which facilitates a link between UK LIS departments. CTILIS (the Computers in Teaching Initiative for Library and Information Studies) runs section Z, and has provided advice on the training exercises in section K.

Section K 'Practical Exercise'

Section K is a training section offered by BUBL to train librarians and the information specialists in how to use JANET services. It is about 21 pages in length and is divided into three levels of training: Basic, Intermediate and Advanced. Each

level of training provides the users with skills in how to use certain services on JANET. This section was evaluated during the experiment on BUBL-92; subsequently alterations were applied to BUBL, in general, and section K specifically. The section was evaluated again during the experiment on BUBL-93 and the INFOSLUG experiment. Details of the section are given in Appendices II and III.

INFOSLUG

INFOSLUG is a joint product of Communication and Technology Services and the Library of the University of California (UC, Santa Cruz). INFOSLUG was established to provide users with instant access to networked information of interest to the UC community. Campus departments, which provide the system with data, are responsible for the content and currency of the information. In addition, some resources found on the system actually reside on other host computers around the Internet.

INFOSLUG uses Gopher software which provides users with access to both local documents and campus information services in other campuses. Menu items on INFOSLUG have visual codes to help users identify what kind of information sources they are. These codes appear at the end of each menu item. For example, the code of '.' means the named document can be displayed on the screen, '/' that a sub-menu of topics related to this item will be displayed, '<?>' that this choice will allow users to search that database, '<TEL>' will initiate a Telnet session to the indicated source, and '<CSO>' gives a connection to a database for users to search.

Overall, INFOSLUG offers several services to users, such as general information about the contents, use of INFOSLUG and the Gopher software, the academic division and board of studies at UC, lists of electronic journals, books, reference

sources, etc. INFOSLUG is hosted on a computer located in the western part of the USA, which has a time difference of eight hours from the UK. Because of this time difference, classes in the UK can access the system easily during the morning session.

NISS

The National Information on Software and Services (NISS) bulletin board was established to guide the higher education community to relevant computer-related information. It operates from Bath University. The information held on NISSBB covers many aspects of Information Technology and its applications, and academic disciplines from accounting to social studies. It gives details of meetings and conferences, on-line services, network facilities, computers in teaching, and information about the latest software available to the higher education communities. These services are available to anyone who can gain access to JANET.

SBB

The Students' Bulletin Board (SBB) was created as a result of increasing use by students at Loughborough University of Technology of existing bulletin boards and a perception of the benefits the students would gain by having their own campus BB. The Department of Information and Library Studies, Loughborough University of Technology, therefore suggested in 1990 that a bulletin board should be set-up by the students for their own use.

The factors that might affect the results of the experiments

It was expected that the background of the students would provide the independent variables. The interface characteristics such as performance, task, navigation and information retrieval variables would constitute the dependent variables.

The variables which affected the results of the experiments have been listed and classified into a number of groups as shown in Table 3.1 below.

Table 3.1

Students	Performance	Task	Navigation	Interface
Age	Speed of info. retrieval	Simple enquiries	Sequential	Ease of use
Sex	No. of correct answers	Complex enquiries	Non-sequential	User-friendliness
Course	No. of incorrect answers	Designing tasks		Error response
Group	No. of questions attempted			Easy to learn
Sub-group				Easy to understand
Subject background	No. of questions not attempted			Presentation of information
General computer experience				

Student variables

The variables used were age, sex, class, group within the class, subject background and general computer experience.

(i) Age

There was a considerable range of ages amongst the students involved in these experiments, ranging from 19 to 47 years. For the purposes of analysis, the students were grouped in age categories on the basis of five-year differences, though in some experiments the students were grouped into two age categories only. The students aged up to 25 years were then grouped as one category and those above 25 years as the other.

(ii) Sex

The aim was to observe gender differences. It has been reported elsewhere that there are differences between the sexes in the performance of tasks relating to computer use.

(iii) Course of study

The composition of courses taken by the students was diverse: they included (a) first-year Information and Computing Studies (ICS) students; (b) second-year ICS students; (c) second-year Library and Information Studies (LIS) students; (d) Postgraduate taught course students; and (e) research students. It was assumed that the students' course backgrounds would affect a number of important parameters, such as their knowledge of computers.

(iv) Group

For the purpose of this study, students were allocated to different groups. These groups contained between 8 and 12 students according to their subject, experience and computer background. These groups were further divided into sub-groups, typically of two students at each terminal. This arrangement was based on discussion of grouping in chapter two.

(v) Sub-groups

Each sub-group had 1-3 students, depending upon the availability of the terminals for each experiment. Sub-groups were constructed according to similarities of subjects and general computer background of the students concerned.

(vi) Subject background

This relates to the subjects which students had read, or were studying in their courses. Students were classified into two categories according to their subject background: i) Information and Computing Studies and ii) Information and Library Studies.

(vi) Computer experience

It was obvious that the students would have varying levels of computer experience, which could affect their performance in the experiment. They were therefore split into three groups:-

(a) students without computer experience; (b) students with two or less years of computer experience; and (c) students with longer experience. The last group (c) contained students with up to ten years experience.

(viii) Overseas students

Overseas students participated in this study. As noted in chapter two, differences have been found according to language background. It therefore seemed necessary to investigate whether there is any difference between the performance of Home students and Overseas students.

Interface variables

For on-line instructional material, the following variables were considered relevant (as presented in chapter two) :-

(i) Ease of use

This meant looking at how easy the interface was for different groups of users, bearing in mind the users' backgrounds and training. This is typically a relative assessment based on a comparison with prior user experience.

(ii) User-friendliness

There was a need to establish how a user with minimal or no previous experience would cope with the system. It was assumed that naive users with little knowledge of computing would be able to work more easily with a user-friendly system. A comparison between a novice and an experienced user's performance and their evaluation of the systems would help pinpoint any significant differences between the performance of the two groups.

(iii) Ease of learning

This looked at how easily use of the system could be learnt, especially the commands and functions. This variable again depended on a comparison of the responses of novice computer users and experienced users.

(iv) Presentation

This was meant to see how well information was presented, in terms of structure and layout on the screen.

(v) Error system response

This related to finding out the system responses when errors were committed during an interaction.

System variables

The variables that were considered appropriate for the study (as discussed in chapter two) were as follows:-

(i) Speed of information retrieval

This related to how quickly information could be retrieved from a BB system. It could be gauged from students' ability to answer certain questions in a given time. Naturally, their achievement depended on the user's knowledge of the system, the different level of the users' experience in using the system, and the type of software used in the systems.

(ii) Number of correct answers

The number of questions answered correctly can indicate two things. First, the nature of enquiries, whether they are simple or complex. Second, how easy it is to use the system, especially for novice computer users.

(iii) Number of incorrect answers

The number of questions that are incorrectly answered can give some indication of the nature of the enquiries and the structure of the system. A well structured system

is expected to lead users readily to the information they need.

(iv) Unattempted questions

The number of questions that were not attempted by the students was also counted in order to establish whether there was a link with time limitation or complexity of the questions.

Task variables

The task variables were based on the type or nature of problems encountered when carrying out a series of tasks (as discussed in chapter two) :-

(i) Simple enquiries

Students were asked to find factual, unambiguous information from the EBBs.

(ii) Complex enquiries

Students were required to think about the complexity of the task and to make their own judgment in finding the answers. Consequently, the answers might differ from person to person.

(iii) Navigational tasks

It has been noted, users can navigate through a BB system in two main ways, sequentially or non-sequentially.

1) Sequential. This is the case where preference is for fixed links, which facilitate viewing of the next screen or a return to the previous screen, as in the dBase III+ system.

2) Non-sequential. Here the users can access the information through hypertext links and can reach it from a variety of directions.

The Initial study methodology

This study was carried out to find the problems users are likely to experience using these BBs. The experiment was carried out over six weeks during January and February 1991. Three groups of students in the Department of Information and Library Studies (DILS) of Loughborough University of Technology (LUT) were used as subjects for evaluating the practical use of four BBs:

- a. Humanities On-line Bulletin Board (HUMBUL).
- b. Bulletin Board for Librarians (BUBL).
- c. National Information on Software and Services Bulletin Board (NISSBB).
- d. Students Bulletin Board (SBB in the DILS of LUT).

Procedures

The students were asked to participate in evaluating the four EBBs as part of their practised work. Students were expected to spend an average of two hours per week on the project. This time was partly supervised, and partly unsupervised. During the practical sessions, students were asked to comment on the aspects of the operation which they perceived to be encouraging or discouraging them from using the bulletin boards. The results of the study were used as an initial guide to students' responses to bulletin boards.

These BBs were selected for this study for several reasons.

- i) All the four BBs are available and accessible to students in the DILS at LUT.

- ii) The aims of each of the four BBs is to serve specific groups and all of these BBs contained information of interest to the students.
- iii) Each BB provided different services, which exposed the students to differences between BBs as well as differences in their use.
- iv) Three of the bulletin boards are available on JANET, the UK academic network, and JANET is similar in terms of operation to GULFNET.

In order not to bias their opinions, students involved in the experiment were not given any prior guidelines or instructions concerning the four EBBs they were to evaluate.

These three groups of participants comprised the following:-

- i) Thirty-six second-year undergraduates taking single or joint honours degrees in the department.
- ii) Six second-year undergraduates taking a BSc honours degree in information and computing studies.
- iii) Five postgraduate students taking an MSc degree in information studies.

Most (70%) of the sample was made up of undergraduate students aged 19-22 years. The remaining undergraduates and the postgraduate students were between 25 and 50 years old. All students had some previous experience in using computers. However, none had any experience of using EBBs. The students were divided into two large groups. Each group consisted of about twenty students, and was based on their backgrounds. Each of these initial two groups was further divided into sub-groups of 2 - 4 students.

The students were asked to discuss the characteristics of each bulletin board, and submit reports on what they had observed concerning the BB's functions and

facilities. The students were also asked to compare the four bulletin boards: HUMBUL, BUBL, NISS and SBB. Finally, they were asked whether further information needed to be added to NISSBB and the SBB (See Appendix I). The students then submitted reports comparing the general characteristics of HUMBUL, BUBL, NISS and SBB, and enumerating the main problems which they found when inputting materials to, or receiving information from, the bulletin boards.

BUBL-92 methodology

This study was carried out over seven weeks during January and February 1992. The design of this study was based on the results of the Initial study. The main objectives in carrying out this work were:-

- 1) To examine how students could do best handle bulletin boards.
- 2) To evaluate the Practical Exercise on BUBL.

This section was evaluated for two reasons:-

- i) To find out whether changes are needed to improve access.
- ii) To assess the utility of the exercise itself.

Forty-one students participated in the exercise. They were divided into four main groups A, B, C, D. Each group was selected primarily on the basis of the students' levels of knowledge and experience with computer facilities. All had some experience in using computers, word processing and electronic mail. This time, half of them had used EBBs before, mainly HUMBUL, BUBL and NISS. Most of the students (76%) were aged under 25 years old

Each group attended four sessions during the experiment. The first session was

attended by all the groups together. In this, they were given a general introduction to the bulletin boards, including NISSBB, HUMBUL, SBB and BUBL. Students were told how to access the bulletin boards and the purposes for which they had been established. At the end of the session, the students were able to recognize the differences between these bulletin boards.

In the second session, the students worked in pairs at a terminal. They accessed NISS, HUMBUL, and SBB bulletin boards, and were asked to answer several questions (See appendix II) to ensure that they understood the differences between these bulletin boards. Their answers to the questions were sent by electronic mail to the class coordinator.

In the third and fourth sessions, the students were divided into four groups so that each student had the chance to use a terminal alone during the exercise. This was done in order to ensure that every student could make individual comments and respond to the questionnaires.

In the third session, the students were given a detailed explanation of BUBL and were asked to move around the sections of the bulletin board in order to familiarise them with it, and especially with the Practical Exercise on BUBL. The students were asked to complete an evaluation form for the Practical Exercise (See appendix II).

In the fourth and final session, the students were handed written instructions on how to down-load materials from the bulletin boards. The instructions also told them how to send materials via electronic mail. The evaluation form for the Practical Exercise (training section) was up-loaded to the SBB, then the students down-loaded it onto a floppy diskette. They wrote their comments and suggestions about the training section

of the BUBL bulletin board and then they sent them to the class coordinator via electronic mail.

A final questionnaire was distributed to the students at the last session in which they were asked to write down the difficulties they had experienced during all the stages of the experiment. Each student was also asked to submit a final report on the bulletin boards, in general, and the training section of the BUBL bulletin board in particular.

BUBL-93 and INFOSLUG methodology

On the basis of the results from the BUBL-92 experiment, this study was carried out over six weeks during January and February 1993. The aims of this study were:

1. To compare BUBL-93 with BUBL-92 and to determine students' responses to BUBL-93 in the light of the changes that had been made on the basis of the results from the BUBL-92 study.
2. To compare BUBL with INFOSLUG to determine any differences between them, especially as it related to their use of different software.

The subjects of the study

The study sample consisted of fifty-four students. All were second year students of the Department of Information and Library Studies at Loughborough University of Technology. Thirty-four of the students were majoring in Information and Library studies while twenty students were majoring in Information and Computing Studies. Most of the students (88%) were aged under 25 years and all had some experience of using computers before. Most of them (95%) had used electronic mail before.

Difficulties during the experiment

The students encountered some problems during the experiment, all of them during the sessions on INFOSLUG.

- 1) INFOSLUG sometimes became disconnected and the students were required to reconnect in order to continue. This confused some students and wasted their time.
- 2) At other times, the connection to INFOSLUG proved to be unavailable because of a shortage of connection lines.
- 3) Even when connected to INFOSLUG, the system responses often took a long time.

Experiment environment

A computer laboratory in the Department of Information and Library Studies was reserved for the experimental sessions. Twelve PCs were available in the laboratory, all connectable to the network.

The experiment

The students in this study were divided into three groups according to their interest, background and experience of using the computer.

Each group attended three sessions during the experiment.

- 1) In the first session, all the students attended together and were introduced to the bulletin boards. The students were also told of the reasons for using and evaluating BUBL and INFOSLUG. A background questionnaire was distributed to the students during this session.
- 2) Each group of students attended the following two sessions separately. In the second session, the students were asked to access BUBL and to answer some questions from BUBL, which enabled them to familiarize themselves with the

system. At the end of that session, the students were given an evaluation form to write down their comments on the system. The students were specifically asked to go through the training section of BUBL and to write down their comments on this section. (See appendix III for more details of the questions, evaluation form and the training section).

3) The second session was concerned with INFOSLUG. The students were instructed in how to access the system. They were then asked to answer some questions which required them to explore the facilities of INFOSLUG. At the end of the session, an evaluation form was distributed to the students to complete and to add their comments on the INFOSLUG facilities (See appendix III).

dBase III+ and HyperCard methodology

This study was carried out during the first half of 1991. It was concerned with evaluating comparatively the usability of a menu-based interface (dBase III+ system) and a hypertext interface (HyperCard). This experiment was carried out with a colleague, Mr Ramaiah, who designed the HyperCard system, while the author of the present thesis designed the dBase III+ system. The evaluation of the two styles of interface was based on the previous definition of 'usability'. The specific set of users comprised student volunteers from the Department of Information and Library Studies at Loughborough University of Technology. A PC and a Macintosh microcomputer were used in a laboratory in the department set aside for the purpose. The students were asked to retrieve a series of items from a common database using the two interfaces. The items allowed examination of two aspects of usability - performance and user rating - and was particularly concerned with speed of information retrieval.

dBase III+

dBase III+ is a microcomputer-based database management system with a built-in programming language, query language, report generator and editor. It runs mainly on the IBM PC and clones under the MSDOS industry standard operating system. dBase III+ is a database language and is unsuited to symbolic, numerical or graphical applications; it is very useful for user interface construction. A variety of different computer interface styles can be implemented in dBase III+.

HyperCard

Hypercard is a Hypertext system. It is one of the educational systems which include both text and graphics at the same time, and allows users of the system to design their own packages. These facilities, and the flexibility of linking the documents together as the user needs, have encouraged the use of HyperCard. Kesselman (1988) said that HyperCard lends itself to instructional purposes as it is a database management package with many options for linking and searching for information. Although programming with HyperCard is quick and easy, one of the biggest advantages of HyperCard is that it allows students to make their way through the program on their own at a level comfortable for them, and in any order they choose. If the users get lost in a program, they can either click on the home button or use the 'go home' command to get back to HyperCard's home card. The 'find' command allows one to search for a particular text string in the stack's text fields.

The evaluation of the two interfaces will concentrate on three factors - ease of use; effectiveness of use in terms of time, errors, learning, etc.; success in completing the tasks.

Procedures

The database used in this study was a catalogue of teaching software prepared by the Computers in Teaching Initiative Centre for Library and Information Studies (CTILIS), which is situated in the Department of Information and Library Studies at Loughborough University of Technology. The CTILIS catalogue consists of four sections:

- i) An introduction to the Software Catalogue. This entry provides an introduction to CTI, the CTI centre for LIS, its objectives, functions, who are the people concerned, its services, etc.
- ii) A list of CTI centres, which covers all the CTI centre addresses and contact persons at the CTI centres in various disciplines.
- iii) A list of LIS Departments, giving all the LIS Departments and schools in the UK.
- iv) A list of the CTI Software. This entry is the main one and covers all the basic information about the software (such as the name of the software, designer, price, hardware required, availability, supplier and teaching uses). The records can be accessed via the above basic entries.

It is a small catalogue (containing 40 entries), but each entry can be retrieved under a range of headings. Altogether there are eleven aspects of each software entry in terms of which retrieval might be necessary (who uses the software for teaching, what sort of teaching is involved, how much does the software cost, what hardware equipment is required to operate the system, etc.). The database has the advantage of being of interest to library and information students, and they have the additional motivation that they can expect to encounter both dbms and hypertext systems in their subsequent careers.

The HyperCard and dBase III+ interfaces to the database were prepared in parallel.

The intention in each case was to provide an interface which was acceptable to relative beginners in the art of information retrieval, but which also exploited the particular advantages of each type of interface for efficient information retrieval. Both versions were presented to students and staff from the Department of Information and Library Studies at Loughborough University of Technology, and also at a CTI Workshop in the Department of Library and Information Studies at Manchester Polytechnic and elsewhere. Modifications were made where necessary, in the light of this pre-testing. Volunteers were selected from amongst undergraduate and postgraduate students in the Department of Information and Library Studies of Loughborough University of Technology. Altogether 40 students participated, 9 of whom were postgraduate research students, 22 postgraduate master's course students and 9 undergraduate students. They were asked to answer a series of questions concerning the contents of the database, using successively the HyperCard/Mac and dBase/PC combinations. To allow for transfer effects (i.e. experience from the first trial affecting the results of the second) the participants was divided into two groups - hereinafter labelled 'Group A' and 'Group B' -each consisting of 20 members. Members of Group A used the HyperCard/Mac combination first, whilst members of Group B used the dBase/PC combination first.

The participants consisted of a mix of 20 overseas students and 20 UK based students. It was important to get a balance between the two groups, since overseas students differ systematically from home-based students in a number of factors (average age, previous computer experience, language, etc.). Each group was therefore made up of 10 overseas and 10 home-based students. The evaluation exercises were carried out with one member of group A and one of group B participating simultaneously. As far as possible, each pair of participants were

matched: for example, if the Group A participant had experience of using the dBase III+ system, so would the Group B participant. This was intended to compensate for any changes in the environment (time of day, external noise, etc.) as the evaluation exercises proceeded. Students were set a series of 12 questions. These questions were selected to enable the students to access the databases from different entries. Finding the answers entailed accessing different parts of the database, starting each time from the initial screen. Examples of these questions are: Who is the supplier of CEA software?; What is the price of QUESTION MARK?; Which software is both a Hypertext system and an expert system? (See appendix IV).

The time taken to find an answer to each question was recorded by an observer, together with the number of steps required to answer the question. (A 'step' here is defined as any input by the user to the system, e.g. a command to move from one screen of information to another). The most efficient routes for answering the questions had been worked out beforehand. The number of steps taken by a participant was compared with this predetermined figure: any excess was recorded under the heading, 'extra steps'.

Icons methodology

This experiment was carried out during January and February 1993 to investigate :-

- i) How easily icons can be recognised and remembered.
- ii) The possibility of using icons as an independent language.
- iii) The differing input of hand drawn and commercially prepared icons.

Types of icon

In this experiment, three types of icon of three different sizes were selected. The Macintosh and IBM icons were commercially prepared icons, while the ones designed

by the author were selected as Hand drawn icons (See appendix V for more details). Macintosh and IBM icons were selected to provide familiar pictures for the users and to show the differences between those familiar icons and the new ones which were seen during the experiment.

The subjects of the study

The study sample comprised fifty-four students. All of them were second year students in the Department of Information and Library Studies at Loughborough University of Technology. Thirty-four of the students were majoring in Information and Library studies, while twenty students were majoring in Information and Computing Studies.

Difficulties during the experiments

Some difficulties were found during the scanning of input icons. Some icons were not clear enough when it came to display, especially those which were Hand drawn. (See appendix V for more details).

Experiment environment

i) Size of icons

Three sizes of icons were used for this experiment.

- a) The small size, which was about (0.5" by 0.5").
- b) The medium size, which was about (1" by 1").
- c) The large size, of icons which was (1.5" by 1.5").

ii) Number of icons

Twenty-one icons were selected for this experiment. Seven icons were selected from each of Macintosh, Hand drawn and IBM sources. At the same time, six ordinary

words were selected to be used alongside the icons. These words related to the functions of the icons which were used in the experiment. This selection was made to examine the differences between students' reactions to the icons and the words.

iii) Equipment

- a. PC- IBM compatible was used with a VGI screen.
- b. Word-perfect 5.1 (Wp51) was used for the icons display. The preview facilities of Wp51 gave the students full pictures of icons.

vi) Place

A small room at DILS was used for the experiment. It was quiet, and students could carry out the experiment without interruption.

Display of icons

The process of display was as follows:-

- i) The first two screens contained the Macintosh icons. The first screen contained the small-size icons, while the second contained the medium-size icons.
- ii) The third and fourth screens contained the hand-drawn icons. Small icons were displayed on the third screen, while the medium-size were displayed on the fourth screen.
- iii) The fifth and sixth screens contained the IBM icons. The fifth screen contained the small-sized icons, while the sixth contained the medium-sized icons.
- vi) The seventh and eighth were used for displaying words. The seventh screen contained the small-size of words and the eighth contained the medium-size.
- v) The screens from nine to twelve were used for the large size of icons. These screens were used as follows: Macintosh, Simple, IBM then Words (See appendix V for more explanation).

This sequence of icons and words was selected for the following reasons :-

- i) The small and medium-size of icons were selected to explore the initial recognition of icons as a function of size.
- ii) The large-size icons were used to provide a comparison, and so were left until the end of the experiment.
- iii) The words were put after the icons so that the relation of the words' functions to the icons' functions should not affect the students' responses.

Procedure of experiment

Each student was asked to do the experiment twice, the first session being for thirty minutes. During this thirty minutes the student displayed the icons and words in the sequence mentioned before. They were not allowed to move backwards, or re-display icons.

Three questionnaires were given to each student at the beginning of the experiment: (1) to record the meaning of the small-size pictures; (2) to record the meaning of pictures which had not been recognized in the small-size; (3) to record the functions of the recognized pictures of both sizes. After looking at the small and medium-size icons, each student was shown the large size of icons with their functions.

Finally, an evaluation form was given to each student to complete immediately. This asked the students for their opinion of the icons (the difficulties they found in recognising the icons, the size of icons they preferred, etc.) (See appendix V).

In the repeat experiment some three weeks later, each student was assigned twenty minutes. During this twenty minutes, each student was asked to repeat the same process as on the occasion. The twenty minutes assigned to each person was chosen

because the students already had some experience of doing the experiment. Limiting the time was thus meant to reflect improvement in the students' performance after their first experience.

GULFNET methodology

The experiment was carried out during March and April 1992. The aim of this study was to determine GULFNET users' needs for training and how to encourage them to utilize the network services. The following objectives were in mind; determining:-

- i) Methods of training they preferred.
- ii) Desired contents of a training package on how to use GULFNET.
- iii) Services they wanted to be available on GULFNET.

Subjects

The users of GULFNET in three universities were selected as the sample for this study:

(1) King Saud University (KSU), (2) King Fahad University for Petroleum and Minerals (KFUPM), and (3) King Abdulaziz University (KAU). KSU and KAU were selected because they are the largest universities in terms of GULFNET members. KFUPM was selected because it is different from the other institutions in the Gulf States in being a scientific and engineering university.

Users' background

The combined sample consisted of 132 users. These users had different backgrounds (in terms of nationality, subject background, position, use of computer and the institution).

Data Collection

Two methods were used to collect data - via on-line and hard-copy questionnaires.

On-line Questionnaire

On-line questionnaires via electronic mail were used in data collection from the users of GULFNET. A general letter was sent to the academic administrators of the above universities asking them to send lists of the network users at their universities. Only KFUPM responded to this letter. The other two had some technical problems with the international electronic mail service. As discussed in chapter one, King Fahad University of Minerals and Petroleum (KFUPM) was selected because it is in the lead in using network facilities: it is the only university which has received and sent much international electronic mail. An on-line questionnaire was used for the following reasons :-

- i) To prove that communications between GULFNET and the world-wide academic networks could be used in this way.
- ii) To ascertain how many users were accessing GULFNET regularly.
- iii) To find out whether electronic mail can be used to collect data from GULFNET users.
- iv) To encourage the users to respond to questionnaires, and to report any difficulties they might experience.

On-line procedures

In relation to the on-line questionnaire, the KFUPM node administrator responded to the letter with the addresses of some 800 eligible users of GULFNET at KFUPM. A general letter was sent to all these people explaining to them the purpose of the study and asking their permission to send them an on-line questionnaire. I also asked them to acknowledge the receipt of the first letter using electronic mail. However, only

about 44 users responded to that letter to say that they were willing to participate in answering the questionnaires.

Copies of the questionnaire were sent to all the 800 users. They were asked to complete the questionnaire and to send it back to me via electronic mail. Only 41 users successfully completed the questionnaire and returned it. Five of them were not from the group who responded to the general letter.

Hard copy procedures

A hard copy version of the questionnaire was distributed to GULFNET users at KSU and KAAU. This questionnaire was distributed in cooperation with the network node administrators at the two universities. About 70 questionnaires were distributed to each university: 47 questionnaires were completed by the users of the network in KSU and 44 questionnaire completed by the users in KAAU. (For more details about the questionnaire, See appendix VI).

Difficulties during the data collection

There were some difficulties during data collection from the on-line version. First, some users of GULFNET in KFUPM had difficulties in down-loading the questionnaire and sending it back via electronic mail. Second, some users at KFUPM did not send the questionnaire back properly.

The other difficulty, which occurred during the distribution of the hard copy questionnaire at KSU and KAAU, was the lack of information about the total number of users of the network. Neither of the two universities had a record of who amongst their staff used the network. Fortunately, some of the registered users helped us to locate other users of the network.

CHAPTER FOUR

An experimental examination of students' perception of electronic bulletin boards (EBBs)

Introduction

The main study involved examination of how easy or difficult users might find it to use EBB's for teaching and training. Six experiments were carried out to discuss the principles of the EBBs from different angles. The result of three experiments are discussed in this chapter, as follows :-

- i) The Initial Study, which aimed to investigate how easy or difficult users were likely to find using EBBs. Four EBBs - HUMBUL, BUBL, NISS and SBB were examined, as discussed in chapter three.
- ii) The BUBL-92 experiment, which aimed to investigate the BUBL system, with emphasis on the Practical Exercises.
- iii) The BUBL-93 and INFOSLUG experiment which aimed to achieve two things: first, to find out whether the changes from BUBL-92 made any difference to the responses of students for BUBL-93; second, to compare two different BBs -

BUBL and INFOSLUG - with different software.

** NOTE All the statistical tests applied in this study used a level of $P > .05$ unless other-wise indicated.*

*** The statistical tests were applied only to cells which contained ten or more subjects.*

The Initial study

The study was carried out over six weeks during January and February 1991, and investigated four EBBs - HUMBUL, BUBL, NISS, and SBB. The subjects were given any no guidelines or instructions about which aspects of the EBBs to evaluate. It was expected that their responses would help guide the construction of questions in the main study.

Students' background

The sample used for the experiment were aged between 19 and 50 years old. All had some previous experience in using computers but not EBBs. Table 4.1 shows the general student background, while Table 4.2 shows the students' experience in using computers.

Table 4.1

SEX		AGE		EXPERIENCE		INTEREST		
Male	Female	Under 22	Above 22	Previous experience	No experience	Information	Library	Equal
9	38	33	14	30	17	20	6	21

Table 4.1 shows that most of the students (78%) were female, and 67% of the sample

were aged under 22 years old. The vast majority of students have an interest in information activities, rather than library work alone.

Table 4.2

Type of computers	Micro	32 (68%)
	Mainframe	10 (21%)
	Other	10 (21%)
The use of computers	High school classes	25 (53%)
	Classes in the University	13 (28%)
	Other	37 (79%)

Table 4.2 shows there were significant differences in students use of Micros and Mainframes, and of Micros and other computers. The results also show that the students used computers significantly more in high school classes than in university classes. But computer use outside formal classes was even more pronounced .

Significant differences in the students' backgrounds did not appear, on statistical analysis, to influence their evaluation of the EBBs. Consequently, their total responses are used in discussing the data in this part of the study.

There are common characteristics between the four examined bulletin boards. All have main menus leading to a number of sections, sub-sections and sub-sub-sections. All have some kind of a manager who vets the material before it is added and who organizes the contents and operation of the bulletin board.

The experimental data was collected from three sources:-

- i) Participant observations.
- ii) The questionnaire which the students had to complete (See appendix I).
- iii) The students' final reports.

Observations

It has been noted previously that some students had problems in sending electronic mail (E-mail) during the first session of the experiment. A common problem was that students sent their E-mail, but were not sure whether it had got through or not. Consequently, a number of students wasted considerable time on trying to communicate.

Questionnaire and final reports

No systematic difference in responses was noted between the three major groups, namely:-

- i) 36 second-year undergraduates taking single or joint honours degrees in the department.
- ii) 6 second-year undergraduates taking a BSc honours degree in information and computing studies.
- iii) 5 postgraduates taking an MSc degree in Information Studies.

The results are therefore discussed here for all 47 students together. All the students who participated in this study were of similar background in terms of using BBs and computers. With regard to the NISS bulletin board and the SBB, the students were asked to suggest new topics for inclusion on these bulletin boards. Finally, the analysis for all four bulletin boards was brought together; including any similarities or differences between them which were observed by the students.

HUMBUL data analysis

The results for HUMBUL were divided into two sections: (1) good features of the system which satisfied the students' needs; (2) features of the system which the students believed needed improvement. However, not all students agreed an which features should figure under each of these headings.

i) Good features

Table 4.3 shows which features students thought particularly good on the HUMBUL system.

Table 4.3

Facilities	Questionnaire	Final report
Navigation system	28 (60%)	15 (32%)
Instructions on how to use HUMBUL	20 (42%)	6 (13%)
HUMBUL system is easy to use	14 (29%)	15 (32%)

Some students (25%) believed that HUMBUL indicated new items well while good E-mail interaction with editor was mentioned by 23% of the students in the questionnaire (and 21% of the students in their final reports). Paging and numbering of the HUMBUL was mentioned by 21% of the students in the questionnaire as a good feature. (The paging and numbering facilities show the users how many pages they have finished and how many are left to complete the section). Finally, 13% of the students indicated in the questionnaire that the Mail and Post options were very useful. (The Mail facilities enable the users to contact the coordinator of the HUMBUL via E-mail through the HUMBUL system, while the Post facilities enable the users to receive a copy of any section of HUMBUL via E-mail).

ii) Features to be improved

Table 4.4 shows the three main things which the students believed should be improved.

Table 4.4

Facilities	Questionnaire	Final report
Searching items from HUMBUL.	20 (43%)	14 (29%)
Instructions on how to use HUMBUL	20 (43%)	14 (29%)
HUMBUL system is difficult to use	9 (19%)	6 (13%)

In their final reports, students mentioned other facilities which they believed should be improved. Some of the students (29%) said the code identifier was a problem in coping with a large volume of information; 29% mentioned that there was ambiguity in some section headings; while 23% of the students considered that registration and access to HUMBUL were not easy. Lastly, 21% of the students said that they should receive acknowledgement of receipt of electronic mail messages.

BUBL data analysis

The results of BUBL will be discussed in relation to the HUMBUL results in terms of their good features and the features which need improvement.

i) Good features

The students evaluated BUBL for its ease or difficulty of use. Table 4.5 shows some of the good features which the students mentioned either in the questionnaire or in their final reports.

Table 4.5

Facilities	Questionnaire	Final report
Navigation system	9 (19%)	16 (34%)
Instructions on how to use BUBL	16 (33%)	7 (15%)
BUBL system is easy to use	35 (73%)	12 (25%)

In the questionnaire, 23% of the students said that the system was good because they could search for any item from any point in the system. A few students stated that the electronic mail facility was good. In their final reports, some of the students (23%) said that the interaction with the editor via electronic mail was good. A few (13%) of the students said that the Mail and Post options were useful; 21% said the BUBL had a good paging/section system; lastly 11% said the display of options at the bottom of the screen was good.

ii) Features to be improved

Table 4.6 shows some of the features which need improvement as reported in the questionnaire and final reports.

Table 4.6

Facilities	Questionnaire	Final report
Navigation system	14 (29%)	6 (13%)
Instructions on how to use BUBL	10 (21%)	10 (21%)
System speed to move from screen to screen	16 (33%)	15 (32%)

Other features were also mentioned. Some of the students (23%) said that the contents

of the sections were not always obvious from the titles in the menu. Again, 33% suggested that BUBL should have a comprehensive index to guide users directly to the information they need. Lastly, 9% said that page breaks on BUBL should be improved.

It can be concluded that the good features were mentioned more frequently by most of the students. They considered eight features of BUBL to be good and satisfying their needs, as opposed to six features of BUBL which needed to be improved in order to make it more useful and easy to use. There were variations of opinion, with certain students considering some features to be good and others saying that improvements to these features were needed.

NISS data analysis

The students were asked to suggest in the questionnaire any new items which they considered to be suitable for the bulletin board. The students were asked to do this because they had already evaluated the HUMBUL and BUBL bulletin boards which are similar to the NISS bulletin board, and so could compare them. At the same time, the students were asked to evaluate the system in their final reports, thus giving them the opportunity to express their points of view about the NISS bulletin board. Most of the students (80%) suggested specific items relating to the procedures for establishing a bulletin board which they considered to be useful, such as reports on new technology for information professionals.

i) Good features

The students submitted a final report on NISS evaluation. Some of the students (32%) said that the system of NISS was easy to use. The same number of students (32%) pointed out that indication of new items was very good, and 29% mentioned that the

BB had good instructions. The interaction with editor via electronic mail was mentioned by 25% of the students as a good facility, while page/section numbering was mentioned by 19% of the students as a good feature. Lastly, 11% of the students thought that the Mail/Post options were useful.

ii) Features to be improved

Some of the students (29%) reported that the section headings were sometimes ambiguous. Other students (21%) indicated that they wanted to receive acknowledgement of electronic mail messages. The searching facilities were considered by 13% of the students to be difficult to use, and 7% said that NISS had a poor page break. The students were asked in the NISS questionnaire to suggest any new items which they considered suitable for the BB. Most of the students (80%) indicated items which would be good in the use of the NISS bulletin board. In this case, six good features were mentioned by students, as compared with five features mentioned by students as needing to be improved.

SBB data analysis

The students were asked to suggest in the questionnaire any new items which they considered to be suitable for the bulletin board. Most of the students (91%) suggested items, including a calendar of assessed work, real life experience of the departmental staff in the field of librarianship and information science, and a list of new books which covered the field of library and information studies.

i) Good features

The students recorded three features as being good: 19% said that interaction via electronic mail was good, while 11% mentioned that the SBB had good page/section numbering, and 11% said that the Mail/Post facility was useful.

ii) Features to be improved

The students recorded four features which they thought needed to be improved. Some of the students (17%) believed that the SBB was not helpful because they could not leave an information item in the middle of the display. A few (13%) said that there were no searching facilities to enable them to search for particular items, 9% said the SBB display of options was not good, and 6% of students reported that the SBB had a poor page break.

Thus students reported three features as good and four features which could be improved. However, the students' comments on the SBB were restricted by because of its small size and the small amount of information available on it. At the time of the evaluation, there was only the main menu without any sub-menu, and this did not give students the opportunity to evaluate the system features as they did with the other BBs.

Summary

Some students faced difficulties, especially in their first attempts at sending electronic mail, in the exercises on HUMBUL, which was the first bulletin board they used. About 65% of the students went to check with the investigator if their electronic mail had gone through. About 19% of them sent the first exercise by electronic mail and submitted the same work on a hard copy because they were not sure if the E-mail they sent went through or not. However, those students were taught how to send electronic mail which helped them in sending their next exercises on the other bulletin boards.

The electronic bulletin boards were generally found to be very useful, and students

thought that they would use such bulletin boards in their future careers. They were generally satisfied with the overall design and operation of the four bulletin boards studied. The students suggested a number of requirements if such systems were to be more user-friendly. One topic indicated by the students was the problem of identifying the correct information files in a menu-based system. Another frequent suggestion was to have an index of the contents of the bulletin board to help to resolve the problem of ambiguities of choice from the menus. Since users with a wide range of backgrounds and experiences are likely to use a bulletin board, the system should be adequately flexible, so that experienced users can skip steps, while inexperienced users can branch off, whenever necessary, to receive more detailed instruction and help. Good interaction with the editor or administrator of the bulletin board was also considered very helpful. Lastly, all users whether experienced or inexperienced would be expected to benefit from the careful provision of navigational aids on the system. The students evaluations and observations of these four EBBs provided the basis for next experiment on BUBL-92.

Results of BUBL-92

The BUBL-92 experiment was carried out during January and February 1992. It examined how students could best handle this EBB and how they evaluated the Practical Exercise (section K) of BUBL. It was used to find out whether changes were needed to improve access. The results of the study were reported to the BUBL administrators, who subsequently made some modifications to BUBL, and especially to the Practical Exercise section.

Students background

Forty-seven students participated in the experiment on BUBL-92. They were divided into several groups as described in the chapter on methodology. Each group was selected on the basis of their level of knowledge of, and experience with computer facilities, and the particular interest of the students. Table 4.7 shows the differences between the students' backgrounds.

Table 4.7
Students' backgrounds

Subject	Type of background	No of students
Speciality	Information and Computing Studies	10
	Information and Library Studies	31
Age	Under 25 years	31
	Over 25 years	10
Interest	Library science	1
	Information science	12
	Equally Information and Library	28
Type of computers which have been used	Mainframe or Mini	20
	PC IBM or MAC	22
Experiences in using computers	Up to three years	20
	Over three years	18
EBBs	Used EBBs before	19

Table 4.7 shows that most (76%) of the students specialised in Information and Library Studies. The same number (76%) of the students were aged under 25 years old. Finally, 68% of the students were interested equally in information and library work. This quite high level of similarity caused some statistical difficulties in comparing the groups, though other categories of students' background showed more

acceptable numbers in each category. The students involved in BUBL-92 had used some computer facilities before the experiments. Table 4.8 shows these facilities and their amount of use by the students.

Table 4.8

Students background with certain types of computer facilities

Computer Facilities	Number of students	Amount of use		
		Frequently	Occasionally	Very little
	BUBL-92	BUBL-92	BUBL-92	BUBL-92
WP	41	14	19	8
E. Mail	41	6	14	21

The significant differences of the students' backgrounds shown in Table 4.8 were not reflected by significant differences in the students responses to their evaluations of the BUBL. Consequently, the total students' responses will be used in the discussion of the results.

Students' responses to the EBBs assessment

i) Screen appearance

The students' responses to each question are weighted from 1 - 3. The best score of all the tables is 3, except for the tables about the amount of information where the best score is 2. The scoring method for each table is noted above each table.

Reading material on screen

In order to obtain information about the students' points of view, they were asked 'How easy it is to read materials on-screen?'. Their responses are shown in Table 4.9 shows.

The scores: Easy = 3 Fair = 2 Difficult = 1

Table 4.9

How easy is it to read material on-screen

System	Easy	Fair	Difficult	Mean score
BUBL 92	18 (47%)	16 (42%)	4 11%	2.37

Design of display

Design factors relating to the layout of information on screen (such as justification, margining, etc.) was investigated in this question. The sample was asked 'How good is the design of the display?'. Their responses to this question is given in Table 4.10.

The scores: Very good = 3 Acceptable = 2 Poor = 1

Table 4.10

The design of the display

System	Very good	Acceptable	Poor	Mean score
BUBL 92	4 (11%)	24 (63%)	10 (26%)	1.8

ii) System design

System design is another aspect which affects how easy the system is to use. Several factors relating to the menu and the contents (Instructions, System friendliness, System speed, Error responses) were investigated in this study.

Relation between the menu and the contents

One important factor in the Menu-Based system is how obvious the relation is between the menu and the contents. The students were asked 'How relevant are the contents to the apparent intentions of the section ?' The students' responses to this question are shown in Table 4.11.

The scores: Fully related = 3 Reasonably related = 2 Partly related = 1

Table 4.11

The relevance of contents to the screen

System	Fully related	Reasonably related	Partly related	Mean score
BUBL 92	10 (26%)	24 (63%)	4 (11%)	2.16

Instructions

The clearer the instructions are, the easier it is to use the system. The students were asked 'How clear are the instructions on each screen ?' The students answered this question as shown in Table 4.12.

The scores: Very good = 3 Acceptable = 2 Poor = 1

Table 4.12

clarity of instructions on each screen

System	Very good	Acceptable	Poor	Mean score
BUBL 92	12 (32%)	22 (58%)	4 (11%)	2.21

System friendliness

The background chapter emphasised this factor and considered it to be one of the most important aspects. To obtain information, students were asked 'How easy is the system to use?' The students' responses to this question are presented in Table 4.13.

The scores: Easy = 3 Fair = 2 Difficult = 1

Table 4.13

Ease of the system to use

System	Easy	Fair	Difficult	Mean score
BUBL 92	31 (81%)	7 (19%)	(00%)	2.82

System speed

The students were asked 'How quickly can you move from screen to screen?' The responses to this question are shown in Table 4.14.

The scores: *Very quickly* = 3 *Fairly quickly* = 2 *Slowly* = 1

Table 4.14

Speed of movement from screen to screen

System	Very quickly	Fairly quickly	Slowly	Mean score
BUBL 92	15 (40%)	19 (50%)	4 (10%)	2.29

Error response

A good system should respond sympathetically to users' mistakes. Usually designers provide facilities which guide users to take the right action when they have made mistakes. The students were asked 'How satisfactory are the system responses when you make mistakes ?' Their responses are shown in Table 4.15.

The scores: *Satisfied* = 3 *Acceptable* = 2 *Unsatisfied* = 1

Table 4.15

System response when you made a mistake

System	Satisfied	Acceptable	Unsatisfied	Mean score
BUBL 92	25 (66%)	13 (34%)	(00%)	2.66

Paging and numbering

Users of a system always want to know where they are. Paging and numbering help the users to know their status in the system. The students were therefore asked ' How do you rate the paging and numbering within the section ?' The students' responses to this question are shown in Table 4.16.

The scores: Very good = 3 Acceptable = 2 Poor = 1

Table 4.16

Paging and numbering of the systems

Systems	Very good	Acceptable	Poor	Mean score
BUBL 92	22 (58%)	14 (37%)	2 (5%)	2.53

Practical exercise

The students were asked several questions concerning the Practical Exercise on BUBL to evaluate the usefulness of the training section.

Language

Using jargon or a complicated style can waste the users' time. The students were asked the following question, 'Was the language used by the author of the section easy to understand ?' The answers are shown in Table 4.17.

Easy = 3 Fair = 2 Difficult = 1

Table 4.17

Language used by the author

System	Easy	Fair	Difficult	Mean score
BUBL-92	24 (63%)	9 (24%)	5 (13%)	2.5

Coverage of the section

The students were asked about the section coverage to find out if they expected any more information about training. They were asked, 'Does the information cover all the aspects you would expect?' The answers are presented in Table 4.18. Clearly, the great majority were satisfied with the coverage.

Table 4.18
Information coverage

System	Yes	No
BUBL-92	34 (89%)	4 (11%)

Changes to section K

The students were next asked, 'Have you any specific suggestions for changes in section K?' The answers to this question are shown in Table 4.19.

Table 4.19
Suggestions for changes in section K

System	Yes	No
BUBL-92	32 (84%)	6 (16%)

A statistical test was applied to the students response to BUBL-92 and it showed a significant difference ($X^2 = 11.5$ $DF = 1$) in the sense that most of the students suggested some changes in section K.

Amount of information

As discussed in the Background chapter, there are no generally agreed for the amount of information on each screen. The students were asked 'What do you think about the amount of information on each screen?' Their responses are presented in Table 4.20. As mentioned earlier in this chapter, the best score for this aspect is 2 not 3.

The scores: Too much = 3 Acceptable = 2 Too little = 1

Table 4.20

The amount of information on each screen

System	Too much	Acceptable	Too little	Mean score
BUBL 92	25 (66%)	13 (34%)	00	2.66

The students' comments can be summarised as follows:-

1. Most of the students (82%) mentioned that each screen should be less crowded.
2. Two-thirds of the students (68%) said they would like to have more space on each screen between the instructions and the text.
3. Two-thirds of the students (66%) said the instructions were not clear.
4. Some students (26%) felt that the headings were not clear.
5. Almost as many (24%) commented that an index is needed for the section.
6. Lastly, a few students (16%) said that the questions in the training section should be separated.

Summary

Students participation in the evaluation of BUBL-92 provided an assessment of user satisfaction with the system (assuming students reflect typical users). At the same time, it highlighted the aspects which should be considered in designing EBB in general.

Most of the students (89%) found the materials either easy or fairly easy to read on screen, but the design of the display was somewhat less highly rated. Only 11% of the students said the display was well designed, as compared with 63% who thought it acceptable, and 26% of them said it was poor. Most students (66%) said there was too much information. Overall, the demand was for well-organised and carefully spaced presentation of text.

Queries about navigation began with the main menu, which was felt by 26% of BUBL-92 students to have ambiguous headings with potential overlap in contents. In consequence, a number of students set off in the wrong direction when beginning a search. More importantly, 66% of the students felt that the instructions were insufficiently clear. The students of BUBL-92 felt that the Practical Exercise sections should indicate more obviously the level of training involved, and that the questions should be separated out from the rest of the text more clearly. It was suggested by 24% that an index of the contents would significantly assist retrieval.

In terms of contents, 87% students found the language either easy or fairly easy to understand. Almost all students (90%) said the Practical Exercise on BUBL covered all the aspects they expected. Most students (84%) had suggestions for changes in section K, and most (92%) said that they were satisfied with the system responses when they made a mistake.

Modifications of BUBL-92

Partly as a result of these suggestions by students some modifications were applied to BUBL. These were both general modifications and specific ones for the Practical Exercise 'section K'. These principally involved:-

- i) A standard space was inserted between the instructions and the text on screen.
- ii) The Practical Exercise 'section K' was divided by several sub-headings based on the levels of training -Basic, Intermediate, and Advanced. (See Appendix III for more details).
- iii) The headings and questions of section K were highlighted.

These modifications of BUBL were expected to make the system more user-friendly. For example, the standard space between the instructions and the text on screens should clarify the instructions and make the appearance of the screen less crowded. The modifications of section K should provide the users with easier access to the information and enable users to access the level of training they need.

Results of BUBL-93 and INFOSLUG

The next experiment was carried out for two reasons. First, to reassess BUBL after the alterations which had been carried out by BUBL. Second, to compare students reaction to BUBL and INFOSLUG. The comparison of the two BBs is interesting in particular because each uses a different software. BUBL uses USERBUL software while INFOSLUG uses Gopher software. The different software gives an opportunity to compare two different softwares in terms of ease or difficulty of use. Each software has its own interface, as shown in the printed screens reproduced on the next two pages.

USERBUL printed screens

Section L1A

Page 1 of 5

JANET : an overview

JANET, the United Kingdom Joint Academic Network, was established in 1984 by the Computer Board for Universities and Research Councils. It now links users to the facilities of over 1700 registered computers on more than 150 sites. All universities and polytechnics are connected, as are the units funded by the research councils.

JANET is managed by the Joint Network Team (JNT), based at the Rutherford Appleton Laboratory outside Didcot. The JNT is also responsible for developing and approving UK academic networking applications funded by the Computer Board.

Use of the network is currently free to users within the Academic Community. The costs of operation are met by the major funding agencies responsible for research and teaching in the universities, and by fixed annual charges for connection to other organisations.

Options: HELP HINTS SEARCH MAIL POST QUIT M (Main Menu) or <RETURN>
(Next Page)

Please select section name, page number, or option:

Section L1A

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JANET is an X.25, packet-switched network. There are gateways to other academic networks especially in Europe and North America (e.g. the Internet and NSFNET, IXI, EAN, USENET and EARN/BITNET) and to the public networks through PSS/IPSS. The network is completely 'open', though most of the computers attached to it accept only approved users.

JANET provides all the standard network services for collaboration and communication: interactive terminal-to-host access (remote login), file transfer, mail and remote job submission. Communication within the network currently depends on the 'Coloured Book Protocols'. The wide use of these standard utilities underpins the huge variety of applications and activities possible across the academic community. Several commercial firms maintain the same protocols to facilitate joint industry/university research. Open Systems Interconnection (OSI) will provide these facilities to computer users worldwide. Facilities for OSI applications (e.g. X.400, X.500) are increasingly available.

Options: HELP HINTS SEARCH MAIL POST QUIT M (Main Menu) or <RETURN>
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Gopher printed screens

About the Clearinghouse for Subject-Oriented Internet
Resource Guides
August 1993

The Clearinghouse for Subject-Oriented Internet Resource Guides is a joint effort of the University of Michigan's University Library and the School of Information and Library Studies (SILS). Its goal is to collect and make widely available guides to Internet resources which are subject-oriented. These guides are produced by members of the Internet community, and by SILS students who participate in the Internet Resource Discovery project.

Why Subject-Oriented Guides?

Many useful guides to Internet resources are organized by format or by information delivery tool. For example,
17% : <SPACE> - next screen, q - quit, /string - search

guides have been produced which solely describe LISTSERVs, or online library catalogs. However, as the scope of available information on the Internet broadens, and as the numbers of formats and delivery systems grow, it becomes increasingly necessary to organize information by subject. Many Internet users are more likely to search for information by subject than by a specific tool or format. Subject organization also provides a context for Internet resources and a means for comparing them.

Who can benefit from using these Guides?

1) Users who are interested in a specific subject, especially those who do not have access to the entire array of commonly used Internet tools. For example, a user who does not have access to Gopherized resources can still benefit from learning what Usenet newsgroups are relevant.

2) Internet trainers can combine these guides with their own teaching skills and general knowledge of the Internet. This allows trainers to reach audiences they may previously have shied away from due to a lack of subject expertise.

3) System builders can use these guides to help determine what resources exist and which of those are of
44% : <SPACE> - next screen, q - quit, /string - search

BUBL-93 results

This section discusses the results of the BUBL-93 experiment. The comparison between BUBL-92 and BUBL-93 and between BUBL-93 and INFOSLUG will be discussed in chapter 7.

Students' backgrounds

Fifty-four students participated in the experiment on BUBL-93. They were divided into several groups as described in the chapter on methodology. Each group was selected on the basis of their level of knowledge and experience of computer facilities, and the particular interests of the students. The students' backgrounds are shown in Table 4.21.

Table 4.21
Students' backgrounds

Subject	Type of background	No. of students
Speciality	Information and Computing Studies	17
	Information and Library Studies	37
Age	Under 25 years	43
	Over 25 years	11
Interest	Library science	9
	Information science	34
	Equally Information and Library	11
Type of computers used	Mainframe or Mini	26
	PC IBM or MAC	54
Experience in using computers	Up to three years	27
	Over three years	27
EBBs	Used EBBs before	8

The above table shows that a large number of the students had the same type of the background which caused statistical difficulty in comparing differences in terms of background. Two thirds (69%) of the students specialised in Information and Library Studies. Most (80%) of the students were aged under 25 years old. More than half (63%) of the students were interested in Information science. Finally, half of the students had used Mainframe or Mini computers, while all of them had used a PC.

Table 4.22 shows the computer facilities that these students had used and the extent to which the students used them.

Table 4.22

Students' backgrounds with certain types of computer facilities

Facilities	Number of students	Amount of use		
		Frequently	Occasionally	Very little
-----	-----			
Windows	54	16	21	17
WP	53	34	16	3
E. Mail	50	7	10	33

The differences of the students' background shown in Table 4.21 were found statistically not to produce significant differences in the students' responses to the evaluation of BUBL-93. Consequently, all the students' responses will be aggregated together for the discussion of the results.

Students responses to the BUBL-93 assessment

Familiarity

Students were first given a set of test questions and asked to find answers for them. Table 4.23 shows the students' performance in answering these questions.

Table 4.23

Number of questions answered by the students

System	Number of correct answers			
	Question 1	Question 2	Question 3	Question 4
BUBL-93	48 (95%)	48 (95%)	47 (93%)	48 (95%)

Screen appearance

Students were then asked a set of questions relating to screen appearance.

Easy = 3 Fair = 2 Difficult = 1

Table 4.24

How easy is it to read material on-screen

System	Easy	Fair	Difficult	Mean score
BUBL-93	29 (56%)	18 (34%)	5 (10%)	2.65

The scores: Very good = 3 Acceptable = 2 Poor = 1

Table 4.25

The design of the display

System	Very good	Acceptable	Poor	Mean score
BUBL-93	15 (29%)	25 (48%)	12 (23%)	2.06

The scores: Fully related = 3 Reasonably related = 2 Partly related = 1

Table 4.26

The relevance of contents to the screen

System	Fully related	Reasonably related	Partly related	Mean score
BUBL-93	9 (17%)	27 (52%)	16 (31%)	2.55

The scores: Very good = 3 Acceptable = 2 Poor = 1

Table 4.27

Clarity of instructions on each screen

System	Very good	Acceptable	Poor	Mean score
BUBL-93	15 (29%)	21 (40%)	16 (31%)	2.38

The scores: Easy = 3 Fair = 2 Difficult = 1

Table 4.28

Ease of use of the system

System	Easy	Fair	Difficult	Mean score
BUBL-93	22 (42%)	18 (35%)	12 (23%)	2.54

The scores: Very quickly = 3 Fairly quickly = 2 Slowly = 1

Table 4.29

Speed of movement from screen to screen

System	Very quickly	Fairly quickly	Slowly	Mean score
BUBL-93	11 (21%)	30 (58%)	11 (21%)	2.00

The scores: Satisfied = 3 Acceptable = 2 Unsatisfied = 1

Table 4.30

System response when you made a mistake

System	Satisfied	Acceptable	Unsatisfied	Mean score
BUBL-93	19 (36%)	17 (33%)	16 (31%)	2.06

The scores: Very good = 3 Acceptable = 2 Poor = 1

Table 4.31

Paging and numbering of the system

System	Very good	Acceptable	Poor	Mean score
BUBL-93	19 (37%)	21 (40%)	12 (23%)	2.13

Easy = 3 Fair = 2 Difficult = 1

Table 4.32

Language used by the author

System	Easy	Fair	Difficult	Mean score
BUBL-93	26 (50%)	17 (33%)	9 (17%)	2.33

Table 4.33

Information coverage

System	Yes	No
BUBL-93	46 (89%)	6 (11%)

A statistical test was applied to the above table and it showed a significant difference of $X^2 = 75.4$ $DF = 1$, implying a high evaluation of coverage.

Table 4.34

Suggestions for changes in section K

System	Yes	No
BUBL-93	14 (27%)	38 (73%)

The Chi-Square test was applied to the above table and it showed a significant difference of $X^2 = 13$ $DF = 1$, implying that students were happy with section K.

The scores: Too much = 3 Acceptable = 2 Too little = 1

Table 4.35

The amount of information on each screen

System	Too much	Acceptable	Too little	Mean score
BUBL 93	16 31%	36 69%	00	2.31

Two general comments were made about screen appearance. Some students (17%) said that clearer definitions and instructions were needed, and some (12%) said that the layout and the menus should be improved.

Summary

Most of the students (90%) looking at BUBL-93 found the materials either easy or fairly easy to read on screen, but the design of the display was somewhat less highly rated. Some 29% of students said the display was well designed, as compared with 48% of them who thought it acceptable, and 23% who said it was poor. Some students (31%) said there was too much information.

Queries regarding navigation began with the main menu, which was felt by 17% of the students to have ambiguous headings with potential overlap in contents. In consequence, some students still set off in the wrong direction when starting. More importantly, 71% of BUBL-93 students felt that the instructions were insufficiently clear. In terms of contents, 83% of BUBL-93 students found the language either easy or fairly easy to understand. Almost all students (89%) of said the Practical Exercise on BUBL covered all the aspects they expected. Only (14%) of the students had suggestions for changes in section K. Most of the students (69%) rated the system

responses to mistakes as either satisfactory or acceptable, while the rest (31%) of them said they were not satisfied with the system responses when they made mistakes.

INFOSLUG results

Students' backgrounds

For students' background see Tables 4.21 and 4.22 of this chapter.

The students' backgrounds and their use of computer facilities as shown in Table 4.21 and Table 4.22 did not affect the students' responses. Consequently, their responses are aggregated in presenting the data.

Students' assessment of the EBB

The students were asked to answer some test questions to familiarize them with the systems. After that they were asked to complete an evaluation form in order to obtain data about their points of view regarding the two systems.

Familiarity

Students were given a set of questions and asked to answer up to four questions in the set. The interest was only in the total number of questions answered, not in which specific questions were answered, since they were all designed to be roughly equivalent difficulty. The students' answers are shown in Table 4.36.

Table 4.36

Number of questions answered by the students

	Number of correct answers			
System	Question 1	Question 2	Question 3	Question 4
INFOSLUG	52 (96%)	42 (78%)	32 (59%)	23 (42%)

This shows that both the number of questions answered and the percentage that were correct diminished with time, mainly due to limitations on the duration of the test.

i) Screen appearance

Easy = 3 Fair = 2 Difficult = 1

Table 4.37

Ease of reading material on-screen

System	Easy	Fair	Difficult	Mean score
INFOSLUG	29 (54%)	19 (35%)	4 (11%)	2.48

The scores: Very good = 3 Acceptable = 2 Poor = 1

Table 4.38

The design of the display

System	Very good	Acceptable	Poor	Mean score
INFOSLUG	13 (25%)	27 (52%)	12 (23%)	2.02

The scores: Fully related = 3 Reasonably related = 2 Partly related = 1

Table 4.39

The relevance of contents on the screen

System	Fully related	Reasonably related	Partly related	Mean score
INFOSLUG	3 (6%)	24 (46%)	25 (48%)	1.58

The scores: Very good = 3 Acceptable = 2 Poor = 1

Table 4.40

Clarity of instructions on each screen

System	Very good	Acceptable	Poor	Mean score
INFOSLUG	12 (23%)	20 (37%)	20 (36%)	1.85

The scores: Easy = 3 Fair = 2 Difficult = 1

Table 4.41

Ease of use of the system

System	Easy	Fair	Difficult	Mean score
INFOSLUG	13 (24%)	11 (21%)	28 (52%)	1.71

The scores: Very quickly = 3 Fairly quickly = 2 Slowly = 1

Table 4.42

Speed of movement from screen to screen

System	Very quickly	Fairly quickly	Slow	Mean score
INFOSLUG	4 (8%)	22 (41%)	26 (48%)	1.58

The scores: Satisfied = 3 Acceptable = 2 Unsatisfied = 1

Table 4.43

System response to mistakes

System	Satisfied	Acceptable	Unsatisfied	Mean score
INFOSLUG	9 (16%)	17 (32%)	26 (48%)	1.67

The scores: Very good = 3 Acceptable = 2 Poor = 1

Table 4.44

Paging and numbering of the system

System	Very good	Acceptable	Poor	Mean of score
INFOSLUG	9 (16%)	17 (32%)	26 (52%)	1.67

The scores: Too much = 3 Acceptable = 2 Too little = 1

Table 4.45

The amount of information on each screen

System	Too much	Acceptable	Too little	Mean score
INFOSLUG	16 (31%)	31 (59%)	5 (10%)	2.21

At the end of the experiments, some students commented on the use and the design of the BB, as follows :-

- i) Some (29%) of the students said that clearer definitions and instructions were needed.
- ii) One student said that the layout and the menus should be improved.

Summary

The majority of the students (90%) who investigated INFOSLUG found the materials either easy or fairly easy to read on screen. The design of the display was considered by 52% of the INFOSLUG sample as Acceptable, while 25% said it was Very Good. The remainder (23%) said it was Poor. Most (69%) of the students considered the amount of information as acceptable, while the remaining 31% said it was too much.

Queries about navigation began with the main menu, which was felt by 94% of the students not to be fully related to the contents. In consequence, a number of students were sent off in the wrong direction when starting. More importantly 77% of INFOSLUG students felt that the instructions were inadequate. The error function was considered by 50% of the students to be either satisfactory or acceptable, while 50% of them said it was unsatisfactory.

Conclusion

It can be concluded that each of the BUBL-92, BUBL-93 and INFOSLUG systems has particular features which were rated better or worse than the others. Five features including - Reading materials on screen, Ease of use of the system, Moving speed from screen to screen, System responses when making a mistake and The Paging and numbering - scored highest on the BUBL-92 system, and second highest on the BUBL-93 system. Three features - Design of display, Relevance of the contents on

the screen, and Instructions on each screen - scored highest on BUBL-93. Two of these features - Relevance of the contents on the screen, and Instructions on each screen - scored second highest on BUBL-92, while INFOSLUG scored second highest on the design of display feature. The INFOSLUG system proved most acceptable in terms of the amount of information on screen, while BUBL-93 came second.

If, as a gives approximation, we give each of the above features scores - the best one (3), second best (2) and the last (1) then the total scores of the three EBBs are 2.33, 2.33 and 1.33 for BUBL-92, BUBL-93 and INFOSLUG, respectively.

In terms of a comparison of BUBL-92 with BUBL-93, most of the students found the language either easy or fairly easy to understand. Almost all students said the Practical Exercise on BUBL covered all the aspects they expected. Most students (84%) of BUBL-92 had suggestions for changes in section K, while only 14% of BUBL-93 students had suggestions for changes in section K. The evaluations of section K on BUBL-92 and BUBL-93 show that the modifications made on BUBL produced a change in students response (which will be discussed in detail later).

CHAPTER FIVE

Comparison of Hypertext vs Menu-based interfaces and an examination of Icons

Introduction

The results of two experiments are presented in this chapter. First, there is the comparison of the usability of a menu-based interface (dBaseIII+) with that of a hypertext interface (HyperCard) from the students' viewpoint. Second, there is an experiment with the use of icons. This experiment was to investigate how different icons can be recognized and the possibility of using them for language-independent instructions.

a) Comparison of Hypertext vs Menu-based interfaces

This experiment was aimed at comparing the reactions of students in their use of two different interfaces: the hypertext and the menu-based interfaces. In order to facilitate the experiment a database providing access to both interfaces was designed. A set of tasks was also designed (See Appendix for more details) which the students were expected to perform in the course of the experiment. The ultimate goal was to establish any inherent differences between the performance levels of individual students using both interfaces. The basis for measuring the task performance by the students was - number of correct answers, number of incorrect answers, number of

tasks attempted, and number of extra steps (beyond the expected number of steps) taken to complete the exercise. The experiment was intended to provide the basis upon which to identify the human factors (characteristics) which were likely to affect the student's ability to complete the prescribed tasks using each interface.

NOTE the results of the statistical tests on the student performances are presented in tables in terms of t-test results, degree of freedom, P value and differences significant at $P > 0.05$.

Results of the performance test

The results of the performance test were compared with the variables relating to the students' characteristics, such as age and length of experience with computers. Table 5.1 gives the analysis by age, with corresponding performance ratings relating to (a) number of correct answers; (b) average time; (c) extra steps taken to complete a question in both the Mac/HyperCard and the PC/dBase III+ systems. A t-test was applied to establish whether there was a significant difference between the different age categories in their performance ratings. The test showed some significant differences in the mean time as presented in Table 5.2.

There was a significant difference in the mean time taken to complete questions between the age group 20 - 25 and the other age groups in both the Mac/HyperCard and PC/dBase III+ systems at the 5% level (Table 5.2). This difference is cancelled when this group is merged with the 26 - 31 age group and compared with the age group 32 - 48. The two age groups of 20-25 years and 26-31 years were merged (i.e. 20-31 years) and were compared with the age group 32-48 years in order to make further statistical comparisons. The test showed that there was no significant

difference between the two merged age groups regarding the number of correct answers, time, and number of extra steps taken using either the Mac/HyperCard and PC/dBase III+ systems. On the basis of these results, it can be deduced that age is an important determining factor in the performance of these interface tasks, but only between the youngest age group and others.

Table 5.1

Age vs Time taken for a question

Age Group	No of Students	HyperCard			dBase III+		
		Correct answers	Time taken for a question	Extra steps taken for a question	Correct answers	Time taken for a question	Extra steps taken for a question
20-25	7	10.8	157.1	5.0	12.0	71	1.3
26-31	13	10.3	132.4	6.8	11.5	115	1.7
32-37	9	9.2	154.8	6.8	11.7	122	2.9
38>	11	10.5	140.4	5.8	11.4	108	1.9
20-31	20	10.5	116.0	6.2	11.6	99.6	1.5
32>	20	10.0	147.0	6.3	11.5	114.4	2.1

Table 5.2

Age vs time taken for a question

Group	Systems	t-test	DF	P. value	Significance
20-25 & 26-31	HyperCard	2.186	18	0.023	SD
	dBase III+	2.028	18	0.027	SD
20-25 & 32-37	HyperCard	2.572	14	0.015	SD
	dBase III+	2.130	14	0.025	SD
20-25 & 38>	HyperCard	4.913	16	0.0001	SD
	dBase III+	2.512	16	0.030	SD
26-31 & 32-37	HyperCard	0.805	30	0.25	NSD
	dBase III+	0.362	30	0.35	NSD
32-37 & 38>	HyperCard	0.505	18	0.35	NSD
	dBase III+	0.541	18	0.28	NSD
20-31 &32-48	HyperCard	1.629	38	0.055	NSD
	dBase III+	0.636	38	0.28	NSD

DF = Degree of Freedom, SD = Significant difference,

NSD = No significant difference.

Table 5.3 gives a gender analysis of the students along with the data on the average time and extra steps taken in both the Mac/HyperCard and PC/dBase III+ systems. There appears to be a significant gender difference in the mean time taken to

complete a question in both the Mac/HyperCard and PC/dBase III+ systems at the 5% level. The male students took less time in both cases. The other measurements showed no significant difference.

Table 5.3
Sex vs Time taken for a question

Sex	No of Students	HyperCard			dBaseIII+		
		Correct answers	Time taken for a question	Extra steps taken for a question	Correct answers	Time taken for a question	Extra steps taken for a question
Male	20	10.7	111	5.6	11.7	8.7	1.9
Female	20	9.8	152	6.9	11.4	12.7	1.9

The results of a statistical test which was applied to the performance of the students by gender are presented in Table 5.4.

Table 5.4
Sex vs Time taken for a question

Sex	Systems	t-test	DF	P. value	Significance
Male & Female	HyperCard	2.222	38	0.035	SD
	dBase III+	2.289	38	0.004	SD

*DF = Degree of Freedom, SD = Significant difference,
NSD = No significant difference.*

Table 5.5 gives the analysis of student composition by course status (i.e. research, postgraduate and undergraduate). Research students showed some differences from undergraduate students at the 5% level for the PC/dBase III+ system, but at the 1%

level for the Mac/HyperCard system. A significant difference was also found between Postgraduate and Undergraduate students on the HyperCard system while there were no significant differences between the two groups on the PC/dBase III+ system. The undergraduate students performed better than the research postgraduate students on both systems, while they performed better than the postgraduate students on the Mac/HyperCard system.

Table 5.5
Class vs Time taken for a question

Class	No of Students	HyperCard			dBase III+		
		Correct answers	Time taken for a question	Extra steps taken for a question	Correct answers	Time taken for a question	Extra steps taken for a question
Research	9	9.2	174.3	5.8	11.4	131	1.7
PG	22	10.6	126.7	6.0	11.7	106	2.1
UG	9	10.3	99.8	6.0	11.2	86	1.6

[Research = Postgraduate research students; PG = Postgraduate students; UG = Undergraduate students]

A statistical test was applied to the results of Table 5.5 and is presented in Table 5.6.

Table 5.6

Class vs Time taken for a question

Group	Systems	t-test	DF	P. value	Significance
Research & PG	HyperCard	1.604	29	0.063	NSD
	dBase III+	1.146	29	0.12	NSD
Research & UG	HyperCard	3.913	16	0.0001	SD
	dBase III+	2.339	16	0.025	SD
PG & UG	HyperCard	1.842	29	0.0381	SD
	dBase III+	1.132	29	0.120	NSD

[Research = Postgraduate research students; PG = Postgraduate students; UG = Undergraduate students] DF = Degree of Freedom, SD = Significant difference, NSD = No significant difference.

Retrieval performance between Group A, who used the Mac/HyperCard combination first, and Group B, who used the PC/dBase III+ combination first, was compared. Both groups showed no significant differences between the Mac/HyperCard and PC/dBase III+ systems in terms of time taken for a question, but a significant difference was found between the two systems in terms of the number of extra steps taken for a question. Tables 5.8 and 5.9 show the results of the statistical test.

Table 5.7

A comparison of retrieval performance (Group A vs Group B)

	Number in Group	Time taken for HyperCard	Time taken for dBase III+	Extra steps for HyperCard	Extra steps for dBase III+
Group A	20	136	104	6.4	1.8
Group B	20	126	110	5.9	2.0

Table 5.8

A comparison of Time taken for a question (HyperCard vs dBase III+) & (Group A vs Group B)

Group	Systems	t-test	DF	P. value	Significance
Hypercard & dBase III+	Group A	1.561	38	0.06	NSD
	Group B	0.93	38	0.12	NSD
Group A & Group B	HyperCard	0.534	38	0.30	NSD
	dBase III+	0.322	38	0.35	NSD

DF = Degree of Freedom, SD = Significant difference, NSD = No significant difference.

Table 5.9

A comparison of Extra steps taken for a question (HyperCard vs dBase III+)

Systems	Groups	t-test	DF	P. value	Significance
HyperCard & dBase III+	Group A	2.964	38	0.004	SD
	Group B	7.352	38	0.00001	SD

DF = Degree of Freedom, SD = Significant difference, NSD = No significant difference.

Further analysis of the time and number of extra steps yielded information about differences between overseas and the home students. There was a significant difference at the 1% level between the two categories both for the Mac/HyperCard system and PC/dBase III+. The overseas students were found to have more difficulties in retrieving information than the home students, but such differences were not significant when comparison was based on the number of extra steps taken, as shown in Table 5.10.

Table 5.10

Overseas students VS Home-based students

	Number in Group	Time taken for HyperCard	Time taken for dBase III+	Extra steps for HyperCard	Extra steps for dBase III+
Overseas	20	165	137	6.7	2.3
Home-based	20	98	77	5.7	1.5

A statistical test was applied to the results of Table 5.10 and the results are presented in Tables 5.11 and 5.12.

Table 5.11

A comparison of time taken for a question (Overseas vs Home-based)

Group	Systems	t-test	DF	P. value	Significance
Overseas& Home-based	HyperCard	4.075	38	0.0005	SD
	dBase III+	3.76	38	0.0005	SD

DF = Degree of Freedom, SD = Significant difference, NSD = No significant difference.

Table 5.12

A comparison of eExtra steps taken for a question (Overseas vs Home-based)

Group	Systems	t-test	DF	P. value	Significance
Overseas& Home-based	HyperCard	0.666	38	0.26	NSD
	dBase III+	1.649	38	0.06	NSD

DF = Degree of Freedom, SD = Significant difference, NSD = No significant difference.

A comparison of retrieval (Computer Users VS Non-users)

Because only a few students lacked previous computer experience, no entirely conclusive results can be obtained in terms of this background variable (Table 5.13).

However, the differences, especially in terms of time taken, are worth remarking.

Table 5.13

Computer Users VS Non-users

	No.in group	Time taken for		Extra steps		Correct answers	
		HyperCard	dBase	HyperCard	dBase	HyperCard	dBase
Used computers previously	36	124	125	6.5	1.4	10.5	11.7
Not used computers previously	4	201	159	3.5	2.2	7.5	10.0

The t-test was applied to the above tables to find out the differences between the people who had used computers before and those who had not used them before with both systems. Tables 5.14, 5.15 and 5.16 present the various results.

Table 5.14

A comparison of time taken for a question (Used computers before vs Non-users)

Group	Systems	t-test	DF	P. value	Significance
Used computers before vs Non-users	HyperCard	2.971	38	0.003	SD
	dBase III+	2.775	38	0.004	SD

Table 5.15

Extra steps taken for a question (Used computers before vs Non-users)

Group	Systems	t-test	DF	P. value	Significance
Used computers before vs Non-users	HyperCard	2.665	38	0.0045	SD
	dBase III+	0.066	38	0.50	NSD

DF = Degree of Freedom, SD = Significant difference, NSD = No significant difference.

Table 5.16

A comparison of Correct answers (Used computers before vs Non-users)

Group	Systems	t-test	DF	P. value	Significance
Used computers before vs Non-users	HyperCard	2.64	38	0.005	SD
	dBase III+	4.09	38	0.0001	SD

DF = Degree of Freedom, SD = Significant difference, NSD = No significant difference.

A comparison of retrieval (Mac Users VS Non-users)

The students who had previous experience with Mac were able to retrieve information much faster than those without previous experience (Table 5.17). Table 5.18 shows the results of the statistical test which was applied to table 5.17.

Table 5.17

Mac Users VS Non-users

Mac system	Number in Group	Time taken for HyperCard	Correct Answers	Extra steps for HyperCard
Used Mac previously	22	105	10.7	5.4
Not used Mac previously	18	164	9.7	7.1

Table 5.18

Time and extra steps taken for a question (Mac users vs Non-users)

Group	Systems	t-test	DF	P value	Significance
Used Mac before vs Non-users	Time taken	3.2	38	0.003	SD
	Extra steps	1.32	38	0.10	NSD

DF = Degree of Freedom, SD = Significant difference, NSD = No significant difference.

Some interfaces/systems are easy to use, while others may require prior experience and other relevant skills in order to use them comfortably. The results of the two groups (Those who used PC/dBase III+ before and those who had not used it before) show no significant differences. Consequently, it can be supposed that this interface can be used readily with little prior experience. Table 5.19 shows the two groups' performance during their work with PC/dBase III+.

Table 5.19

PC/dBase III+ Users VS Non-users

dBase III+	Number in Group	Correct Answers	Time taken for dBase III+	Extra steps for dBase III+
Previous experience	19	11.8	97	1.6
No previous experience	21	11.4	116	2.1

A statistical test was applied to the results of the performance of the people who had used PC/dBase III+ before and those who had not. The results are presented in Table 5.20.

Table 5.20

Time and extra steps taken for a question (dBase users vs Non-users)

Group	Systems	t-test	DF	P. value	Significance
dBase III+ previous users vs Non-users	Time taken	1.070	38	0.14	NSD
	Extra steps	1.012	38	0.16	NSD

DF = Degree of Freedom, SD = Significant difference, NSD = No significant difference.

Results of the user ratings

At the end of the experiment using the Mac/HyperCard and PC/dBase systems, the students were asked to give their assessment of the two interfaces by answering a questionnaire. The students were specifically asked to indicate which interface they found it easier to retrieve information from. Table 5.21 gives the analysis of preference by overseas students and home students in term of rapidity of retrieval. Table 5.22 gives a similar analysis in terms of flexibility. Home students were more in favour of the Mac/HyperCard system, while the overseas students were more comfortable with PC/dBase III+.

Table 5.21

Which system permitted more rapid retrieval ?

System	Total	Overseas	Home-based
HyperCard	8	5	3
dBase III+	28	13	15
Equal	4	2	2

Two-thirds of the students indicated that retrieval of information from the menu-based system was easier and quicker than for Hypertext. Both the home students and the overseas students had a similar view on these differences. Overall, the home students appeared to be in favour of the Mac/HyperCard system more than the overseas students, as illustrated by Table 5.22.

Table 5.22

Which system was more flexible ?

System	Total	Overseas	Home-Based
HyperCard	22	9	13
dBase III+	18	11	7

Appearance of information

The second aspect of the assessment involved students' feedback on the appearance of information on the screen and how well they could absorb it. Table 5.23 shows that both interfaces were considered to be good or acceptable to most students. The general view was that PC/dBase III+ was easier to read, though not as attractive as the Mac/HyperCard system.

Table 5.23

Relative assessments of presentation

User Grading	HyperCard	dBase III+
Poor	2	0
Acceptable	15	11
Good	23	29

The students appeared to be generally pleased with the way information was presented on the screen in both systems. The only variation was that the students found the presentation on the menu-based system to be simpler and easier to understand than it was with the Mac/HyperCard system. Such a difference was apparent when moving from the screen of one system (Mac/HyperCard system) to the other (PC/dBase III+) as indicated in Table 5.24.

Table 5.24

Relative assessment of movement between screens

User Grading	HyperCard	dBase III+
Hard	3	2
Fairly hard	10	2
Fairly easy	14	16
Easy	13	22

Table 5.25

Relative assessment of organisation for rapid retrieval

User Grading	HyperCard	dBase III+
Poor	8	0
Acceptable	19	11
Good	13	29

In response to the question as to which system was better organised for retrieval of information, most students preferred PC/dBase III+. Their responses (Table 5.25) tally well with the observations made earlier relating to ease of retrieval and time taken to answer questions.

Table 5.26

Which hardware/software system is more User-friendly ?

System	Total	Overseas	Home-based
Mac & Hypertext	13	7	6
PC and dBase database	27	13	14

When asked further about the system they thought more user-friendly, two-thirds of the students preferred the PC/dBase III+ system as shown in table 5.26.

Students' comments on both systems

In conclusion, some ideas of the points raised by students can be gained from the selection of their comments presented in Table 5.27.

Table 5.27

Students' comments about both systems

	Hypertext	dBaseIII+
User-friendliness	'Very user-friendly and quick in finding information' 'Hypertext looks more user-friendly, but use of the mouse is not familiar' 'Both are user-friendly but Mac and Hypertext are somewhat easier than dBase'	'Menu-oriented system is user-friendly and simple to navigate'
Easy to understand	'Had some problems due to lack of understanding of the system' 'Hypertext sometimes not very clear, dBase easier to read although not attractive'	'Easy to pick up information and instructions' 'Better working interface and more user-friendly system'
Easy to Use	'More online help to use the system' 'After using Hypertext system, the dBase felt heavy and cumbersome' 'dBase database is complicated whereas Hypertext is straightforward'	'Hypertext is user-friendly but I prefer dBase due to mouse problems' 'Need not have any background to use the system' 'Less confusing and more simple'
Flexibility	'More flexible in finding information' 'Hypertext would take longer to get to know but it is more flexible for an inexperienced user'	'Necessary to go through many steps linearly'

	Hypertext	dBaseIII +
Information presentation	<p>'More clearly presented'</p> <p>'Sometimes screens were too cluttered'</p> <p>'Too much information on the screen at once'</p> <p>'Too much information on the screen that can confuse the beginners'</p>	<p>'Screens are not cluttered up, simple straightforward text not so dazzling'</p> <p>'Logical layout of dBase is more similar to word processor than Hypertext'</p> <p>'With Hypertext you have to keep pressing next button'</p> <p>'Logical sequence of information may lead to answers easily'</p>
Interesting to Use	<p>'Hypertext seems to be quite challenging, though it is interesting to use'</p> <p>'Hypertext is interesting compared to monotonous dBase database'</p>	
Cognitive/ distortion problems	<p>'Not used to different names and terms, difficult to remember'</p> <p>'I got lost somewhere but can't remember where'</p> <p>'Problem of the logical tie between the various steps'</p>	<p>'Forgotten what I have read on the dBase database screen'</p>

	Hypertext	dBaseIII+
More time needed to use	'Hypertext needs much more time to move through the menus' 'Tend to look at other interesting information while searching for something'	'Directions are too much to read'
Searching for information	'Use of mouse is quicker in retrieving information compared to dBase' 'Use of mouse and retrieving of information is quicker compared to dBase' 'Finding answers is difficult' 'Hypertext showed one answer at a time'	'Need not type keywords only a number or letters is enough' 'Difficulty in finding the information on some screens'
Designing	'Not used to the layout'	'Too many headings on the screen' 'Titles are not explanatory enough of their contents'

Conclusion

It can be concluded from the students' performance in completing the tasks on the Mac/HyperCard and PC/dBase III+ systems and from the students' rating of the two systems that the majority of the students found the PC/dBase III+ system easier. There were no significant differences in completing the tasks on the PC/dBase III+ system between the students who had experience in using PC/dBase III+ and those who had not. Students who had experience in using the Mac systems before were able to finish tasks on the HyperCard system in almost the same time they took to finish the PC/dBase III+ tasks. It can be concluded that students with experience of using the Mac system can use either of the two systems readily. The Menu-based interface system appears to be easier for novice users.

b) *Icons experiment*

This study was carried out to find out how well students can recognize different types of icons and the possibility of using them for language -independent instructions. Three types of icons were used - Mac, IBM, and Hand drawn icons.

Students' backgrounds

Fifty-four students participated in the experiment on Icons. They were divided into several groups as described in the chapter on methodology. Each group was selected on the basis of their level of knowledge and experience of computer facilities, and their particular interests. The students' backgrounds as shown in Tables 4.21 and 4.22 in chapter four.

The students' differing backgrounds did not, for the most part, result in a significant difference between student responses. The exception was their length of use of computer facilities. For purposes of analysis, this length of experience was divided into two groups: (1) a group who had experience of up to three years, (2) those with experience of over three years.

Macintosh icons

The seven Mac icons used in this experiment are reproduced below. All were designed by professionals for commercial purposes.

The Mac icons

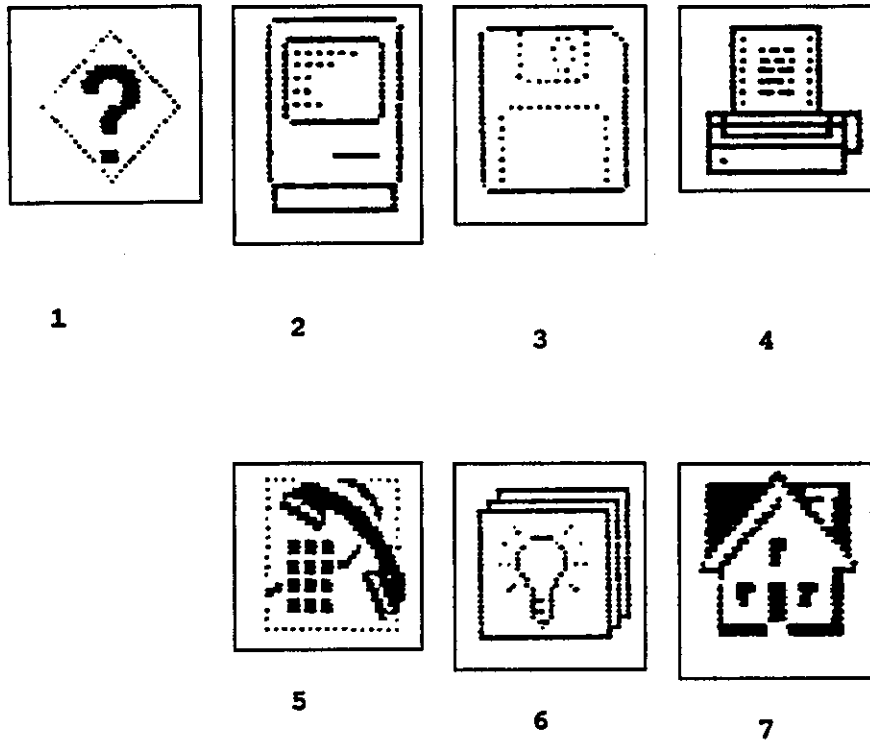


Table 5.28

The Pictures and Functions of the Mac icons

Icon No.	Description of the pictures	Functions of the pictures
1.	Question Mark	Help facilities
2.	Mac monitor	Software
3.	Diskette	Database
4.	Printer	Printing facilities
5.	Telephone	Modem
6.	Light Bulb	New ideas
7.	House	Main menu

The students were asked if they could recognize the pictures of the icons first in the small and medium sizes (See Appendix 5 for more detail). They then had to identify the function of the icons in the computer system. The tables below present the students' performance in recognizing the pictures of the icons. A further set of tables present the students' performance in identifying the functions of these icons.

Recognising Mac pictures

Table 5.29 shows the students' responses in recognizing the pictures of the icons at the two different sizes in the first and second times round.

Table 5.29
Mac system pictures

Experiment No.	Small size		Medium size		No response
	Correct	Wrong	Correct	Wrong	
Exper. 1	198 (52%)	27 (7%)	115 (31%)	15 (4%)	23 (6%)
Exper. 2	277 (75%)	14 (4%)	66 (18%)	8 (2%)	6 (1%)

A statistical test was applied to Table 5.29 to see whether these were significant differences between the students' responses in the two experiments. Such significant differences ($X^2 = 13.5$ $DF = 1$) and ($X^2 = 4.6$ $DF = 1$) were found between the responses to the correct answers and the wrong answers, respectively, of the two experiments in the small size category. The number of students who recognized the pictures in small size increased significantly in the second experiment; at the same time, wrong identifications decreased significantly. Another significant difference of ($X^2 = 14.3$ $DF = 1$) was found between the correct responses of the two experiments in the medium size category. Overall, this reflect a slight identification from the medium size to the small size in the second experiment. Finally, there is a

significant difference of ($X^2 = 15.1$ DF = 1) between the 'No responses' category in the two experiments, in the sense that the students' performances improved significantly in the second experiment. Further analysis of the wrong responses and no responses is presented in Table 5.30 and Table 5.31.

Wrong response

Table 5.30 shows the icons which the students did not recognize correctly and how many students did not recognize each icon.

Table 5.30

Wrong response to Mac pictures

Mac icon	Question mark	Mac monitor	Diskette	Printer	Telephone	Light Bulb	House
Experiment 1	7	8	3	15	00	7	2
Experiment 2	1	5	2	9	00	5	00

As can be seen, the difficulty of the pictures varied. It should be added that six of the students who responded incorrectly in experiment 2 also responded incorrectly to experiment 1.

No response

As shown in Table 5.29 there differences between the no responses in the two experiments. Further investigation was carried out to find out which icons the students responded to least. The data are presented in Table 5.31.

Table 5.31

No response in recognizing the Mac pictures

Mac picture	Question mark	Mac monitor	Diskette	Printer	Telephone	Light Bulb	House
Experiment 1	4	7	2	00	00	5	4
Experiment 2	3	1	00	00	00	1	1

The table above shows the icons which the students did not respond to. Fifteen students did not respond in experiment one, while only five students did not respond in experiment two. All but one of the students who did not respond to experiment two also did not respond to experiment one except one.

Degrees of difficulty in recognizing the pictures of the icons in the Mac system
Tables 5.30 and 5.31 show the number of students who responded incorrectly or did not respond in recognizing the pictures of the Mac icons. This total number of students can be taken as a reflection of the degree of difficulty for identifying each icon. The icon with the largest number can be regarded as the most difficult for the students to recognize (See Table 5.32). This method of assessment will be used in relating the Mac icons to their functions as well as for the IBM and Hand-drawn icons.

Table 5.32

Degree of difficulty in recognizing the Mac pictures

DOD	Experiment 1		Experiment 2	
	Pictures	NOS	Pictures	NOS
1.	Printer	15	Printer	9
2.	Mac monitor	15	Mac monitor	6
3.	Light Bulb	12	Light Bulb	6
4.	Question Mark	11	Question Mark	4
5.	House	6	Diskette	2
6.	Diskette	5	House	1
7.	Telephone	00	Telephone	00
Total		64	-----	28

DOD = Degree of Difficulty NOS = Number of Students

The results on the table above show that the printer was the most difficult picture for the students to recognize followed by the Mac monitor, the light bulb, then the question mark in the two experiments. The Telephone picture was the easiest picture for the students to recognize in the two experiments.

Pictures and students' experience

As discussed in chapter two, users' experience might affect their performance in doing a task. Twenty-seven of them in this experiment had used computer facilities for up to three years, while the remainder had used these facilities for more than

three years. Table 5.33 shows the students' performance in recognizing the pictures of the Mac icons as a function of their computer experience.

Table 5.33

Mac system pictures

Users with experience of up to 3 years vs users with experience over 3 years in using computer facilities

Experiments	Correct		Wrong	
	Under 3	Over 3	Under 3	Over 3
Experiment 1	146 (39%)	167 (44%)	24 (7%)	13 (3%)
Experiment 2	159 (43%)	184 (49%)	17 (5%)	5 (1%)

A statistical test was applied to the above table and it shows no significant difference between the students as a function of their computer experience. We could not apply the test to the 'wrong' category of the second experiment, because of the small number in the final cell, but there is an indication that the students with over three years experience recognized the pictures better than those with experience of up to three years.

Mac functions

As discussed in chapter three, the students were asked to recognize the pictures of the icons then to relate them to their function. The students were then told what function the icons represented after they finished Experiment 1. A minimum of three weeks was given between Experiment 1 and Experiment 2 which aimed to see how well the students could remember the functions of the icons. Table 5.34 presents the students' responses to the functions of the icons in the two experiments.

Table 5.34**Macintosh system functions**

Experiment number	Functions		
	Correct	Wrong	No response
Experiment 1	185 (48%)	117 (30%)	74 (22%)
Experiment 2	279 (75%)	57 (15%)	35 (10%)

A statistical test was applied to Table 5.34 and it shows significant differences of ($X^2 = 19.8$ DF = 1), ($X^2 = 23.5$ DF = 1) and ($X^2 = 16$ DF = 1) between the students' responses for the Correct, Wrong and No response categories, respectively, in Experiment 1 and Experiment 2. Clearly the students were able to remember functions to a significant extent.

Wrong responses

Wrong responses were investigated in detail in order to determine the icons to which the students' responded incorrectly. The results are presented in Table 5.35.

Table 5.35**Wrong responses to Mac functions**

Mac function	Help facilities	Software	Database	Printing facilities	Modem	New ideas	Main menu
Experiment 1	7	14	27	8	14	26	21
Experiment 2	4	17	1	7	12	3	3

The table above shows the students' wrong responses to the Mac icons functions. All the students responded incorrectly to some functions in experiment one, while only twenty-three students responded wrongly in experiment two.

No response

Some students did not respond regarding the functions of some icons in the two experiments, as shown in Table 5.34. Table 5.36 presents the 'No responses' of the students to the functions of the Mac icons.

Table 5.36
No response Mac functions

Mac function	Help facilities	Software	Database	Printing facilities	Modem	New ideas	Main menu
Experiment 1	9	19	3	3	6	16	20
Experiment 2	4	11	3	1	00	3	12

Thirty-five students did not respond in Experiment one, while twenty-two students did not respond in Experiment two. However, only two students did not respond in either Experiment 1 or Experiment 2.

Degrees of difficulty in relating the icons of the Mac system to their functions

Tables 5.33 and 5.34 show the number of students who responded incorrectly or did not respond in relating the icons of the Mac system to their functions. The procedures which were used in calculating the degree of difficulty in recognizing the pictures of the Mac icons are used here to calculate the degree of difficulty in relating the icons to their functions.

Table 5.37

Degree of difficulty in relating the Mac icons to their functions

DOD	Experiment 1		Experiment 2	
	Functions	NOS	Functions	NOS
1.	New ideas	42	Software	28
2.	Main menu	41	Main menu	15
3.	Software	33	Modem	12
4.	Database	30	Help	8
5.	Modem	20	Printer	8
6.	Help	16	New ideas	6
7.	Printer facilities	11	Database	4
Total		193	-----	81

DOD = Degree of Difficulty NOS = Number of Students

The results show that the degree of difficulty in relating the Mac icons to their functions varied between the two experiments. For example, the new ideas icon was the most difficult icon in experiment 1, while it was the second most easy icon in experiment 2.

Functions and students' experience

Table 5.38 shows the responses of students with different experience of using computer facilities in relating the Mac icons in the two experiments to their functions.

Table 5.38

Macintosh icons functions

Experience under 3 years VS over 3 years

Experiments	Correct		Wrong		No response	
	Under 3	Over 3	Under 3	Over 3	Under 3	Over 3
Exper. 1	61 (16%)	78 (21%)	85 (22%)	71 (19%)	43 (11%)	40 (10%)
Exper. 2	120 (32%)	145 (39%)	36 (10%)	32 (9%)	26 (7%)	12 (3%)

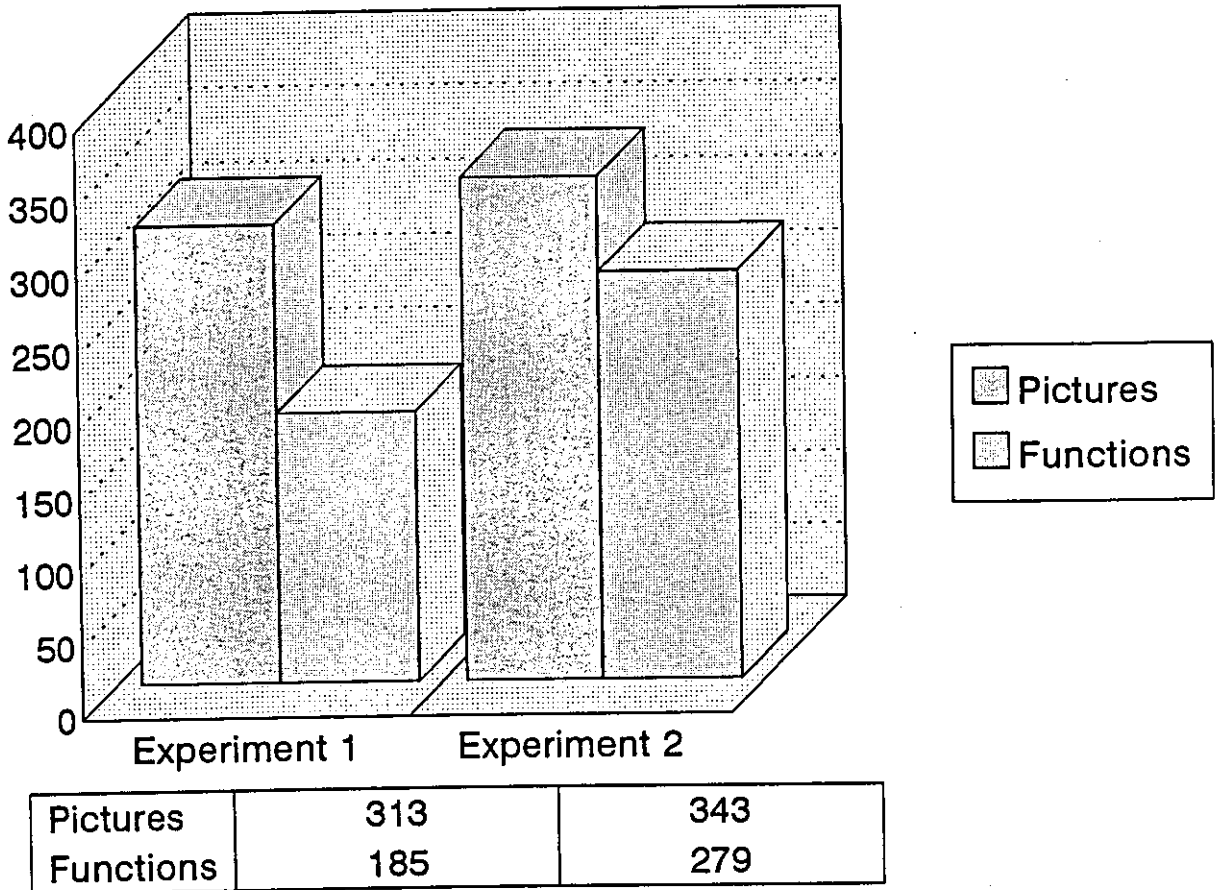
A statistical test was applied to Table 5.38 and it showed a significant difference of ($X^2 = 5.9$ DF = 1) in the 'No responses' category in the second experiment. Students with less experience of using computer facilities did not respond so well in relating Mac icons to their functions.

Correct answers to the Mac pictures and functions

The students' correct answers to the Mac Pictures and Functions show how well the students can recognize the pictures of the icons, then how well they can relate them to the functions of the computer facilities. Figure 5.1 shows the responses to the Pictures and Functions for the two experiments.

Figure 5.1

Correct answers to the Mac Pictures and Functions



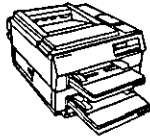
A statistical test was applied to the correct answers to the Mac pictures and functions as shown in Figure 5.1. It shows no significant differences between the answers for the pictures of the two experiments. However, there was a significant difference between the responses for the functions in the two experiments. A significant difference ($X^2 = 32.9$ at the $DF = 1$) was found between the correct answers to the pictures and the functions of experiment one, while there was a significant difference of ($X^2 = 6.6$ at the $DF = 1$) between the correct answers to the pictures and the functions of experiment two. In other words, while the students recognized the

pictures in both experiments with no significant differences, there was a significant difference in identifying the functions of the icons in the two experiments. The students identified the functions of the icons in experiment two better than in experiment one, which suggests that, after users have used the icons for the first time, it is easier for them to identify them when they see them again.

IBM Icons

The seven icons selected from the IBM system are reproduced below. The icons were designed by professionals for commercial purposes.

IBM icons pictures



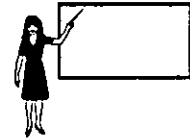
1



2



3



4



5



6



7

Table 5.39

The Pictures and Functions of the IBM icons

Icon No.	Description of the pictures	Functions of the pictures
1.	Laser printer	Printing facilities
2.	Personal Computer	Software
3.	World map	Geographical places
4.	Teacher and board	On-line teaching class
5.	Telephone	Modem
6.	Newsletter	Electronic newsletter or journals
7.	Diploma	Degree requirements

The students were asked to recognize these icons then to relate them to their functions. The set of tables below present the students' recognition of the pictures of the IBM icons, and another set present the students' ability to relate them to functions of the icons.

Recognising the IBM pictures

Table 5.40 shows the performance of the students in recognising the pictures of the IBM icons in the two different sizes.

Table 5.40
IBM system pictures

Experiment number	Small size		Medium size		No response
	Correct	Wrong	Correct	Wrong	
Exper. 1	137 (37%)	16 (4%)	159 (42%)	39 (10%)	27 (7%)
Exper. 2	253 (68%)	12 (4%)	82 (22%)	20 (5%)	4 (1%)

A statistical test was applied to Table 5.40 to look for the differences between the responses in the two experiments. A significant difference ($X^2 = 37.9$ DF = 1) was found between the responses for the correct answers in the 'small size' of the two experiments. It can be concluded from this that the performance improved significantly in the second experiment. Further investigation of the Wrong response and No response answers is presented in Tables 5.41 and 5.42.

Wrong response

Table 5.41 shows the students' wrong responses to the IBM icons. It identifies the icon and the number of students who responded to it incorrectly.

Table 5.41

Wrong response to IBM pictures

IBM icon	Printer	PC	World Map	Teacher & Board	Telephone	Newsletter	Diploma
Experiment 1	8	00	4	3	4	11	22
Experiment 2	2	4	3	1	5	8	9

Twenty-nine students answered incorrectly in experiment 1, while only fourteen students answered incorrectly for the icons in experiment 2. Twelve of the students who answered incorrectly in experiment 1 also answered incorrectly in experiment 2.

No response

Table 5.42 shows the icons which students did not respond to, and the number of students who did not respond to each icon.

Table 5.42

No response in recognizing the IBM pictures

IBM	Printer	PC	World Map	Teacher & Board	Telephone	Newsletter	Diploma
Experiment 1	00	2	6	2	5	4	8
Experiment 2	00	00	00	1	00	00	2

Sixteen students did not respond in experiment one, while only four students did not respond to experiment two. All the students who did not respond in experiment two also did not respond in experiment one.

Degrees of difficulty in recognizing the pictures of the icons in the IBM system

Tables 5.41 and 5.42 show the number of students who responded incorrectly or did not respond in recognizing the pictures of the IBM icons. A combination of the two

tables will be used to show the degrees of difficulty of each of the IBM icons. The same procedure was used to assess the degree of difficulty of recognizing the icons as in the Mac system.

Table 5.43

Degree of difficulty in recognizing the IBM pictures

DOD	Experiment 1		Experiment 2	
	Pictures	NOS	Pictures	NOS
1.	Diploma	30	Diploma	11
2.	Newsletter	15	Newsletter	8
3.	World map	10	Telephone	5
4.	Telephone	9	Personal Computer	4
5.	Printer	8	World map	3
6.	Teacher & Board	5	Teacher & Board	2
7.	Personal Computer	2	Printer	2
Total		79	-----	35

DOD = Degree of Difficulty NOS = Number of Students

The results show that the most difficult icons for students to recognize were the Diploma and the Newsletter. The students' performance in recognizing the other pictures differed in the two experiments.

Pictures and students' experience

Experience of using computers may affect the performance of the students, as discussed in chapter 2. Table 5.44 shows the students with up to three years experience in using computer facilities separately from those who had more than three years experience.

Table 5.44

IBM system pictures

Users with experience of up to 3 years vs users with experience over 3 years in using computer facilities

Experiments	Correct answers		Wrong answers	
	Under 3	Over 3	Under 3	Over 3
Exper. 1	144 (38%)	152 (40%)	32 (9%)	23 (6%)
Exper. 2	156 (42%)	179 (48%)	24 (7%)	8 (2%)

A statistical test was applied to Table 5.44 and it showed a significant difference ($X^2 = 10.7$ $DF = 1$) between the students' recording a Wrong answer in the second experiment. This difference suggests that students with experience of over three years in using computer facilities performed better than those with experience of up to three years.

IBM functions

The students were asked to relate the pictures of the IBM system they saw to their functions. When the students had answered in the first experiment, they were given a list of the functions of the icons (See Appendix for more details). A minimum of three weeks was allowed between the two experiments, then the students were asked again to relate the pictures to their functions. Table 5.45 shows how well the students

remembered these functions.

Table 5.45
IBM system functions

Experiment #	Functions		
	Correct	Wrong	No response
Experiment 1	108 (29%)	166 (44%)	104 (27%)
Experiment 2	234 (63%)	98 (26%)	39 (11%)

A statistical test was applied to the above table and it shows significant differences ($X^2 = 53.8$ DF = 1), ($X^2 = 18.8$ DF = 1), and ($X^2 = 45.1$ DF = 1) between the students' responses to the two experiments in the Correct, Wrong, and No response categories of the experiments, respectively. The difference shows that the students' performance improved significantly in Experiment 2.

Wrong response

Further investigation into the student responses in the Wrong category was carried out, in order to find out which icons the students could not readily relate to their functions, and how many students related the icons incorrectly (Table 5.46).

Table 5.46
Wrong responses to IBM functions

IBM function	Printing facilities	Software	Geograph. database	On-line teaching class	Modem	Electronic newsletter or journal	Degree requirements
Experiment 1	17	36	20	33	15	21	24
Experiment 2	9	15	10	17	4	21	22

All the students responded incorrectly to the functions of the IBM icons in one or

more cases in the first experiment. Thirty-two students responded incorrectly to the second experiment.

No response

Table 5.45 shows significant differences between the students' responses for the 'No response' category. More investigation was carried out to identify the icons which the students did not respond to, and the number of students who did not respond to each icon, as shown in Table 5.47.

Table 5.47
No response to the IBM functions

IBM	Printing facilities	Software	Geograph. database	On-line teaching class	Modem	Electronic newsletter or journal	Degree requirements
Experiment 1	5	17	16	11	16	11	28
Experiment 2	1	11	5	2	4	5	11

Forty-two students did not respond in experiment one, while twenty students did not respond in experiment two.

Degrees of difficulty in relating the icons of the IBM system to their functions

Tables 5.46 and 5.47 show the number of students who responded incorrectly or did not respond in relating the icons of the IBM system to their functions. The same counting procedures used with the Mac icons are used here with the IBM icons.

Table 5.48

Degree of difficulty in relating the IBM icons to their functions

DOD	Experiment 1		Experiment 2	
	Functions	NOS	Functions	NOS
1.	Software	53	Degree requirements	33
2.	Degree requirements	52	Software	26
3.	Online teaching class	44	Newsletter	26
4.	Geographical database	36	Online teaching class	19
5.	Newsletter	32	Geographical database	15
6.	Modem	31	Printing facilities	10
7.	Printer facilities	22	Modem	8
Total		270	-----	137

DOD = Degree of Difficulty

NOS = Number of Students

Functions and students' experience

Table 5.49 shows the responses of the students with different experience of using computer facilities. Students with experience of up to three years are in one group and the other group are the students who had used computer facilities for more than three years.

Table 5.49

IBM icons functions

People with experience up to 3 years vs Those with experience over 3 years

Experiment number	Functions					
	Correct		Wrong		No response	
	Under 3	Over 3	Under 3	Over 3	Under 3	Over 3
Experiment 1	49 (13%)	59 (61%)	92 (24%)	74 (19%)	48 (13%)	56 (15%)
Experiment 2	101 (27%)	133 (36%)	49 (13%)	49 (13%)	32 (9%)	7 (2%)

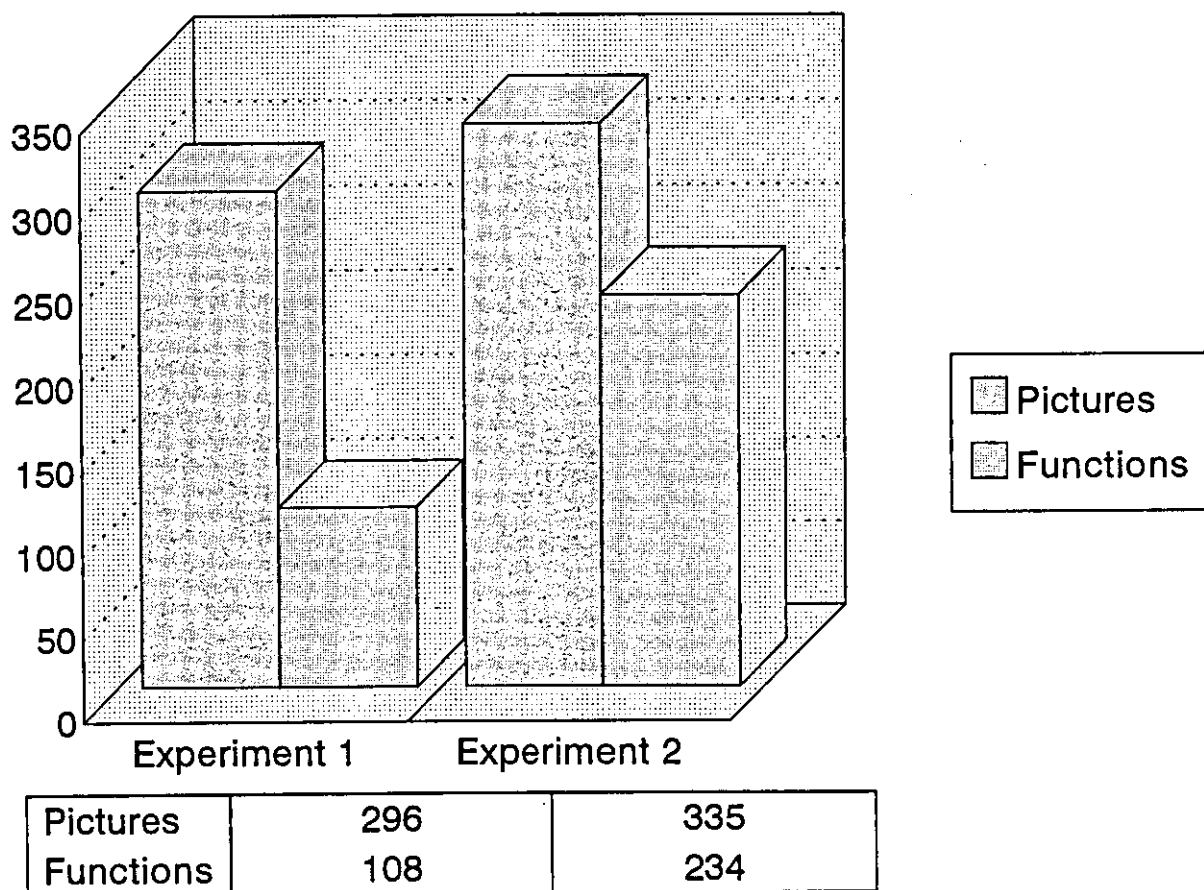
A statistical test was applied to the above Table 5.49 and significant differences ($X^2 = 4.4$ $DF = 1$) and ($X^2 = 27.2$ $DF = 1$) were found between the response of the students with experience of up to three years in using the computer facilities and those with experience of over three years for the Correct and No response categories in Experiment 2.

Correct answers for the IBM pictures and functions

The correct responses for the pictures and the functions of the two experiments were investigated in more detail. Figure 5.2 shows the correct responses to the pictures and the functions in both experiments.

Figure 5.2

Correct answers to the IBM Pictures and Functions in both experiments



A statistical test was applied to the correct answers in experiment 1 and experiment 2 as shown in figure 5.2. It showed no significant differences between the correct answers to the pictures in the two experiments. There is a significant difference ($X^2 = 100.5$ $DF = 1$) between the correct answers to the pictures and functions in experiment one, and a similar significant difference ($X^2 = 18$ $DF = 1$) in experiment two. We can conclude that the students recognized the pictures of the

system in both experiments with no significant differences, while there is a significant difference in identifying the functions of the pictures in both experiments. The students identified the functions of the pictures in experiment two significantly better than in experiment one.

Hand-drawn Icons

The seven hand-drawn icons used in this experiment were designed by the author. They were used for research purposes to represent some of the network facilities.

Hand-drawn icon pictures

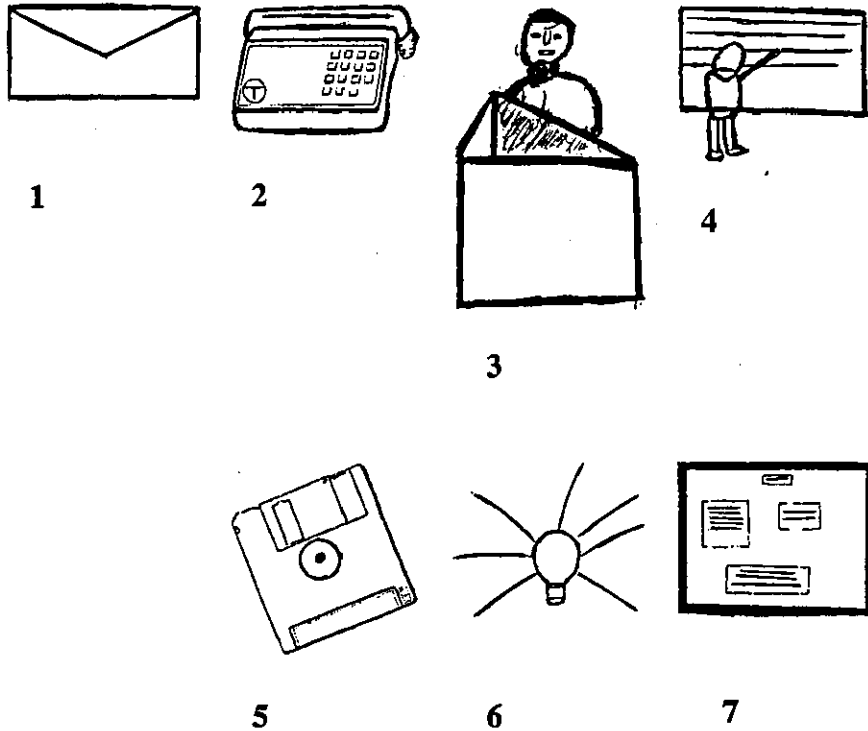


Table 5.50

The pictures and functions of the Hand-drawn icons

Icon No.	Description of the pictures	Functions of the pictures
1.	Envelope	E-mail
2.	Telephone	Modem
3.	Person giving speech	Computer Conferences
4.	Teacher and board	On-line teaching class
5.	Diskette	Database
6.	Light Bulb	New ideas
7.	Bulletin Board	Electronic Bulletin Board

The idea of designing these icons was to investigate differences in user reactions to icons designed by professionals and non-professionals. Students were asked to recognize the pictures, then to relate them to the appropriate functions of the computer facilities. One set of tables below show the students' perceptions in recognizing the pictures of the Hand-drawn icons, and another set show the results.

Recognising the Hand-drawn pictures

Table 5.51 below shows the responses in recognizing the pictures of the Hand-drawn pictures in the small and medium sizes.

Table 5.51

Hand-drawn design pictures

Exper. No.	Small size		Medium size		No response
	Correct	Wrong	Correct	Wrong	
Exper. 1	65 (17%)	11 (3%)	194 (52%)	54 (14%)	54 (14%)
Exper. 2	184 (50%)	16 (4%)	124 (34%)	31 (8%)	14 (4%)

A statistical test was applied to Table 5.51 and a significant difference ($X^2 = 59.5$ $DF = 1$) was found between the students' response for the correct answers to the small size in both experiments. This indicates that the students recognized the pictures of the icons in the small size significantly better in the second experiment. Another significant difference ($X^2 = 16.2$ $DF = 1$) and ($X^2 = 6.7$ $Df = 1$) was found between the students' responses for the correct and wrong answers, respectively, in the medium size of the two experiments. The results show that the students' performance improved significantly in Experiment 2. Finally a significant difference ($X^2 = 36.2$ $DF = 1$) was found between the responses for the 'No response' category of both experiments. Further investigations of the wrong responses and no

responses are presented in Tables 5.52 and 5.53.

Wrong response

Table 5.52 shows the number of students who recognized the pictures of the Hand-drawn icons incorrectly.

Table 5.52
Wrong response to Hand-drawn pictures

Hand-drawn icon	Envelope	Telephone	PGS	Teacher & Board	Diskette	Light Bulb	Bulletin board
Experiment 1	00	21	9	5	00	3	27
Experiment 2	3	9	5	4	00	4	22

**PGS = Person Giving Speech*

Thirty-seven students recognized the pictures incorrectly in the first experiment while twenty-six students recognized the pictures incorrectly in the second experiment. All the students who responded incorrectly in the second experiment also responded incorrectly in the first experiment.

No response

Table 5.53 shows the number of students who did not recognize the pictures from the Hand-drawn icons.

Table 5.53

No response in recognizing the Hand-drawn Pictures

Hand-drawn icon	Envelope	Telephone	PGS	Teacher & Board	Diskette	Light Bulb	Bulletin board
Experiment 1	2	15	16	4	00	5	12
Experiment 2	00	2	00	1	00	1	4

***PGS = Person Giving Speech**

Thirty-two students did not respond to experiment one, while only nine students did not respond to experiment two. All the students who did not respond to experiment two also did not respond to experiment one.

Degrees of difficulty in recognizing the pictures of the icons in the Hand-drawn system
Tables 5.52 and 5.53 show the number of students who responded incorrectly or did not respond in recognizing the pictures of the Hand-drawn icons. A combination of the two tables will be used to show the degrees of difficulty of each of the icons. The procedure used for the icons in the Mac system is applied to the Hand-drawn icons.

Table 5.54

Degree of difficulty in recognizing the Hand-drawn pictures

DOD	Experiment 1		Experiment 2	
	Pictures	NOS	Pictures	NOS
1.	Bulletin Board	37	Bulletin Board	26
2.	Telephone	36	Telephone	11
3.	Person giving speech	25	Person giving speech	5
4.	Teacher & Board	9	Teacher & Board	5
5.	Light Bulb	8	Light Bulb	5
6.	Envelope	2	Envelope	3
7.	Diskette	00	Diskette	00
Total		117	-----	55

DOD = Degree of Difficulty NOS = Number of Students

The results show that the degree of difficulty in recognizing the pictures of the Hand-drawn icons retained much the same order in the two experiments.

Pictures and students' experience

Possible differences in performance between those with computer experience of up to three years and those who had experience of over three years was next investigated. Table 5.55 compares the performance of these students in recognizing the pictures of the Hand-drawn icons.

Table 5.55

Hand-drawn icon pictures

**People with experience up to 3 years vs those with experience of
over 3 years in using computer facilities**

Experiments	Correct answers		Wrong answers	
	Under 3	Over 3	Under 3	Over 3
Experiment 1	129 (34%)	130 (34%)	36 (9%)	29 (7%)
Experiment 2	147 (39%)	164 (44%)	27 (7%)	20 (6%)

A statistical test applied to Table 5.55 showed no significant difference between the responses of the two experiments.

Hand-drawn function

The same procedure for retesting students concerning the functions of the icons was used as before. Table 5.56 presents the students' responses to the functions of the icons in the two experiments.

Table 5.56

Hand-drawn icons function

Experiment # -----	Functions		
	Correct	Wrong	No response
Experiment 1	57 (15%)	215 (57%)	106 (28%)
Experiment 2	240 (65%)	97 (26%)	34 (9%)

A statistical test was applied to the above table and it showed significant differences ($X^2 = 181.8$ $DF = 1$), ($X^2 = 52.1$ $DF = 1$) and ($X^2 = 50.3$ $DF = 1$) between the student responses for the Correct, Wrong and No response categories, respectively, in the two experiments. All three results indicated that the students performed significantly better in the second experiment. Further investigation of the Wrong and No response categories was carried out and is presented in Tables 5.57 and 5.58.

Wrong response

Table 5.57 shows the number of students who responded incorrectly for each to the Hand-drawn icons.

Table 5.57

Hand-drawn wrong responses to functions

Hand-drawn icon	E-mail	Modem	CC	Online teaching class	Database	New ideas	EBB
Experiment 1	20	39	23	26	45	29	33
Experiment 2	12	21	2	8	26	13	15

CC = Computer Conferences

EBB = Electronic Bulletin Board

All the students responded incorrectly to some functions of the Hand-drawn icons in the first experiment, and only forty-one students responded incorrectly in the second experiment.

No response

Some students did not respond to the functions of some icons in both experiments, as shown in table 5.56. Table 5.58 presents the 'No response' answers of the students to the functions of the Hand-drawn icons.

Table 5.58

Hand-drawn no-response functions

Hand-drawn icon	E-mail	Modem	CC	Online teaching class	Database	New ideas	EBB
Experiment 1	7	17	33	11	7	16	15
Experiment 2	2	7	8	5	2	5	5

CC = Computer Conferences

EBB = Electronic Bulletin Board

Forty-two students did not respond to experiment one, while nineteen students did not respond to experiment two. Most of the students (95%) who did not respond to experiment two were the same students who did not respond to experiment one.

Degrees of difficulty in relating the icons of the Hand-drawn system to their functions

Tables 5.57 and 5.58 show the number of students who responded incorrectly or did not respond in relating the icons of the Hand-drawn pictures to their functions. The same procedures used with the Mac icons were also used with the Hand-drawn icons.

Table 5.59

Degree of difficulty in relating the Hand-drawn icons to their functions

DOD	Experiment 1		Experiment 2	
	Functions	NOS	Functions	NOS
1.	Computer Conferences	53	Database	28
2.	Database	52	On-line teaching class	26
3.	Online teaching class	50	Computer Conferences	20
4.	Electronic Bulletin Board	48	Electronic Bulletin Board	20
5.	New ideas	45	New ideas	18
6.	Modem	33	Modem	15
7.	E-mail	30	E-mail	4
Total		311	-----	131

DOD = Degree of Difficulty NOS = Number of Students

Functions and students' experience

Table 5.60 shows the correct and wrong answers of the students with different backgrounds in using computer facilities.

Table 5.60
Hand-drawn icon function
Experience under 3 years vs over 3 years

Exper. No.	Correct		Wrong		No response	
	Under 3	Over 3	Under 3	Over 3	Under 3	Over 3
Exper. 1	25 (7%)	32 (8%)	114 (30%)	101 (27%)	50 (13%)	56 (15%)
Exper. 2	104 (28%)	136 (37%)	53 (14%)	44 (12%)	25 (7%)	9 (2%)

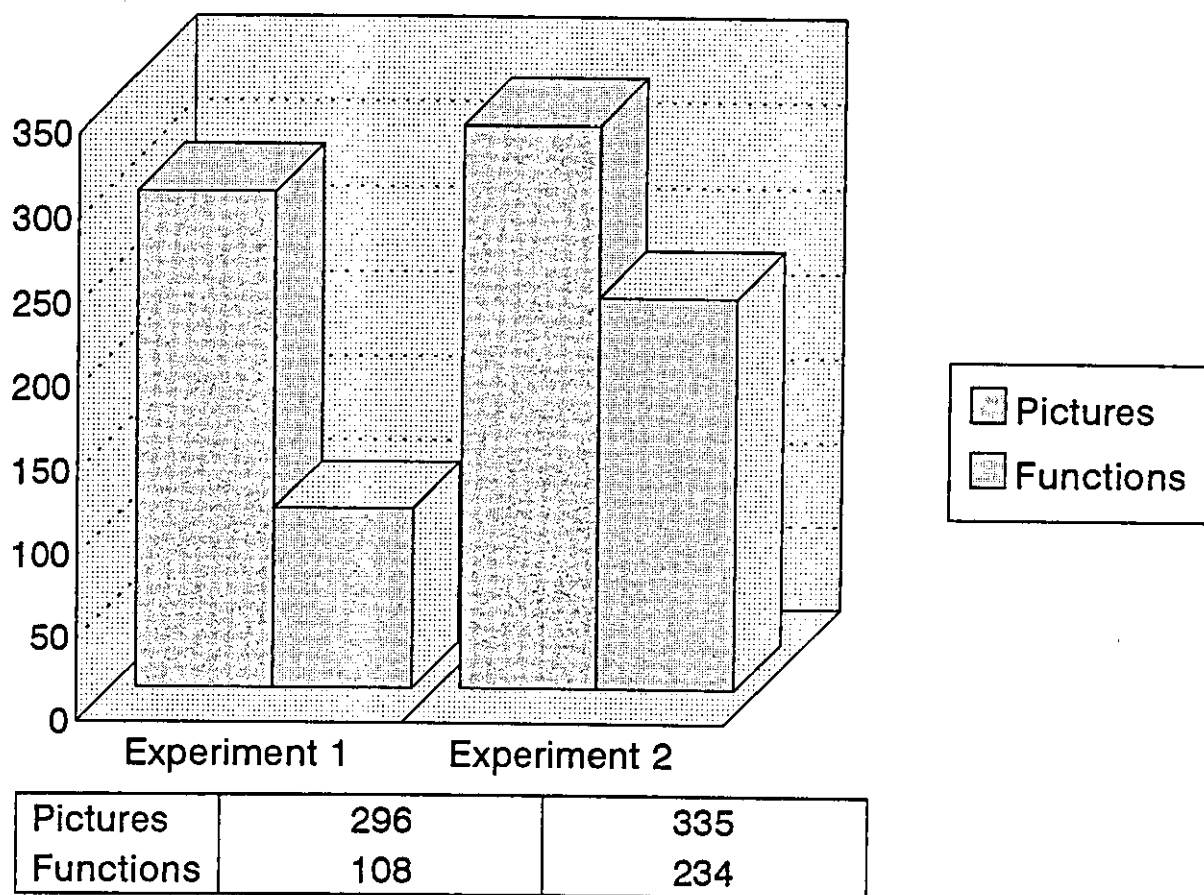
A statistical test was applied to Table 5.60 and it showed that the students with over three years in using computer facilities performed significantly better in the second experiment. A significant difference ($X^2 = 4.3$ DF = 1) and ($X^2 = 9.7$ DF = 1) was found between the results for the Correct and No response categories, respectively, in the second experiment.

Correct answers to the Hand-drawn pictures and functions

The students' correct answers to the Hand-drawn Pictures and Functions show how well they can recognize the pictures of the icons, and also how well they can relate them to their function. Figure 5.3 indicates the responses to the Pictures and Functions in the two experiments.

Figure 5.3

Correct answers to the Hand-drawn Pictures and Functions



A statistical test applied to the correct answers for the Hand-drawn pictures and functions in the two experiments shows no significant differences between the responses in recognising the pictures. There is a significant difference ($X^2 = 129$ $DF = 1$) between the correct answers to the pictures and functions in experiment one, and another significant difference ($X^2 = 8.4$ $DF = 1$) between the correct answers to the pictures and the functions in experiment two. Hence, students performed significantly better in the second experiment.

Students' perceptions of the pictures and functions of the three types of icons

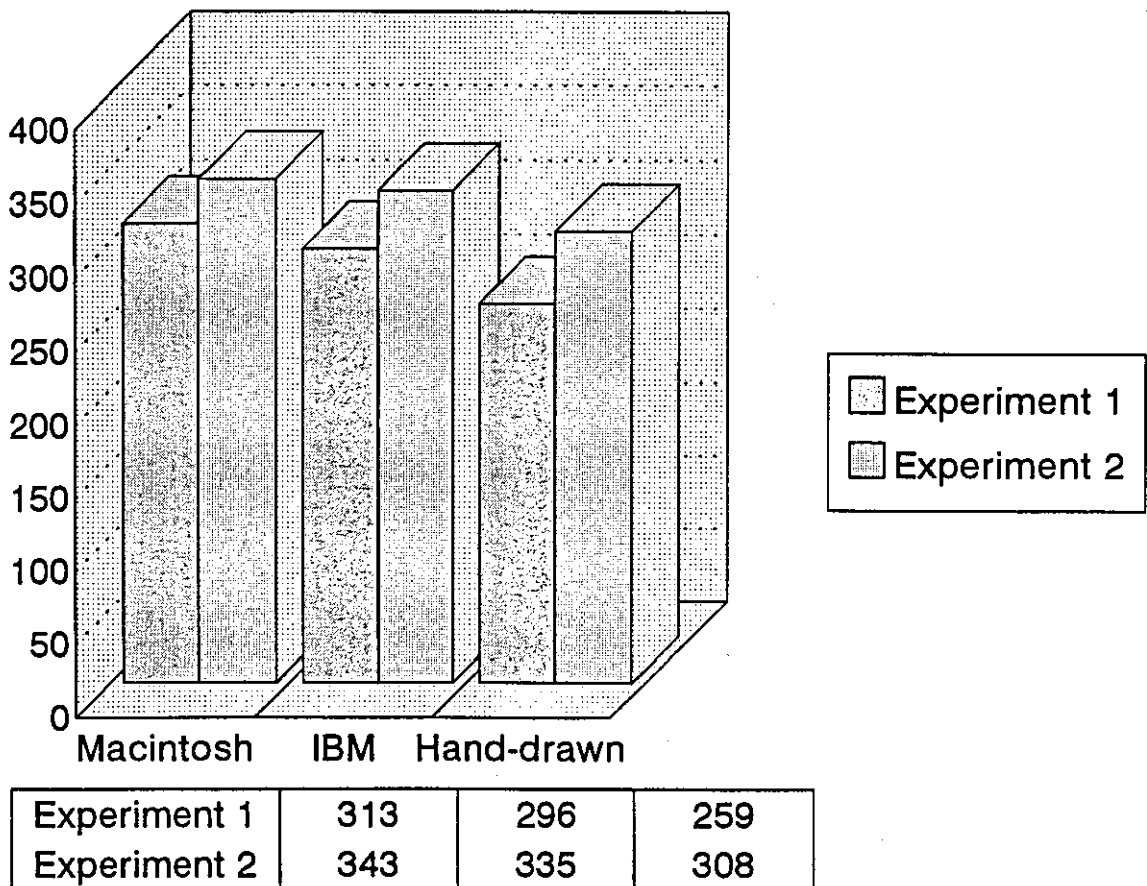
A comparison of the students' correct answers in recognising the pictures of the three types of icon, then relating them to the function of the computer facilities, is presented in figures 5.4 and 5.5.

Pictures

Students performed differently in the experiments for recognizing the pictures of the three types of icons. Figure 5.4 presents the results.

Figure 5.4

Students performance in recognizing the pictures of the three types of icons



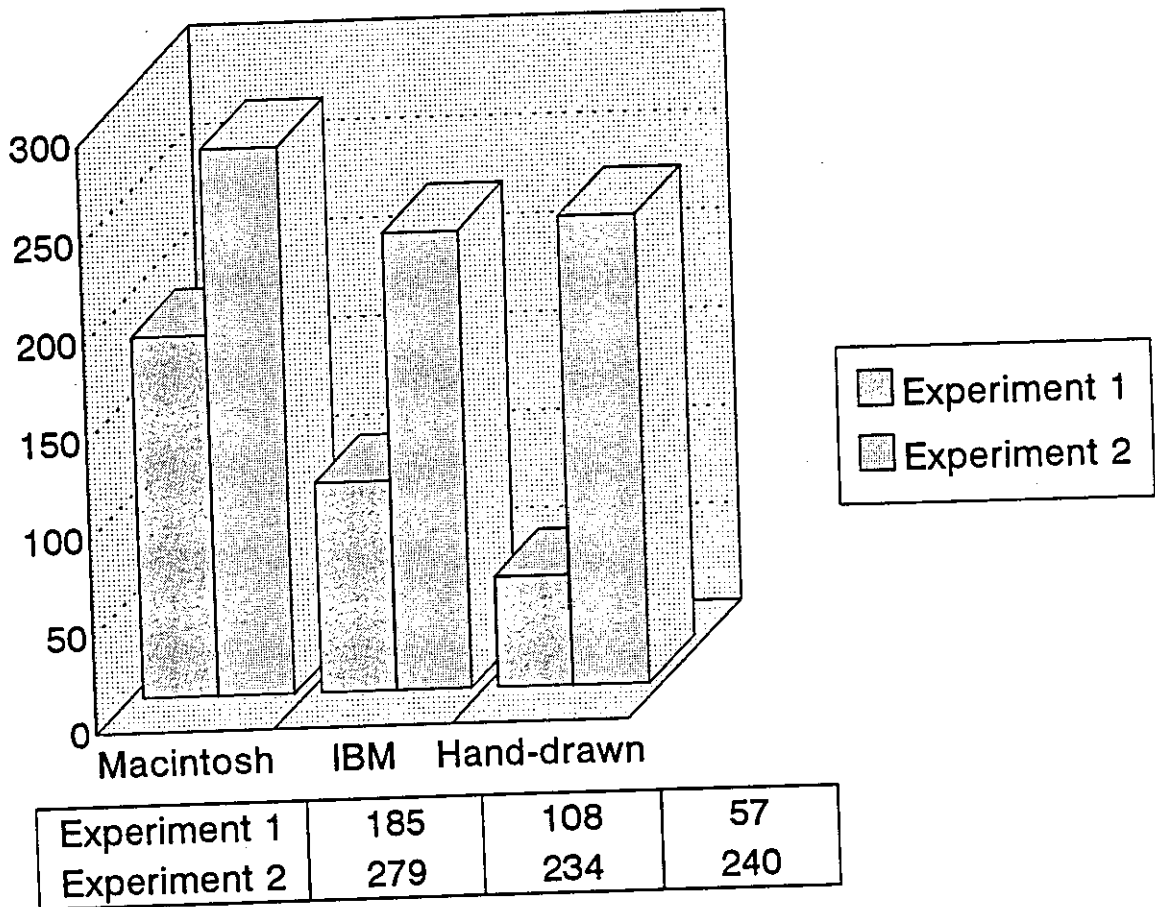
A statistical test was applied to the students' performance in recognizing the pictures of the three types of icons in the two experiments. The results show a significant difference ($X^2 = 5.1$ at the $DF = 1$) between the Mac and the Hand-drawn pictures in the first experiment. The students recognized the Mac icons' pictures significantly better than the Hand-drawn icons' picture. The test does not show any significant differences between the students' performance in recognizing the pictures of the three types of icons in Experiment 2.

Functions

Students performed differently in the two experiments when relating the pictures of the three types of icons to their functions. Figure 5.5 shows the results.

Figure 5.5

Students' performance in relating the pictures of the icons to their functions



A statistical test was applied to the results of the two experiments shown in Figure 5.5, and indicated significant differences ($X^2 = 21.7$ $DF = 1$), ($X^2 = 94$ $DF = 1$) and ($X^2 = 17.4$ $DF = 1$) between student performance in relation to Mac and IBM

icons, Mac and Hand-drawn icons and IBM and the Hand-drawn icons, respectively, in terms of their functions in the first experiment. Student performances improved significantly in the second experiment. The statistical test showed only one significant difference ($X^2 = 4$ $DF = 1$) between student performances in relating the Mac and IBM icons to their functions. This significant difference indicates that the students related to the icons of the Mac system significantly better than to the IBM icons.

Words

Six words related to the computer facilities were selected for this experiment (See Appendix V for more details). The purpose of using these words was to give the students an opportunity to see both words and icons to determine which type of entry they would prefer to use on screen. The words were displayed, like the icons, in three sizes (See Appendix V for more details). The students' performance in recognizing the words is presented in Table 5.61.

Table 5.61

Words

Experiments	Small size	Medium size
	Correct	Correct
Experiment 1	237 (73%)	85 (27%)
Experiment 2	263 (83%)	55 (17%)

A statistical test was applied to Table 5.61 and it showed a significant difference ($X^2 = 6.7$ $DF = 1$) between the students' responses at the medium size in the two experiments.

Results of the students' rating

At the end of each experiment the students were given an evaluation form asking them for their opinions of the icons and their assessment of them as an entry point for frequent on-screen use (See appendix V for more details). The results from the evaluation form are presented in several tables below.

Size of icons

Students were shown three sizes of icons (See Appendix V for more details), and then were asked which size of icon they thought was the best for frequent on-screen use. They were also asked for the factors they had in mind when they chose the size of the icons. The results from these two questions are presented in tables 5.53 and 5.54.

Table 5.62

Size of icons the students would like to use

Size of icons	Experiment 1	Experiment 2
Small size	1	2
Medium size	45	48
Large size	8	3

The students obviously preferred the medium size of the icons for frequent use, and Table 5.63 shows the reasons for this.

Table 5.63

Reasons	Experiment 1	Experiment 2
Clear details	44	43
Screen space	36	37
Strain on the eyes	24	26
Processing speed	9	2

Of the other students, those who selected the small size of icons as best said that they chose that size because of the screen space. Small size allows them to have more icons on each screen. The students who said that they preferred the large size of icons believed that small sizes of icons cause strain on the eyes. The large size of icons have clear details.

Relating the icons to functions

Students were asked if they had difficulties in relating the icons to the functions they represent, they were then asked for the main problems which occurred. The results are presented in table 5.64.

Table 5.64

Difficulties in relating icons to functions

Experiments	Yes	No	No responses
Experiment 1	51	3	--
Experiment 2	45	6	2

The table shows that most of the students had difficulties in relating all the icons to their functions. Twenty-five students in the first experiment and 12 students in the second experiment believed that the difficulties of relating the icons to their functions came from their lack of knowledge of the icons. Another 22 students in the first experiment and 13 students in the second experiment said it was difficult to see the icons clearly in the small size. Finally, 17 students in the first experiment and 24 in the second experiment said that some icons were not fully related to the functions, giving, as examples, the floppy disc, the on-line teaching class, the Mac Monitor and the PC computer.

Type of entry

The students were asked 'Which form of entry to the system would you prefer for frequent on-screen use?' The students were given only two choices - Icons or Words. This choice forced them to select one. However, some students still said they preferred both and most students commented in their final report that they would like to have both the Icons and the Words. The length of experience in using computers was tested here to see if it led to a difference. The results are presented in Table 5.65.

Table 5.65

Type of entry the students preferred

Entry	Experiments	Under 3	Over 3	Total
Icons	Experiment 1	12	22	34
Words	Experiment 1	15	5	20
Icons	Experiment 2	13	21	34
Words	Experiment 2	12	7	19

A statistical test could not be applied because of the small numbers in the cells relating to students with experience of over three years. However, there is some indication that students with computer experience of over three years preferred to use the Icons as an entry for frequent on-screen use. The students with experience of up to three years were divided in choosing the form of entry they preferred for frequent on-screen use.

Students were asked what factors they had in mind when they chose the entry type. The answers to this question are given in table 5.66.

Table 5.66
Reasons for selecting entry

Reasons	Exper.1	Exper.2	Entry
1. Icons easier to remember	31	26	Icons
2. Universal interface	19	18	
3. Icons are easy for eyes	19	18	
4. Icons are faster	18	17	
5. Icons utilize less space on screen	11	4	
6. Icons are ambiguous	9	18	Words
7. Icons hard to recognize	9	7	
8. Words & icons are better	8	7	Both

Conclusion

The results of the second experiment indicate a significant improvement in performance by the students in recognizing the pictures of the icons as well as in relating them to their functions. At the same time, the results show that the students had some difficulties in recognizing some icons. About 28% of the students did not recognize the printer, monitor, and light bulb amongst the Mac icons in the first experiment. Over half of the students (59%) did not recognize the diploma amongst the IBM icons and some 20% of the students did not recognize the picture of the world map, printer and newsletter in the group of IBM icons in the first experiment. Finally, the results with the Hand-drawn icons show that the students had difficulties in recognizing the pictures of the hand-drawn icons. Most of the students (77%) did not recognize the picture representing the EBB, and about 50% did not recognize the picture of the person giving a speech in the first experiment. In all cases, the students' performance improved significantly in recognizing the pictures of the three types of icons in the second experiment.

In terms of relating the icons to their functions, quite a large number of the students did not do this correctly in the first experiment, though their performance improved significantly in the second experiment. Hence, memory of past experience plays a significant role in relating the icons to their functions. The size of the icons was investigated and it was shown that most of the students in the two experiments were in favour of using the medium size of icons. Students of over three years computer experience may have some preference for icons over words. However the comments from most students indicate a preference for a combination of both icons and words as an entry form.

CHAPTER SIX

GULFNET USERS' RESULTS

Introduction

The aims of this part of the study were to investigate GULFNET users' training needs and to explore ways of encouraging them to utilize the existing network services. Three main aspects were considered: the type and method of training they preferred, the content of the training they thought was most appropriate for them, and services they wanted available on GULFNET.

**NOTE All the statistical tests applied in this study will use a level of $P > 0.05$ unless otherwise indicated.*

*** The statistical tests will only be applied to cells which contain a number of 10 or greater.*

Sample background

The sample consisted of 132 GULFNET users in three universities in Saudi Arabia. The method of selecting the sample is discussed in detail in the Methodology chapter. The users were selected from different backgrounds (as shown in Table 6.1) to investigate what effect these differences in background might have.

Table 6.1

Background		Number of people
Universities	KSU	47
	KFUPM	41
	KAAU	44
Nationality	Arabic	67
	Non-arabic	65
Subject	Science	111
	Arts	21
Position	Faculty member	86
	Post graduate	24
	Administration staff	22

The sample were asked if they used Electronic mail (E-mail) and, if so, how frequently they were using it. Their responses are presented in Table 6.2.

Table 6.2

The frequency of use of E-mail

Frequency of use of E-mail	No of users
Daily	37 (28%)
Weekly	56 (42%)
Monthly	37 (28%)

The background of the sample from Table 6.1 and the use of E-mail in table 6.2 were assessed to see if there were significant differences between the participants' responses based on their backgrounds. No such differences were found. However, people who used E-mail daily (E-mail frequent users) and those who used it monthly (E-mail infrequent users) were separated out for consideration in subsequent analyses. Some significant differences between the E-mail frequent and infrequent users will be found in the tables below.

Electronic mail (E-mail)

The E-mail service was used in collecting the data from KFUPM as discussed in chapter three. We could not distribute the questionnaires in this way to KAAU and KSU because of some technical problems experienced at these two universities. (More details are given in chapter three.) Respondents were asked a series of questions about their use of E-mail in order to help characterise their use of the system.

User friendliness

One of the most important factors is how easy it is for users to operate the system. The E-mail users were asked "How would you rank the user-friendliness of the network electronic mail services ?" The answers to this question are presented in

Table 6.3.

Table 6.3
E-mail user-friendliness

Categories	Very good	Good	Poor
Whole sample response	43 (33%)	63 (49%)	24 (18%)
E-mail frequent users	18 (14%)	16 (12%)	3 (2%)
E-mail infrequent users	8 (6%)	18 (14%)	11 (9%)

The results for the E-mail frequent and infrequent users show a significant difference ($X^2 = 4.5$ DF = 1) for the Very good category. Half of the frequent users considered E-mail user-friendliness to be very good, while only eight of the infrequent users said it was very good. Only three of the E-mail frequent users considered the E-mail system as poor, while 11 of the E-mail infrequent users said it was a poor system to use.

Reasons for using E-mail

One of the advantages of E-mail is that it saves the users' time, and it is convenient for on-campus, national and international communication. The sample was asked, "Why do you use electronic mail?" The responses are listed below.

Time saving

The responses relating to time saving are shown in table 6.4.

Table 6.4
E-mail saves time

Categories	Yes	No
Whole sample response	95 (73%)	35 (27)
E-mail frequent users	30 (23%)	5 (4%)
E-mail infrequent users	22 (17%)	15 (12%)

A significant difference ($X^2 = 6.7$ $DF = 1$) was found between the answers to the 'No' choice. Fifteen of the E-mail infrequent users said that E-mail did not save them time, while only five of the E-mail frequent users said that E-mail did not save them time. Another significant difference ($X^2 = 36.5$ $DF = 1$) was found between the E-mail frequent users' responses to the 'Yes' and 'No' categories. This difference indicates that the E-mail frequent users are more likely to believe that E-mail saves users' time.

Convenience

The respondents were asked whether they used E-mail because it was convenient, as compared with postal letters or other communications (such as Fax, telephone, etc.). Their responses are shown in Table 6.5.

Table 6.5**E-mail is more convenient**

Categories	Yes	No
Whole sample response	79 (60%)	53 (40%)
E-mail frequent users	25 (19%)	12 (9%)
E-mail infrequent users	24 (19%)	13 (10%)

A significant difference ($X^2 = 5.3$ $DF = 1$) was found between the whole sample responses, but there was no significant difference between the E-mail frequent and infrequent users' responses. This difference shows that all E-mail users considered the E-mail service as more convenient than the other tools mentioned above.

Communication on campus

The sample was asked if they were using E-mail because it was good for communication on campus. Their responses are presented in Table 6.6.

Table 6.6**E-mail is good for communication on the campus**

Categories	Yes	No
Whole sample response	50 (38%)	82 (62%)
E-mail frequent users	22 (17%)	15 (12%)
E-mail infrequent users	10 (8%)	27 (21%)

A statistical test was applied to the E-mail frequent and infrequent users in the above table, but it showed no significant differences.

National communication

The sample were asked if they the E-mail because it is good for national communication. Their responses are listed in Table 6.7.

Table 6.7

E-mail is good for national communication

Categories	Yes	No
Whole sample response	56 (42%)	76 (58%)
E-mail frequent users	17 (13%)	20 (15%)
E-mail infrequent users	14 (11%)	23 (18%)

A statistical test was applied to the results of E-mail frequent and infrequent users in Table 6.7, but it showed no significant differences.

International communication

The sample were asked if they used the E-mail because it is good for international communications. Their responses to that question are presented in Table 6.8.

Table 6.8

E-mail is good for international communication

Categories	Yes	No
Whole sample response	115 (87%)	17 (13%)
E-mail frequent users	34 (26%)	3 (2%)
E-mail infrequent users	30 (23%)	7 (5%)

A statistical test was applied to the E-mail frequent and infrequent users' responses

in the above table, but again it showed no significant differences.

Summary

The responses to the E-mail questions show that most of the sample (82%) considered the E-mail system to be user friendly. Most (73%) believed that E-mail saved them time, and 60% of the sample said that E-mail is more convenient than other methods. Some (38%) considered E-mail to be good for communication on the campus, while 42% and 87% said E-mail is good for national and international communication respectively. A few (5%) commented that E-mail produces guide responses. The results of the statistical tests show some significant differences between the responses of the E-mail frequent and infrequent users. These differences indicate that the E-mail frequent users were more satisfied with the E-mail facilities than the E-mail infrequent users.

Training methods

As mentioned earlier, this study is aimed at investigating the possibility of using an EBB or other methods to train users of GULFNET. Several questions were concerned with this aspect of the network. The sample were asked, "Do you think that GULFNET users need to have some training in how to use the network services?" The answers to this question showed the great majority of the sample saying 'Yes' (93%). Following this, another question was asked: "What method of training would you prefer?" The sample were given a list of methods to help them in their selection: they were told that they could choose as many as they wanted. Their responses are presented below.

Workshop

The sample were asked if they would like to have a workshop to teach them how to use GULFNET services. The responses are presented in Table 6.9.

Table 6.9
Training Workshop

Categories	Yes	No
Whole sample response	78 (59%)	54 (41%)
E-mail frequent users	14 (11%)	23 (18%)
E-mail infrequent users	29 (22%)	8 (6%)

A statistical test was applied to the above table. Significant differences ($X^2 = 5.9$ DF = 1) and ($X^2 = 9.4$ DF = 1) were found between the E-mail frequent and infrequent users' responses to the Yes and No choices, respectively. The result shows that the E-mail infrequent users were significantly more in favour of using the Workshop method than the E-mail frequent users.

Lectures and seminars

The sample were asked about lectures and seminars as another choice of training method. Their responses are presented in Table 6.10.

Table 6.10
Training by lectures and seminars

Categories	Yes	No
Whole sample response	75 (57%)	54 (43%)
E-mail frequent users	19 (15%)	18 (14%)
E-mail infrequent users	25 (19%)	12 (9%)

A statistical test shows no significant difference between the responses of the E-mail frequent and infrequent users.

Electronic bulletin board (EBB)

The sample were asked if they would prefer to use an EBB as training method in learning how to use GULFNET services. Their responses are shown in Table 6.11.

Table 6.11
EBB as training method

Categories	Yes	No
Whole sample response	60 (46%)	72 (54%)
E-mail frequent users	28 (22%)	9 (7%)
E-mail infrequent users	8 (6%)	29 (22%)

A statistical test was applied to the above table. It showed significant differences (X^2

= 16.3 DF = 1) and ($X^2 = 14.4$ DF = 1) between the E-mail frequent and infrequent users' responses. The E-mail frequent users were significantly more in favour of using the EBB method than the E-mail infrequent users.

Electronic mail (E-mail)

The sample were asked if they would like to use E-mail as a training method for use of GULFNET services. Their responses are shown in Table 6.12.

Table 6.12
E-mail as training method

Categories	Yes	No
Whole sample response	60 (46%)	72 (54%)
E-mail frequent users	23 (18%)	14 (11%)
E-mail infrequent users	11 (9%)	26 (20%)

A statistical test was applied to Table 6.12. It showed significant differences ($X^2 = 4.9$ DF = 1) and ($X^2 = 4$ DF = 1) between the responses of the E-mail frequent and infrequent users. The E-mail frequent users were significantly more in favour of using this method than the E-mail infrequent users.

Floppy diskette

The sample were given another choice of training method. Physical dissemination of a floppy diskette is one method which could be used for training. The responses to that choice are presented in Table 6.13.

Table 6.13**Floppy diskette as training method**

Categories	Yes	No
Whole sample response	28 (21%)	104 (79%)
E-mail frequent users	8 (6%)	29 (22%)
E-mail infrequent users	7 (5%)	30 (23%)

A statistical test was applied to the above table and showed no significant difference between the E-mail frequent and infrequent users' responses. The results show that most of the sample were not interested in the use of floppy diskettes as a training method.

Manual

Another method which can be used for training is by providing the users with a manual which explains how to use the system facilities. The sample were asked if they preferred to have a manual as an introduction on how to use GULFNET services. Their responses are presented in Table 6.14.

Table 6.14**Using manual as training package**

Categories	Yes	No
Whole sample response	74 (56%)	58 (44%)
E-mail frequent users	12 (9%)	25 (19%)
E-mail infrequent users	28 (22%)	9 (7%)

A statistical test was applied to the above table. Significant differences ($X^2 = 7.6$ DF = 1) and ($X^2 = 9.7$ DF = 1) were found between the E-mail frequent and infrequent users' responses. The E-mail infrequent users were significantly more in favour of using a manual than the E-mail frequent users.

At the end the sample were given the opportunity to add any other training method they would prefer to use. A few students (5%) said they would like to have brief instructions on a sheet of paper.

Summary

Most of the possible training methods were of some interest to users of GULFNET. Workshops and Manuals were significantly preferred by the E-mail infrequent users. The E-mail frequent users preferred using electronic methods, such as EBBs and E-mail. Lectures and seminars were equally acceptable to the E-mail frequent and infrequent users. However, most responded negatively to the use of floppy diskettes for training purposes. Table 6.15 outlines the E-mail frequent and infrequent users' responses to all the training methods.

Table 6.15

E-mail frequent and infrequent users' response to the training methods

Training methods	Frequent users	Infrequent users	Significant
Workshop	14 (11%)	29 (22%)	SDI
Manual	12 (9%)	28 (22%)	SDI
EBB	28 (22%)	8 (6%)	SDF
E-mail	23 (18%)	11 (9%)	SDF
Lectures and seminars	19 (15%)	25 (19)	NSD
Floppy diskette	8 (6%)	7 (5%)	NSD

SDI = Significant differences preferred by the E-mail infrequent users.

SDF = Significant differences preferred by the E-mail frequent users.

NSD = There were no significant differences between the E-mail frequent and infrequent users.

Contents of training

The users' expectations of the training package is a vital aspect. The sample were asked, "What do you expect a training package to contain ?" They were given a list of possible training contents and were asked to indicate those they would like to see included in the training package. Finally, they were asked if they would like to add anything else that was not listed. Their responses are shown below under a series of headings.

General introduction

The sample were asked if they would like to have a general introduction to GULFNET to give them an idea of the history of the network and the available services. The responses to that question are presented in Table 6.16.

Table 6.16
General introduction to GULFNET

Categories	Yes	No
Whole sample response	97 (74%)	35 (26%)
E-mail frequent users	27 (21%)	10 (8%)
E-mail infrequent users	26 (20%)	11 (9%)

A statistical test was applied to the table, and showed no significant difference between the E-mail frequent and infrequent users' responses.

Instructions about using the network

The sample were next asked if they would like the training package to include instructions about accessing and using the network. The responses are presented in Table 6.17.

Table 6.17

Instructions about using the network

Categories	Yes	No
Whole sample response	100 (76%)	32 (24%)
E-mail frequent users	29 (22%)	8 (6%)
E-mail infrequent users	25 (19%)	12 (9%)

A statistical test was applied to the above table, and showed no significant difference between the E-mail frequent and infrequent users' responses.

Instructions on how to use the network services

The sample of the study were asked if they would like instructions on how to use GULFNET services to be included within the training package. The responses to that choice are presented in Table 6.18 below.

Table 6.18

Instructions in using the services on GULFNET

Categories	Yes	No
Whole sample response	106 (80%)	26 (20%)
E-mail frequent users	29 (22%)	8 (6%)
E-mail infrequent users	29 (22%)	8 (6%)

A statistical test was applied to the above table, it showed no significant difference between the E-mail frequent and infrequent users.

Practical exercise in how to use GULFNET

The sample were next asked if they would like the contents of the training to include a practical exercise on how to use GULFNET. Their responses are shown in Table 6.19 below.

Table 6.19
Practical exercise in how to use GULFNET

Categories	Yes	No
Whole sample response	97 (74%)	35 (26%)
E-mail frequent users	24 (25%)	13 (10%)
E-mail infrequent users	27 (22%)	10 (8%)

A statistical test was applied to the above table, and again showed no significant difference between the E-mail frequent and infrequent users.

Lastly, the sample were given the opportunity to propose any items they would like to be added to see contents of the training: 8% of the sample suggested a one page summary of the most useful commands.

Summary

The responses show that the respondents were in favour of including all the listed suggestions in the training package for GULFNET users. The statistical test applied to the responses of the E-mail frequent and infrequent users shows no significant differences in terms of content between the two groups. It can be concluded that the contents need to be the same, but the method of presentation needs to be different, as shown in previous sections.

Services

The available services of GULFNET were considered next, since the rate of use of GULFNET is so low. The sample were asked what they thought of the available services on GULFNET. This question was intended to obtain feedback as to where the services on GULFNET met their needs and expectations and where they did not. This question was followed by queries concerning specific services.

Available services

The sample were asked "Do you think that the available services on GULFNET are adequate ?" The responses to this question are presented in Table 6.20.

Table 6.20

Do you think that the available services on GULFNET are adequate ?

Categories	Yes	No
Whole sample response	44 (34%)	87 (66%)
E-mail frequent users	9 (7%)	28 (22%)
E-mail infrequent users	15 (12%)	21 (16%)

A statistical test was applied to the above table and it showed no significant difference between the E-mail frequent and infrequent users. However, significant differences ($X^2 = 15.8$ $DF = 1$) and ($X^2 = 13.2$ $DF = 1$) were found between the Yes and No responses for the whole sample, and between the Yes and No responses of E-mail frequent users. These differences show that the whole sample believed that the GULFNET services were not adequate, and that this belief was especially strong amongst heaviest users.

Access to more databases

The sample were asked if they would like to able to access more databases. Their answers are given in Table 6.21.

Table 6.21
Access more databases

Categories	Yes	No
Whole sample response	73 (56%)	58 (44%)
E-mail frequent users	25 (19%)	12 (9%)
E-mail infrequent users	18 (14%)	18 (14%)

A statistical test applied to E-mail frequent and infrequent users in the above table showed no significant difference.

Access to library catalogues

One of the functions of the academic networks is to enable users to access the Online Public Access Catalogues (OPACs) of other institutions. The sample were asked if they would like to access the OPACs of other institutions in the Gulf States. The answers to this question are presented in Table 6.22.

Table 6.22

Access to the OPAC of the other institutions in the Gulf States

Categories	Yes	No
Whole sample response	76 (58%)	55 (42%)
E-mail frequent users	25 (19%)	12 (9%)
E-mail infrequent users	19 (15%)	17 (13%)

A statistical test applied to the above table showed no significant differences between the E-mail frequent and infrequent users' responses.

Summary

Most of the sample (66%) considered that GULFNET services were not adequate. About half (56%) said that they would like to access more databases, and 58% responded in favourably to accessing the OPACs of other institutions in the Gulf States.

New services

At the end of the questionnaire, the sample were given a list of possible new services. They were asked if they would like to see these services added to GULFNET. Respondents were given a scale of 1 - 3 to indicate their opinion of the importance of the service: (1 = Unnecessary), (2 = Useful) and (3 = Worthwhile) {See Appendix for more details}. Respondents inserted the appropriate value in front of each possible new service. The services are listed in Table 6.23 based on the marks given by the sample to each service. E-mail frequent and infrequent users' responses are not separated in this table, because there was no significant difference between them.

Table 6.23

Categories	Unnecessary	Useful	Useless	Total of marks	Mean
E-mail addresses	11 (8%)	50 (38%)	71 (54%)	324	2.45
Library collec.news	17 (13%)	52 (39%)	63 (48%)	310	2.35
Projects in progress	17 (13%)	52 (39%)	63 (48%)		
Recent est. activities	11 (8%)	66 (50%)	55 (42%)	308	2.33
Conferences&meetings	11 (8%)	75 (57%)	46 (35%)	299	2.27
Online Newsletter	11 (8%)	75 (57%)	46 (35%)		
New publications	18 (14%)	61 (46%)	53 (40%)		
Users' comments	23 (17%)	78 (59%)	31 (24%)	272	2.06
Departments' address	27 (20%)	72 (55%)	33 (25%)	270	2.05
Institutions addresses	44 (33%)	55 (42%)	33 (25%)	253	1.9

A statistical test was applied to the above table to see whether there were differences in the respondents' apparent need for these services. Significant differences ($X^2 = 8.9$ $DF = 1$), ($X^2 = 5$ $DF = 1$) and ($X^2 = 4.6$ $DF = 1$) were found between the need for E-mail addresses and other categories (Institutions' addresses, Academic departments' addresses and Users' comments), with the E-mail addresses seen as particularly important. A significant difference ($X^2 = 5.6$ $DF = 1$) was found between the need for Institutions' addresses and both Library news and Projects in progress. Another significant difference ($X^2 = 5.5$ $DF = 1$) was found between the need for Recently established activities and Institutions' addresses in the Gulf States. Finally, a significant difference ($X^2 = 3.9$ $DF = 1$) was found between each of Conferences and meetings, Newsletter, New publications of academic staff and Institutions addresses. Users preferred to have the Library collection news, Projects in progress, Recently established activities, Conferences and meetings, Newsletter,

and New publications of the academic staff, rather than the institutions addresses.

It appears from these responses that adding more services to GULFNET would encourage users in academic institutions in the Gulf States to use the network facilities. Some services should be given priority, as indicated in Table 6.23.

Comments and suggestions

At the end of the questionnaire the sample of the study were asked if they had any comments or suggestions concerning GULFNET. Their replies can be classified as relating to network problems and network needs.

Network problems

The respondents noted problems which they faced during their use of GULFNET. A number of respondents (22%) said that there were often long delays in the E-mail, 21% said they had encountered difficulties in sending E-mail, and 11% asked for E-mail recipient acknowledgement. At the same time, 11% reported that they had lost some of their E-mail. Difficulties in contacting other international networks were reported by 17% of the sample. Finally, 11% said that the GULFNET system was not user-friendly in general terms.

Network needs

Several suggestions were made to improve the network services. Some 20% of the sample indicated that the network administrators should provide users with technical support. Some respondents (14%) said the network should be connected to more international networks, and 11% said that commands should be displayed on the screen. It was noted by 11% that GULFNET was not known well among staff and students of the Gulf States academic institutions, or among international networks

users. Hence, publicity was necessary. Finally, 5% said that better management and coordination was needed.

Summary

Most of the sample (93%) believed that training for GULFNET users in how to use the network facilities was needed. Most agreed that they could use all the methods listed, except for the floppy diskette method. People who used E-mail daily preferred to use electronic methods for training, such as EBB and E-mail methods, while those who used the E-mail monthly preferred to use traditional methods, such as workshops, lectures and seminars, etc..

The services of GULFNET were considered by 66% of the sample to be inadequate for their needs. Most of respondents indicated that they would like to have access to more databases and to the OPACs of libraries of other Gulf States academic institutions. The list of possible new services on GULFNET were all rated as either 'useful' or 'worthwhile', which suggests there is a need for new services.

CHAPTER SEVEN

DISCUSSION AND CONCLUSION

Introduction

The results obtained from the various experiments are discussed together here in the light of the original objectives of the study. Four main sections are included in this chapter. The first is a discussion of the participants' backgrounds and their effect on responses and performances in the various experiments. The second is a discussion of the evaluation of BUBL-92, BUBL-93 and INFOSLUG. The third section is a general examination of how to apply the factors discussed in this study to the EBBs and on-line training. The last section is a general conclusion to the whole work with emphasis on GULFNET user needs.

Backgrounds of participants

The participants in the six experiments had different backgrounds, which might affect their performance and response, as discussed in the background chapter and the methodology chapter. Table 7.1 presents the variables involved and their effect on the performance and responses of the participants.

Table 7.1

Participants' background and its effects in the various experiments

Variables	Initial study	BUBL-92	BUBL-93	INFOSLUG	Hypertext dBase III+	Icons	GULFNET
Age	NSD	NSD	NSD	NSD	PSD	NSD	NSD
Sex	NSD	NSD	NSD	NSD	SD	NSD	--
Course/Class	NSD	NSD	NSD	NSD	PSD	NSD	NSD
Group	NSD	NSD	NSD	NSD	NSD	--	--
Subject	NSD	NSD	NSD	NSD	--	NSD	NSD
Computer Experience	NSD	NSD	NSD	NSD	SD	PSD	PSD
OS/HS	--	--	--	--	SD	--	NSD

SD = Significant difference.

PSD = Partly significant in some aspects.

NSD = No significant difference.

OS/HS = Overseas Students/Home Students

-- = Not questioned

Age

The age of the sample was one of the factors which might affect sample performance and responses. However, only one age group 20 - 25 in the comparison between the Mac/HyperCard and PC/dBase III+ interfaces experiment performed significantly better than the other age groups in the time taken for retrieving information from the two systems. As discussed in chapter one, Information Technology (IT) has been introduced to schools during the last 10 years, which coincides with the time that these students were in high school. If this is the influence at work then any effect due to age difference may be transitory. Since within the next decade or so, most students will have had the same experience of using IT at school. However, it might be asked

"Why did this age group not show significant difference in the other experiments?" Perhaps the answer is that the significant difference related to speed of retrieving the information, which was not directly measured in the other experiments.

Sex

It was found that males performed significantly better than females in the time taken in retrieving information from Mac/HyperCard and PC/dBase III+ databases. In the other five experiments, the subjects were asked to navigate through the systems without measuring the time taken. Hence, it may be that gender is a significant variable specifically when the participants are asked to do a standard measured task. This difference did not appear when the participants, tasks were open-ended.

Course/Class

Course or class - Undergraduate, Course Postgraduate and Research Postgraduate - was one of the factors which was partly significant in the menu-based and hypertext experiment, but was not important in the other five experiments. A significant difference was found between the undergraduate students and the postgraduate research students handling in the menu-based and hypertext systems, but there was a significant difference between the course postgraduate and the research postgraduate students only in the Mac/HyperCard system. There were no significant differences in the PC/dBase III+ system. These differences might be interpreted as a result of the students' experience in using computer facilities.

Grouping

Two types of group were presented in chapter 2, the large group containing from eight to twelve students per session and the small 'sub-group' containing from two to four students per computer terminal. As discussed in the study background and

methodology chapters, the students were grouped homogeneously, based on their experience of using computer facilities, subjects, age and sex. The results of the study show no significant differences between either the participants of the large groups or of the small groups. It may be that these groupings are satisfactory for the teaching contexts in which they have been used. As discussed in chapter 2, the students can cooperate and solve the IT problems they encounter satisfactorily in these groupings.

Subject background

The subject background of the participants was examined in this study. However, none of the experiments showed significant differences between participants from different subject backgrounds. However, the participants in the Initial study, BUBL-92, INFOSLUG and BUBL-93, and the Icons experiments had similar subject backgrounds in that most of them were studying either Information and Computing Studies or Information and Library Studies. The introductory courses of these two subjects were similar though the students tended to come from different subject backgrounds at school. It may be concluded that the effect of the participants' subject background should be left open for more investigation. However, the preliminary result is that it is not a factor of major importance.

Computer experience

Computer experience is another factor which has been discussed in chapter 2. The participants with greater computer experience in this study show significant differences from the remainder in three experiments out of six. These significant differences occurred in the Mac/HyperCard and PC/dBase III+ interface experiment and the Icons experiment. Participants with prior experience of using computer facilities performed significantly better than those with little or no experience of using computer facilities. It can be concluded that the experience factor is an important one,

which significantly affects the performance of the participants.

Overseas and Home students

The Overseas and Home students - considered, in part, as Non-native and Native speakers of a Language - were compared in two experiments, showing significant differences in the Mac/HyperCard and PC/dBase III+ experiment, but no significant differences in the GULFNET experiment. However, the objectives of the two experiments were quite different. The participants in the Mac/HyperCard and PC/dBase III+ experiment were carrying out measured tasks, whereas the participants in the GULFNET experiment were simply asked to give their opinions. This type of questionnaire does not measure the performance of the participants. These results correspond with the results in the literature presented in chapter 2, which indicate that the native speakers performed better than the non-native speakers when performing measured tasks.

Summary

Most of the participants' background factors correlated with significant differences in the Mac/HyperCard and PC/dBase III+ experiment. The other experiments show some significant differences as presented in Table 7.1 above. It can be concluded that differences are easier to distinguish when the participants are asked to do standard measured tasks rather than when they are simply asked their opinions.

The Initial study

The participants in this study were asked to comment on how easy or difficult they found the four EBBs - HUMBUL, BUBL, NISS and SBB. The students were given a series of questions to help them investigate the EBBs, then they were asked to write comments based on their experience of using the systems. As mentioned in chapter

3, the students were not given any guidelines as to which aspects or features they should evaluate. This method gave the participants the opportunity to explore the features they thought were important. The features mentioned by the students either as "good" or "to be improved" were investigated in other experiments. Some features were considered by some students to be good, while other students considered that the same features could be improved (as shown in Tables 4.3 - 4.6). For example, the instructions on how to use HUMBUL were reported by 20 students in their questionnaires and 6 students in their final reports, respectively, to be a good feature, while 20 and 14 students reported in their questionnaires and final reports, respectively, that this feature needs to be improved.

The main features/aspects of the BUBL-92, BUBL-93, and INFOSLUG

Some of the main features of the above three EBBs are discussed together to examine the students' judgment of these EBBs. Different software was used by BUBL-92 and BUBL-93 and by INFOSLUG giving a different layout of screens and different instructions (as presented in Chapter 4 and in the Appendices). All the features presented in table 7.2 were scored out of 3.

Table 7.2

The main features/aspects of 'BUBL-92, BUBL-93, and INFOSLUG

Features/Aspects	BUBL-92	BUBL-93	INFOSLUG
Reading materials on screen	2.79	2.65	2.48
Design of display	1.80	2.06	2.02
Relevance of contents to screen	2.61	2.55	1.58
Instructions on each screen	2.21	2.38	1.85
Ease of use of the systems	2.82	2.53	1.71
Speed to move from screen to screen	2.29	2.00	1.58
System response when make a mistake	2.66	2.06	1.67
Paging and numbering	2.53	2.33	1.67
Amount of information*	2.66	2.31	2.21

** The score is out of 3, but the best score was 2 as explained in chapter 4.*

Table 7.2 shows that there is some difference between the students' responses to some features of the three EBBs. For example, reading materials on screen and amount of information on each screen show no significant differences between the participants' responses. However, the relevance of the contents to the screen, the instructions on each screen, ease of use of the systems, speed to move from screen to screen, systems responses when a mistake is made and paging and numbering show significant differences, particularly between BUBL-92 / BUBL-93 and INFOSLUG.

Changes on BUBL

Some changes were made to BUBL which may have affected the responses of the participants in BUBL-93. Two types of changes were involved: (1) General changes concerning the layout of the information, such as leaving standard blank space between the instructions and the text (2) Specific changes, which were made for Section K 'Practical Exercise'. The changes to section K were concerned with the presentation and structure of the section: it was divided into four sub-sections - 'Introduction, Basic Exercises, Intermediate Exercises, and Advanced Exercises'. These four sections were divided into sub sub-sections (for more detail see Appendices II and III). It was expected that these changes would affect the participants' responses. However, simultaneously, the amount of information was almost doubled. The volume of information was increased in the old existing sections, and new sections were created. For example, the main menu of BUBL-92 contained about 15 entries, while it contained about 25 entries in BUBL-93. These two things - the increase of the information of the old sections and the newly created sections - almost certainly negatively affected retrieval from the system adversely. Consequently, the good effects of restructuring BUBL-92 could be offset by information overload.

Reading materials on screen

The evaluation of this feature included such things as analysis of print sizes and print styles, also the use of underlining and perhaps bold type to make separate items stand out and the legibility and contrast of the on-screen material. It concerns anything that helps with the readability of the material, as discussed in chapter 2. BUBL-92 scored the best here, followed by BUBL-93, then INFOSLUG. However, the differences between BUBL-92 and BUBL-93 were not significant. It seems from the scores that INFOSLUG did not reach a satisfactory level in regard to some of the above criteria.

In fact, the textual information of INFOSLUG covered the whole of the screen and little regard appeared to have been given to margins, spacing and the differentiation of headings. As a result it was found that reading a whole screen of text was rather difficult.

Design of display

There is a strong correlation between the design of the display and the ease of reading the materials on screen. The criteria included whether the information is presented in a way that is not confusing to the user. At the same time, a logical organisation of information that is pleasing to the eye is needed. This feature has been discussed by several authors, as presented in chapters 2 and 3. BUBL-93 scored the best, followed by INFOSLUG, then BUBL-92. The modification of BUBL gave more space between the Instructions and the text which probably affected positively the students evaluation of this feature.

Relevance of the contents to the screen

This questions how well each section of the EBBs was labelled, how well the contents related to their section and whether the menu option was displayed in a consistent and logical order, as discussed in chapter 2. The optimum number of the items was specified by Horton (1990) to be seven or fewer, and he said that it may be helpful to group together interdependent or common choices. There were about 17 items on the main menu of BUBL-92, while there were some 25 items on the main menu of BUBL-93. Consequently, BUBL-92 scored the best, followed by BUBL-93, then INFOSLUG. In fact, the number of items in each menu of BUBL-93 was increased, which must have affected students' responses. The INFOSLUG system includes the largest number of items on each menu. It can be concluded that the number of items is a very important factor in assessing acceptability of the contents of a screen.

Instructions on each screen

A bulletin board needs to have easy instructions for use. Instructions on-screen should tell the users which buttons to press, and what they must do to get where they want to be. The users need to know how they can move around in the system. Consistency of the instructions is very important for users. At the same time, the instructions should be kept separate from the text. BUBL-93 scored the best here, followed by BUBL-92, then INFOSLUG. The modifications made for BUBL, as explained earlier in this chapter, clearly affected the students' responses to BUBL-93. The limited instructions on INFOSLUG, which gave the users few options, evidently also affected the responses of the students to the INFOSLUG system. It can be concluded that clear and consistent instructions which gave more opportunities to the users to select, necessary in the design of EBBs.

Ease of use of the systems

The friendliness of the system can be facilitated by such things as Help options and pointers to indicate where you are within a system: there must be a logical organisation of information. Ease of use of the system has a strong correlation with other features, such as reading materials on screen, design of display, instructions on each screen, speed of moving from screen to screen, etc. Users should know how to move from screen to screen, how to get the information they want and what they should do when they make a mistake. BUBL-92 scored the best, followed by BUBL-93, then INFOSLUG. Since BUBL was modified, why did BUBL-93 not score better than BUBL-92? The problem here was almost certainly that the amount of information held in a one file increased dramatically on BUBL-93. This is a factor which affects the navigation within the system, the speed of the system, and the relevance of contents to their screen. INFOSLUG scored the lowest among the three EBBs. Possibly, the score here was due to difficulties the students found in accessing

INFOSLUG and the time taken to access different databases.

Speed of moving from screen to screen

The speed of the system was defined and discussed in chapter 2, as the number of seconds which the system needs to respond to inquiries. As expected, BUBL-92 scored the best, followed by BUBL-93, then INFOSLUG. BUBL-93 had a greater volume of information which affected the speed of the system. The INFOSLUG system scored the lowest because, primarily, the system is located in the USA so it takes time between initiating enquiries and their receipt by the system. Secondly, the system activities are located in different places which also requires time in moving from site to site. One session was in the afternoon when system responses were particularly slow. All these factors might influence the students' judgment of this aspect.

System response to mistake

An error message must be in a consistent and eye-catching position on the screen. It must be clear, simple, able to attract the user's attention, and should be located outside the main body of the screen text. On these criteria, BUBL-92 scored the best, followed by BUBL-93, then INFOSLUG. None of the three systems included all the above criteria. In fact, none of them a message explaining the mistake except on the main menu. The BUBL system took the user back to the previous menu without telling him/her about the mistake which had occurred. The big difference in the scores between BUBL-92 and BUBL-93 again probably came as a result of the amount of information on each system. For example, when the users made a mistake during the use of BUBL-92, the system would take them to the previous menu, but the information was so little that they could return quickly; but when the users of BUBL-93 made mistakes the system took longer to return them to their original

positions. The amount of information on BUBL-93 was almost double the amount in BUBL-92. The students experienced some difficulties in using INFOSLUG, as some were disconnected from the system when they made a mistake, but did not receive any message telling them what the mistake was.

Paging and numbering

The paging and numbering feature tells the users where they are. Some systems do not show the users where they are, so some users get lost or they do not know how long is needed to complete the section they are in. BUBL-92 scored the best here, followed by BUBL-93, then INFOSLUG. This result is understandable, in that BUBL-92 and BUBL-93 show the number of screens and tell the users where they are and how many screens are left. The INFOSLUG system shows the percentage of the document, which is another indication, but not as clear as the exact number of screens.

Amount of information

As discussed previously the best score for the Amount of Information feature is 2 - 3 means "too much", while 1 means "too little". The amount of information on each screen should not be excessive. Several studies have discussed the amount of information on each screen, as presented in chapter 2. There was disagreement between the authors of these studies: they recommended that the amount of information should range from 22% to 60% of the screens. This gives room to the designers to present the information within this range based on the needs of the users and the flexibility of the system. INFOSLUG scored the best, followed by BUBL-93, then BUBL-92. The scores of BUBL-92 and BUBL-93 are understandable because the modification of BUBL had affected the amount of information on each screen. The students did not necessarily see typical screens of the INFOSLUG system.

Summary

The three EBBs were given general scores - BUBL-92 and BUBL-93 scoring 2.33 out of 3 and INFOSLUG scoring 1.3 out of 3, as presented in chapter four. These three scores are acceptable overall, especially the BUBL-92 and BUBL-93 scores. It was expected that BUBL-93 would score better than BUBL-92, based on the modifications made on BUBL. The modifications showed some improvement of the students' evaluation of BUBL-93, but, there were some aspects which scored less well than BUBL-92. These lower scores were due to the extra information added to BUBL-93. The volume of information, which almost doubled in BUBL-93, slowed the system. Consequently, the modifications balanced the other aspects which were changed to make BUBL-92 more attractive. The INFOSLUG score does not fully represent the system, because the students experienced some difficulties during their use of the INFOSLUG as discussed above, and this affected their view of the system.

The Practical Exercise on BUBL 'Section K'

Section K on BUBL was evaluated for BUBL-92, then modified and reevaluated in BUBL-93. The major modification was made to the organisation of the materials in section K. For more details, see the two versions of section K in Appendices 2 and 3. The participants in BUBL-92 and BUBL-93 were asked three questions about the Section. The first asked about the language used by the author of the section; the second asked about the coverage of the section; the third asked if they would like to suggest changes to Section K. The results of these questions are given in Table 7.3 below.

Table 7.3

The Practical Exercise on BUBL 'K'

ASPECTS	BUBL-92 & BUBL-93
Language	NSD
Coverage of the section	NSD
Changes of section K	SD

NSD = No significant difference

SD = Significant difference

Most of the participants in the two experiments were satisfied with the language used in the section. BUBL-92 scored 2.5, while BUBL-93 scored 2.33 out of 3. The difference between the two systems was not significant. Some students commented that there were some ambiguous words which should not be used, and they also said that there were some technical computer words which they believed should be explained. Whatever the differences, most of the participants in the two experiments were satisfied with the level of language used in the Practical Exercise section.

The other question asking about the coverage of the section showed that 89% of the students in each experiment believed that the section covered all the aspects they expected. There was a reasonable number of levels to give the users more opportunity to access the right level - Beginners, Intermediate, and Advanced - as recommended by most of the literature on this subject in chapters 1 and 2.

The students were asked if they had suggestions for changes in section K. The answer was that 84% and 27% of the participants of BUBL-92 and BUBL-93, respectively,

had some suggestions for section K. These results show significant differences between the students responses to the two experiments. Clearly, the modification made to the training section had affected the participants' responses on BUBL-93 positively.

Comparison of Hypertext and Menu-based interfaces

The experiment was carried out to compare two different interfaces - Direct Manipulation and Menu-based - presented by Mac/HyperCard and PC/dBase III+, respectively. The data were obtained from three sources: a series of questions (see Appendix VI) given to the students to find specific information from the two databases; a questionnaire given to the students after they finished answering the series of the questions; short essays written by the students on their opinions of the two systems they had used. Agreement between the three sources of information seems to be good. The discussion of this experiment was divided into three parts: the performance of the participants as shown in their answers to the questions; the questionnaire and the essays linking the performance of the participants; a general discussion of all the data.

As discussed earlier in this chapter, there are strong correlations between the participants' background variables. For example, the experience of using IT can be affected by age, with most of the young participants better at using IT than the older ones, as presented in tables 5.1 and 5.2. The age group 20-25 years showed significant differences from all the other age groups. Tables 5.19 and 5.20 show no significant differences for the Menu-based system between participants who had used PC/dbase III+ before and those who had not, either in time or in extra steps. It can be concluded that the Menu-based interface is suitable for both experienced and inexperienced users. This conclusion corresponds with the claims by some other

authors presented in chapter 2, that the menu-based interface can be used with advantage for novice users.

In contrast to these results, participants who had used the 'Mac system before performed significantly better with a direct manipulation interface than those who had not (Tables 5.17 and 5.18). These results support Franklin (1989) and Shneiderman (1991) who have claimed that a direct manipulation interface can be of advantage to experienced users. From all the above results and discussion, it can be said that a Menu-based interface is suitable for all the users, especially novices, while a Direct-manipulation interface is suitable for experienced users.

The results from Tables 5.21-5.26 show three significant differences between students' opinions of the two systems. First, most of the students believed that PC/dBase III+ is significantly easier and quicker for retrieving information; second, that the organisation of information is significantly better in the PC/dBase III+ system than in the Mac/HyperCard system. Third, the PC/dBase III+ system is significantly more user-friendly than the Mac/HyperCard system. These results agree with the results obtained from the students' performances in answering questions and the students comments about the two systems presented in Table 5.27.

In summary, most of the results show that the menu-based interface is suitable for all types of user. The results of this experiment support the conclusion from the background variables, discussed earlier in this chapter, that the difference between the participants is more clear when they asked to do standard measured Tasks.

The Icons experiment

The icons experiment was carried out to investigate the possibility of using icons for frequent on-screen use with EBBs. The use of icons has been investigated as discussed in chapter 2, and the results of those studies suggest that icons are easy to use, easy to learn, and can be language independent. They give some criteria to be applied in designing icons.

The data for this experiment were obtained from three sources:-

- i) The students' answers in recognizing the pictures of the icons and relating them to their computer functions.
- ii) Questionnaires given to the students to complete after each experiment.
- iii) The students' comments and suggestions.

There is good agreement between the results from these sources.

Generally, the students performed significantly better when repeating the experiment with all the three types of icons - Mac, IBM and Hand-drawn - both in recognizing them and in relating them to their computer facilities. In Experiment 1, the students performed significantly better in recognizing the pictures than in relating them to their computer functions. The participants found some difficulties in recognising the pictures of the icons in the two experiments. The degree of difficulty differed from one type of icon to another. The Hand-drawn icons scored as the most difficult icons for students to recognise, followed by the IBM icons, then the Mac icons which were the easiest (See Tables 5.32, 5.43, and 5.54). The Mac systems use icons with all their software, so some of the students may have seen them before. The IBM system uses icons with only some of their software, which may mean that fewer students had

seen them before. The Hand-drawn icons had not been seen by the students before, which may be one of the reasons why the students were unable to recognise them as easily as the other icons. It can be concluded from the results of the two experiments that the users recognise the pictures of the icons better if they have seen them before.

Relating the icons to their computer facilities functions was the more difficult task for the students, as shown in Tables 5.37, 5.48, and 5.59. However, the students performed significantly better in relating all the three types of icons to their computer functions when repeating the experiment. The participants found it more difficulty to relate the icons to their computer functions than to recognise the pictures of the icons. The Mac icons remained the easiest icons for the students to relate to their computer functions. Table 7.4 shows the degrees of difficulty the students experienced during the experiment.

Table 7.4

Degree of difficulty	Experiment 1	Repeating the experiment
Most difficult	Hand-drawn icons	IBM icons
Second most difficult	IBM Icons	Hand-drawn icons
The easiest	Mac icons	Mac icons

One thing to be highlighted here is that the students with more than three years experience of using computer facilities performed better in relating the icons to their functions than those who had less than three years experience. The results of recognising the icons and relating them to their functions fit well with the discussion presented in chapter 2.

As explained in chapter 3, the students were given six words related to the computer

facilities to give them the opportunity to look at both icons and words, before deciding which type of entry they preferred to use for frequent on-screen use. All the students recognised all the words in the two experiments. When students were asked about the type of entry they preferred, and were given two choices - Icons or Words - two thirds of them selected the icons. Most of those who selected icons had more than three years experience of using computer facilities, as shown in Table 5.65. Several students reported that a combination of icons and words would be helpful, which agreed with Ramaiah (1993).

Responses to the questionnaires which were given to the students after each experiment agreed with the results obtained from the students' performance in recognising the pictures of the icons, then relating them to their computer functions, as demonstrated in Tables 5.62 - 5.66. The participants were asked which size of icons they preferred to use. Most of them selected the medium size (1" by 1"), which gives clear details and, at the same time, gives reasonable space on the screen.

It can be concluded that the icons can be easy to remember, use and learn, but are best supplemented by words. The results also fit well with the criteria presented in chapter 2: icons should be familiar to the users, they should convey their intended meaning, the context of the icons should give the full meaning of the icon, icons should include enough detail to enable the users to recognise them, icons used should be expected by the users of the system, and icons chosen must be visually distinguishable from other icons.

GULFNET

The data obtained in this study came from the questionnaire which was distributed via E-mail or hard copy as explained in chapter 3. This study investigated the methods and contents of training that users would like to use for GULFNET training. At the same time, it investigated the satisfaction of people with the network services. The background of the sample was found not to affect the participants' responses.

The sample were asked about E-mail services, and the results show that most of the E-mail frequent users considered the E-mail system of GULFNET as Very good or Good, while about third of the infrequent users said it was Poor. At the same time, the E-mail frequent users, more than the E-mail infrequent users, thought that the various benefits they could get from the E-mail service were good. These results indicate that the experience of the users played a major role in the responses.

Most (93%) agreed that training in how to use GULFNET services was needed. Various methods of training were suggested, and the results show that different methods of training were needed. For example, the EBB and the E-mail methods were preferred by the E-mail frequent users, while the Workshop and Manual were preferred by the E-mail infrequent users. However, lectures and seminars were preferred by more than half of each group of users, as indicated in Table 6.15. Lectures and seminars could be used to introduce the users to the network facilities and training available. They can then use these facilities for more detail about how to use GULFNET. Most of the sample agreed to all the suggested contents of training, as shown in Tables 6.16 to 6.19. It can be concluded that the contents of training required are the same for all users, but need to be presented by different methods.

The services of GULFNET were considered by 66% of the sample as inadequate. This result agreed with the responses to suggested new services on GULFNET, as shown in Table 6.23. A fifth of the participants reported some problems, such as delay of E-mail, difficulty in sending E-mail, and difficulty in contacting the international networks, that they encountered during their use of GULFNET. This could be another factor which might discourage the users from using the network facilities.

It can be concluded from the above results that more than one method (EBBs, E-mail, Workshop, and Manuals) should be used for training in how to use GULFNET services. The experience of the users affects the method of training preferred. At the same time the services of GULFNET need to be evaluated further, and adding more services will be useful. The usability of the GULFNET system needs to be evaluated to provide specific improvements to the system.

The above results show that GULFNET needs to be improved in various directions - technological, services, and providing users with suitable training in how to use the network facilities. This study concerned the use of the EBBs for training, and it shows that there is a good chance of using them for this purpose. Therefore, the aspects of the EBBs discussed earlier in this chapter should be applied in designing an EBB for GULFNET. The menu-based system is the most suitable for the users of GULFNET, since most of them did not have great experience in using the network facilities. Icons with associated words can be used with GULFNET after upgrading the technology of the network. Establishing an EBB on GULFNET gives an opportunity to the administrators of the network to provide the users with services, such as the ones on BUBL. The EBB should be divided into several sections, and each section should target a specific group and might be managed by different people.

The training section of GULFNET should be planned carefully, based on the results obtained from the users of GULFNET and the participants' comments on BUBL-92 and BUBL-93. Different levels of training - beginners, intermediate, and advanced - should be used to give the users the choice to access the level they want. The contents of the training should include the suggested contents discussed in chapter 6. The users of GULFNET are both Arab and Non-Arab, but most of them speak, read and write English. Hence, Arabic and English languages should be used in designing the on-line training package. An evaluation followed by modifications of the EBB and the training package would be useful for improving the EBB and the training package. Finally, the accessibility of GULFNET should be made easier, and the users of the network should be registered the first time they use the network with the same registration procedure as HUMBUL. This facility will also help the administrators to contact the real users of the network when they would like to do so. All these things together will help to increase the use of the network facilities.

Guidelines for the design of the EBBs

The experiments of the study show that the following points should be considered in designing an EBB system.

- 1) Accessibility - the system should be easy to access.

- 2) An introduction at the beginning should tell the users about the system and how they can use it efficiently.

- 3) System design should be simple, clear, consistent and easy to use. Instructions on screen should be clear and inform the users what they can do on that screen. Instructions should be presented in a consistent form.

- 4) There should be a restricted number of menu options on a single screen and the display of the text should be in the range of 40% to 60% of the screen. At the same time, text should be justified from the left and ragged on the right. The important words should be highlighted. Paging and numbering should be provided in a clear position as this tells the users where they are on the system.
- 5) Adequate on-line help facilities which explain the information organisation, graphics and icons used, search facilities, etc., should be provided on the system.
- 6) Movement of the users through the system should be flexible and fast in executing their enquiries. Navigational help on the screen should be available.
- 7) Interactive error messages should be provided and displayed clearly on the screen, telling the user that a mistake has occurred and what they should do to handle that mistake. Error messages must be in a consistent, eye-catching position on the screen.
- 8) A search facility is necessary with a large volume of information. Experienced users might prefer to use such a facility rather than using the sequential search method.
- 9) An index of the contents of the EBB is useful, especially when the system and the volume of information is large.
- 10) The information in the sections should be updated regularly, and the new items should be highlighted.

- 11) The language should be easy to understand. Jargon and technical words should be avoided unless explained. It must be remembered that English is not the native language of many users of GULFNET.
- 12) The type of interface depends on the users of the EBB, but the menu-based interface is suitable for novice users.
- 13) Continuing evaluation and modification of the EBB will be necessary.
- 14) Registration procedure needs to be efficient for the EBB administrators for several reasons, such as contacting the users of the system and knowing the different type of users of the system. This type of information can help them to improve the EBB services.

Guidelines for on-line training

This study shows that there is a possibility of using the EBB for on-line training, and the above guideline points can be applied to this end. However, aims for training should also be highlighted.

- 1) To specify the objectives of the training, the skills and the knowledge the trainees should gain after using the training package.
- 2) Knowing the users backgrounds is important, so that the levels of training can be defined. Three levels - beginners, intermediate, and advanced - seems most appropriate.
- 3) The contents of training should include an introduction to the training package,

cover all the aspects of the training, and use easy and understandable language.

- 4) An evaluation of the training package will be helpful to find out the difficulties that trainees might experience and to examine whether the package fulfils the objectives of the training.

Conclusion

This study has shown that EBBs are acceptable for use in on-line training. The experience of users with computer facilities has proved to be an influential factor in selecting the type of interface that is most suitable for users' needs and expectations. The Menu-based approach was found to be suitable for all types of users with different experiences of using the computer facilities. Icons were preferred by about half the participants, especially by the ones with more than three years computer experience. The icons must be associated with words for more clarity and guidance.

The EBB system should be easy to access and to use. Difficult accessibility can discourage some users from using the system. A registration procedure is needed for the efficient management of the EBB to contact the users, and to find specific information, such as nationality, interests, specialty, etc. A brief introduction to the system is useful to give the users a general idea about the system. Instructions on-screen need to be clear, consistent, and separated from the text on the screen. The menu options on the screen should be clear, and lead the users to the information they expect. The menu options should be restricted to a small number on each screen. Newly created sections should be distinguishable from the old ones. The display of the text should be in the range of 30% to 50% of the space of the screen.

The navigation of the system should be flexible and fast. The users should know

where they are in the system. On-line help is important, and should explain the organisation of information, as well as be a guide to the use of the facility. The system error messages should be clear and should inform the user of what to do in order to proceed.

GULFNET users will benefit from the establishment of an EBB system. This system should be accessible by all the users of the network. At the same time, training in how to use the GULFNET facilities via EBB will be acceptable especially to the frequent users of the E-mail services. The other network users should be instructed by means of workshops or lectures in how to use the network, in order to attract them to the services provided by GULFNET. More services on GULFNET should be provided; and it should be connected to international networks.

APPENDICES

APPENDIX I

BACKGROUND QUESTIONNAIRE

(To be completed and returned at the beginning of the course)

1. Personal record:

- a) Name:
- b) Age:
- c) Sex:
- d) Qualifications (e.g. A-levels):

- e) What were you doing before joining this course (e.g. school, work, etc)?

- f) Would you regard your interests as:
 - i) More 'library' oriented ()
 - ii) More 'information' oriented ()
 - iii) Equal interest ()

2. Have you used any computer or had computer training before?

Yes () No () Questionnaire is now complete

- a) Which type of computer did you use?
 - i) Micro () ii) Mini ()
 - iii) Mainframe () iv) Don't know ()

- b) What did you use the computer(s) for?

HUMBUL BULLETIN BOARD EXERCISE

This exercise introduces you to the use of a simple bulletin board - HUMBUL (the Humanities Bulletin Board). It is suggested that you should carry out the work in small groups (preferably of about three people). Each member of the group should take the lead at the keyboard in turn, but the answers should be put together by discussion within the group. The answers to questions 6-12, together with the names of members of the group, should be typed up as an E-mail message, and sent to the following address:

M.S.Sulaiman:UK.ac.Loughborough

Please keep written copies of this material in case there is any problem with the E-mail connection.

GETTING INTO HUMBUL

1. Set your computer up so that you can connect with JANET (Joint Academic Network). This usually means getting to the PAD prompt.
2. Type CALL HUMBUL, and press Return.
3. When you see the "Welcome to HUMBUL", message go through the registration procedure indicated on the screen.
4. Enter your terminal type (if known).
4. Read the opening menu and spend a few minutes exploring the bulletin board in your own way.

NOW GO ON TO THE SET OF EXERCISES BELOW

6. Find out what you can about the Association for History and Computing, and record the section that it is classified under on HUMBUL.
Q. By what route (a) Did you find this entry? (b) How comprehensible is it? (c) How up-to-date is it?
7. See if you can find any report of some research by A. Booth on the evaluation of IT-based communication systems.
Q. Answer the same questions for this entry as for item 6.
8. Find a conference that you would be interested in attending and record its date and venue.
9. See if you can find any entries on HUMBUL relating to MUSICOLOGY.

Q. What sections did they appear under?

10. Evaluate section T as a means of finding items on HUMBUL. Comment briefly on its value (20 words or less).
11. Briefly describe the purpose and objectives of HUMBUL (20 words or less).
12. Briefly evaluate (less than 50 words) HUMBUL In terms of how easy it is to use.

EXERCISES ON THE BUBL BULLETIN BOARD

For each of questions (1) to (5), please record how you found the answer and note the section in BUBL where it is found.

1. What recent grants have been made to (a) The City University and (b) Loughborough University by the British Library Research and Development Department?
2. What information from the CTI Centre for Library and Information Studies is present on BUBL? How many pages does it occupy?
3. What method is provided for readers of BUBL to send feedback to the manager of BUBL?
4. What book has been published recently on the evaluation of library and information services? Give the complete bibliographic reference
5. What is the most recent issue of the journal Program to be listed on BUBL? Give the complete bibliographic reference to an article in it about the National Library of Wales.
6. Briefly describe the purpose and objectives of BUBL (20 words or less).
7. Briefly evaluate (less than 50 words) BUBL in terms of how easy it is to use.

APPENDIX II

BACKGROUND QUESTIONNAIRE

(To be completed and returned at the beginning of the course)

1. Personal record:
 - a) Name:
 - b) Age:
 - c) Sex:
 - d) Group No:
(This will be given by us later on)
 - e) Qualifications (e.g. A-levels or others, if any, and the subjects studied):
 - f) What were you doing before joining this course (e.g. school, work, etc)?
 - g) Would you regard your interests as:
 - i) More 'library' oriented ()
 - ii) More 'information' oriented ()
 - iii) Equal interest ()
2. Have you used any computer, or had computer training before?
Yes () No () Questionnaire is now complete
 - a) Which type of computer did you use?
 - i) Micro () ii) Mini ()
 - iii) Mainframe () iv) Don't know ()
 - b) How long have you been using a computer?
 - c) What have you used computer(s) for?
3. Have you used the electronic bulletin boards before?
Yes)) No ()
4. If the answer is 'Yes', which bulletin board(s) have you used?
5. Have you used electronic mail before?
Yes () No ()

6. If the answer is 'Yes', how much have you used electronic mail?
- a) Frequently ()
 - b) Occasionally ()
 - c) Very little ()
7. Have you used word processing before?
- Yes () No ()
8. If the answer is 'Yes', how much have you used word processing?
- a) Frequently ()
 - b) Occasionally ()
 - c) Very little ()

Department of Information and Library Studies
Loughborough University of Technology

DATA ANALYSIS AND PRESENTATION II
BULLETIN BOARDS
THE STUDENT BULLETIN BOARD, HUMBUL AND NISSBB

Professor A.J. Meadows, M.S. Sulaiman and J.F.B. Rowland
23-24 January 1992

This week you will start to make practical use of several bulletin boards: this Department's Student Bulletin Board which resides on one of LUT's Hewlett Packard computers, and the HUMBUL and NISS bulletin boards accessible over the academic network, JANET. HUMBUL NISS and the third bulletin board which will be the main topic of study next week, BUBL, all use the same software package, USERBUL, originally developed at Leicester University for HUMBUL. The Student Bulletin Board uses a different software package.

First you will access the Student Bulletin and look briefly at the items of information posted on it. While you are doing that, try to make an assessment of the user-friendliness and intuitiveness of the software; one of the things we will be asking you to do later on will be to compare it with USERBUL.

Then you will access successively HUMBUL and NISS, looking at each one for about fifteen minutes. There is a brief exercise on each of these two bulletin boards later in this handout; you will need to answer a few questions, the answers to which are to be found on the bulletin boards, and at the end of the session you should send your answers by electronic mail to: **M.S.Sulaiman** (note, full stops but no spaces in the name!).

Logging on to the Bulletin Boards

To log on, first start up the Amstrad computers by using the green start-up disks. When the start-up sequence is complete, type: **PAD <return>**, and you will be connected to the pad, which will give you the prompt **lut-spald16>**. At this point, the log on procedure for the Student Bulletin Board differs from that for HUMBUL, NISS and BUBL.

Student Bulletin Board. Type **call hpc <return>**, and the Hewlett Packard machine will ask you for your username (lsxxx, where xxx are your initials)) and then your password (which

only you know). After that, it will go through a short dialogue (you will need to type `l<return>` to tell it what sort of terminal you have got), and will come up with an hpc prompt. At this point type `sbb<return>`, and you will be into the Student Bulletin Board.

[The same procedure is used for sending electronic mail, except that instead of `sbb` you will need to type `elm` to get into the electronic mail system].

HUMBUL. At the `lut-spald16>` prompt, type `call 00005020010002<return>`. (There is another way which is supposed to work by typing "call HUMBUL", but at present, owing to changes at HUMBUL, it unfortunately does not work from here, so we have to use the long and rather unmemorable number instead). After a brief pause it will ask you whether you have used HUMBUL before; when you say you have not, it will ask you for your last name and initials. After it has registered you as a HUMBUL user, you will be in on the bulletin board.

NISS. At the `lut-spald16>` prompt, type `call niss<return>`. After a moment, the NISS gateway screen will appear. Type A to choose the NISS Bulletin Board. No further dialogue is needed; you will go straight into the NISS bulletin board.

BUBL. Here you have two options; (1) you can call the NISS gateway as above, and then type U, which will bring up another menu, from which you can choose BUBL by typing B. You will then be into BUBL, but it will ask you what sort of terminal you have got; answer `vt100<return>`, and then you will be properly in. (2) The second option is to go in directly from the `lut-spald16>` prompt; type `call gla.bubl<return>` and you bypass the NISS gateway and go straight to BUBL.

What is on the Bulletin Boards?

These four bulletin boards are all aimed at different groups of clients. The Student Bulletin Board is what you - the students of DILS - make of it. Contact the editors by electronic mail if you would like to contribute any items to it: e-mail or C.Sheen or S.Masters.

HUMBUL (HUMANities BULLETin board) is about the Humanities, very broadly defined, and more specifically about the use of information technology in research, teaching and scholarship in the humanities. NISS (National Information on Software and Services) is aimed at the entire academic community and provides information on computer software and services that are available to the academic community; its original clientele were the staff of university computer centres, and it may still have a bit of a leaning that way. BUBL (Bulletin Board for Libraries) serves the academic library community and provides

information about the use of information technology in the broadest sense in support of academic libraries and their services.

The last two pages of this handout show you the main menu of each of the four bulletin boards.

There now follow two brief exercises, with four questions for HUMBUL and four for NISS. **With each answer, please say which frame on the bulletin board provided the answer.** After these, there are a few general questions seeking your opinions about the bulletin boards and their software. Please e-mail your answers to M.S. Sulaiman.

HUMBUL Exercise

- Q1. News of what new service, based at Loughborough University, was given on 23 December 1991?
- Q2. When and where will the Association for Literary and Linguistic Computing and the Association for Computers in the Humanities be holding their 1992 Joint Conference?
- Q3. What academic institution is offering a course, starting on 7 March 1992, on How to Design and Present Courses Using Computer Networks?
- Q4. Research at which academic institution in the East Midlands has produced a database of the Wills and Inventories of the parish of Church Gresley in Derbyshire?

NISS Exercise

- Q5. What is the UK contact address for the online host STN International?
- Q6. How many OPACS are listed and when was the list last updated?
- Q7. What is CHEST? What does it do? Which university in the East Midlands is involved in running it?
- Q8. When did JANET come into being?

General Opinion Questions

- Q9. Did you find USERBUL or the Student Bulletin Board's software easier and more convenient to use? Why?
- Q10. Did the structure of HUMBUL make it easy to find the particular pieces of information you needed? What difficulties did you find in locating them?
- Q11. Did the structure of the NISS BB make it easy to find the particular pieces of information you needed? What difficulties did you find in locating them?
- Q12. In general, is USERBUL's tree structure appropriate for Bulletin Boards?

EXERCISES ON THE BUBL BULLETIN BOARD

For each of questions (1) to (5), please record how you found the answer and note the section in BUBL where it is found.

1. What recent grants have been made to (a) The City University and (b) Loughborough University by the British Library Research and Development Department?
2. What information from the CTI Centre for Library and Information Studies is present on BUBL? How many pages does it occupy?
3. What method is provided for readers of BUBL to send feedback to the manager of BUBL?
4. What book has been published recently on the evaluation of library and information services? Give the complete bibliographic reference
5. What is the most recent issue of the journal Program to be listed on BUBL? Give the complete bibliographic reference to an article in it about the National Library of Wales.
6. Briefly describe the purpose and objectives of BUBL (20 words or less).
7. Briefly evaluate (less than 50 words) BUBL in terms of how easy it is to use.

For the Practical Exercise 'Section K',

Please see the enclosed materials on the back of the thesis

BUBL-92 EVALUATION

1. How easy is it to read material on screen?
 - a) Very easy ()
 - b) Easy ()
 - c) Fair ()
 - d) Difficult ()
 - e) Very difficult ()

2. How good is the design of the display?
 - a) Excellent ()
 - b) Good ()
 - c) Acceptable ()
 - d) Poor ()
 - e) Very poor ()

3. What do you think of the amount of information on each screen?
 - a) Too much ()
 - b) Acceptable ()
 - c) Too little ()

4. How relevant are the contents to the apparent intentions of the section?
 - a) Fully related ()
 - b) Reasonably well related ()
 - c) Partly related ()
 - d) Poorly related ()

5. Was the language used by the author of the section easy to understand?
 - a) Very easy ()
 - b) Easy ()
 - c) Fair ()
 - d) Difficult ()
 - e) Very difficult ()

6. Does the information cover all the aspects you would expect?
Yes () No ()
7. If the answer is NO for the above question, what else did you expect?
8. Do you think that it is necessary to update the training section fairly frequently?
Yes () No ()
9. If the answer is YES for the above question, how frequently do you think it should be updated?
- a) Every six months ()
 - b) Every year ()
 - c) Every two years ()
 - d) Other (please specify) ()
10. How clear are the instructions on each screen?
- a) Excellent ()
 - b) Good ()
 - c) Acceptable ()
 - d) Poor ()
 - e) Very poor ()
11. How easy is the system to use?
- a) Very easy ()
 - b) Easy ()
 - c) Fair ()
 - d) Difficult ()
 - e) Very difficult ()
12. How satisfactory are the system responses when you make mistakes?
- a) Very satisfactory ()
 - b) Satisfactory ()
 - c) Acceptable ()
 - d) Not very satisfactory ()
 - e) Unsatisfactory ()

13. How quickly can you move from screen to screen?
- a) Very quickly ()
 - b) Fairly quickly ()
 - c) Not very quickly ()
 - d) Slow ()
14. How do you rate the paging and numbering within the section?
- a) Excellent ()
 - b) Very good ()
 - c) Acceptable ()
 - d) Poor ()
 - e) Very poor ()
15. Have you any specific suggestions for changes in section K?
- Yes () No ()
16. If the answer is YES for the above question, what are they?

Students comments and suggestions

EXPLANATION OF BUBL EVALUATION

- Q1. Examine the legibility and contrast of the on-screen display.
- Q2. Look here for a logical organisation of information that is pleasing to the eye.
- Q10. Can you see easily where you are in the system, and can you move easily from screen to screen?
- Q14. Do the page numbers and other indications of position really help you determine where you are in the system?

APPENDIX III
BACKGROUND QUESTIONS

1. Personal record:
 - a) Name:
 - b) Age
 - i) Under 25 ()
 - ii) 25 or over ()
 - c) Would you regard your interests as:
 - i) More 'library' oriented ()
 - ii) More 'information' oriented ()
 - iii) Equal interest ()

2. Which type of computer(s) have you used?
 - i) Mainframe ()
 - ii) Mini ()
 - iii) PC or equivalent ()
 - iv) Macintosh ()
 - v) Others ()
 - iv) Do not know ()

4. How long have you been using a computer(s)?

5. Have you used Windows before?
Yes () No ()

6. If the answer is 'Yes', how often have you used Windows?
 - i) Frequently ()
 - ii) Occasionally ()
 - iii) Very little ()

7. Have you used electronic bulletin board(s) before?
Yes () No ()

8. If the answer is 'Yes', which bulletin board(s) have you used?

9. Have you used electronic mail before?
Yes () No ()

10. If the answer is 'Yes', how often have you used electronic mail?
- i) Frequently ()
 - ii) Occasionally ()
 - iii) Very little ()
11. Have you used word processing before?
- Yes () No ()
12. If the answer is 'Yes', how often have you used word processing?
- i) Frequently ()
 - ii) Occasionally ()
 - iii) Very little ()

COMPUTER STARTING UP

1. Insert "Green start up disk" into drive A.
2. Switch computer on.
3. When menu appears, type GN if you are in a **gandalf** machine (i.e. a blue box is located of the side to the computer) or type PA if you are working on a **PAD** computer.

PRESS RETURN

4. If you are on a **gandalf** machine:
 - A message will appear informing you to flick the gandalf switch to its up position
 - Do this by flicking the switch when it appears. (Note the red ready light will come on)
 - Press return a couple of times until you are asked to enter a class
 - Enter net to access the pad prompt
 - Follow one of the above by pressing return.

BUBL QUESTIONS

HOW TO ACCESS BUBL

1. Type pad then return
When you get (LUT-spada17) type call gla.bubl then return

QUESTIONS

1. What book has been published recently on 'Marketing the Information Profession to the Information Society'? Give the complete bibliographic reference.
2. Who is the head of the Department of Library and Information Studies at University College, Dublin?
3. What does ADONIS stand for?
4. What does BUBL mean, and what is the intended audience?

For the Practical Exercise 'Section K'

Please see the enclosed materials on the back of the thesis

BUBL-93 EVALUATION

1. How easy is it to read material on screen?
 - a) Very easy ()
 - b) Easy ()
 - c) Fair ()
 - d) Difficult ()
 - e) Very difficult ()

2. How good is the design of the display?
 - a) Excellent ()
 - b) Good ()
 - c) Acceptable ()
 - d) Poor ()
 - e) Very poor ()

3. What do you think of the amount of information on each screen?
 - a) Too much ()
 - b) Acceptable ()
 - c) Too little ()

4. How relevant are the contents to the apparent intentions of the section?
 - a) Fully related ()
 - b) Reasonably well related ()
 - c) Partly related ()
 - d) Poorly related ()

5. How clear are the instructions on each screen?
 - a) Excellent ()
 - b) Good ()
 - c) Acceptable ()
 - d) Poor ()
 - e) Very poor ()

6. How easy is the system to use?
- a) Very easy ()
 - b) Easy ()
 - c) Fair ()
 - d) Difficult ()
 - e) Very difficult ()
7. How satisfactory are the system responses when you make mistakes?
- a) Very satisfactory ()
 - b) Satisfactory ()
 - c) Acceptable ()
 - d) Not very satisfactory ()
 - e) Unsatisfactory ()
8. How quickly can you move from screen to screen?
- a) Very quickly ()
 - b) Fairly quickly ()
 - c) Not very quickly ()
 - d) Slow ()
9. How do you rate the paging and numbering within the section?
- a) Excellent ()
 - b) Very good ()
 - c) Acceptable ()
 - d) Poor ()
 - e) Very poor ()
10. Was the language used by the author of the section easy to understand?
- a) Very easy ()
 - b) Easy ()
 - c) Fair ()
 - d) Difficult ()
 - e) Very difficult ()

11. Does the information cover all the aspects you would expect?

Yes () No ()

12. If the answer is NO for the above question, what else did you expect?

13. Have you any specific suggestions for changes in section K?

Yes () No ()

14. If the answer is YES for the above question, what are they?

Students' comments and suggestions

EXPLANATION OF BUBL EVALUATION

- Q1. Examine the legibility and contrast of the on-screen display.
- Q2. Look here for a logical organisation of information that is pleasing to the eye.
- Q5. Can you see easily where you are in the system, and can you move easily from screen to screen?
- Q9. Do the page numbers and other indications of position really help you determine where you are in the system?

GLOSSARY

Internet:

The global collection of interconnected regional and wide-area networks which use the IP as the network layer protocol.

Telnet:

The Internet standard protocol for remote terminal connection service. Telnet allows a user at one site to interact with a remote time sharing system at another site as if the user's terminal was connected directly to the remote computer.

Bulletin Board System (BBS):

An electronic bulletin board system is a message database where people can login and leave messages for others. The bulletin board is typically divided into topic groups ... they serve a valuable function by knitting together a lot of users in the PC/micro world who would otherwise be unable to exchange information.

Anonymous FTP:

Anonymous FTP allows a user to retrieve documents, files, programs and other archived data from anywhere in the Internet without having to establish a usergrid and password.

Gopher:

A distributed information service that makes available hierarchical collection of information across Internet.

* * * * *

In case you do not yet a connection to INFOSLUG from hpb, then type at the pad Call uk.ac.nsfnet-relay.telnet and press the return key. When you get Guest telnet to: then type scilibx.ucsc.edu and press the return key. Login: gopher.

INFLOSLUG QUESTIONS

HOW TO ACCESS INFLOSLUG

1. Type hpb, then return
When you get hpb then type telnet scilibx.ucsc.edu and return.
Login: gopher and return.

QUESTION

1. What is the zip code of Rodeo in California?
2. What is the meaning of the visual code (?) question mark used in the different sections of Infoslug?
3. What is the telephone area code of Los Angeles in California?
4. What does NREN stand for?

Additional questions, if time permits

(Or you can try the extra Launchpad questions)

1. How many tragedies by William Shakespeare are listed by Infoslug?
2. What is the e-mail address to which you can send your comments about Infoslug?
3. How many library journals are listed by Infoslug?
4. What is section 6 of Infoslug about?

INFOSLUG EVALUATION

1. How easy is it to read material on screen?
 - a) Very easy ()
 - b) Easy ()
 - c) Fair ()
 - d) Difficult ()
 - e) Very difficult ()

2. How good is the design of the display?
 - a) Excellent ()
 - b) Good ()
 - c) Acceptable ()
 - d) Poor ()
 - e) Very poor ()

3. What do you think of the amount of information on each screen?
 - a) Too much ()
 - b) Acceptable ()
 - c) Too little ()

4. How relevant are the contents to the apparent intentions of the section?
 - a) Fully related ()
 - b) Reasonably well related ()
 - c) Partly related ()
 - d) Poorly related ()

5. How clear are the instructions on each screen?
 - a) Excellent ()
 - b) Good ()
 - c) Acceptable ()
 - d) Poor ()
 - e) Very poor ()

6. How easy is the system to use?
- a) Very easy ()
 - b) Easy ()
 - c) Fair ()
 - d) Difficult ()
 - e) Very difficult ()
7. How satisfactory are the system responses when you make mistakes?
- a) Very satisfactory ()
 - b) Satisfactory ()
 - c) Acceptable ()
 - d) Not very satisfactory ()
 - e) Unsatisfactory ()
8. How quickly can you move from screen to screen?
- a) Very quickly ()
 - b) Fairly quickly ()
 - c) Not very quickly ()
 - d) Slow ()
9. How do you rate the paging and numbering within the section?
- a) Excellent ()
 - b) Very good ()
 - c) Acceptable ()
 - d) Poor ()
 - e) Very poor ()

Students' comments and suggestions

APPENDIX IV
BACKGROUND QUESTIONNAIRE

(To be completed and returned at the beginning of the course)

1. Personal record:
 - a) Name:
 - b) Age:
 - c) Sex:
 - d) Qualifications (e.g. A-levels):
 - e) What were you doing before joining this course (e.g. school, work, etc)?
 - f) Would you regard your interests as:
 - i) More 'library' oriented ()
 - ii) More 'information' oriented ()
 - iii) Equal interest ()
2. Have you used any computer or had computer training before?
Yes () No () Questionnaire is now complete
 - a) Which type of computer did you use?
 - i) Micro () ii) Mini ()
 - iii) Mainframe () iv) Don't know ()
 - b) What did you use the computer(s) for?
 - c) Have you used a Macintosh computer before?
Yes () No ()

COMPARISON OF HYPERTEXT AND dBASE DATABASES WORKSHEET

Your task is to use the database to find the answers to the questions given below. Fill in your answers in the spaces provided after each question. Fill in also the time for each questionnaire in the boxes provided.

Name:

Course:

1. Where is the CTI (Computers in Teaching Initiative) Centre for Physics?
[Give the complete address] []

2. What people are associated with the CTI Centre for Library and Information Studies?
[]

3. Who originally developed 'HyperTIES'?' []

4. Who is the supplier of 'CEA' software? []

5. "What is the price of 'QCIP' software? []

6. Which LIS Departments in the UK user Hypercard?
[]

7. Which software is both a Hypertext system and an Expert system?
[]

8. What software is available for running on a PRIME (mainframe) system?
[]

9. Who is the supplier of Bibliometrics toolbox'?
[]

10. Which software is freely available?
[]

11. What software has been developed by the Department of Information Studies at the University of Sheffield?

[]

12. Who is using the 'Softop' software?

[]

COMPARATIVE STUDY OF HYPERTEXT AND dBASE III DATABASES

Please tick against the appropriate response

Name:

Course:

1. How well organised did you find the information in the database?

	<u>Hypertext database</u>	<u>dBase database</u>
i) Very poor	[]	[]
ii) Poor	[]	[]
iii) Acceptable	[]	[]
iv) Quite well	[]	[]
v) Very well	[]	[]

2. How acceptable was the appearance of the material on the screen?

	<u>Hypertext database</u>	<u>dBase database</u>
i) Very poor	[]	[]
ii) Poor	[]	[]
iii) Acceptable	[]	[]
iv) Fairly good	[]	[]
v) Very good	[]	[]

Note briefly here any major defects

3. Which system did you feel enabled you to retrieve information most quickly?

i) Hypertext	[]
ii) dbase	[]
iii) Both equal	[]

4. Which system did you find was the most flexible for seeking information?

i) Hypertext	[]
ii) dBase	[]

5. How easy did you find it to move from one screen to another?

	<u>Hypertext database</u>	<u>dBase database</u>
i) Hard	[]	[]
ii) Fairly hard	[]	[]
iii) Fairly easy	[]	[]
iv) Easy	[]	[]

6. Did you encounter any navigational problems while using this catalogue?

Yes []

No []

If your answer is 'Yes', note briefly what they were below:

1. Hypertext database

2. dBase database

7. Did you encounter any other problems in retrieving the information?

Yes []

No []

If 'Yes', please note the sorts of problems briefly

10. Which hardware/software system did you feel was more user friendly?

i) Mac and hypertext []

ii) PC and dBase database []

a) Can you explain briefly why?

APPENDIX V
BACKGROUND QUESTIONS

1. Personal record:
 - a) Name:
 - b) Age i) Under 25 ()
 ii) 25 or over ()
 - c) Would you regard your interests as:
 - i) More 'library' oriented ()
 - ii) More 'information' oriented ()
 - iii) Equal interest ()

2. Which type of computer(s) have you used?
 - i) Mainframe () ii) Mini ()
 - iii) PC or equivalent () iv) Macintosh ()
 - v) Others () iv) Do not know ()

4. How long have you been using a computer(s)?

5. Have you used Windows before?
Yes () No ()

6. If the answer is 'Yes', how often have you used Windows?
 - i) Frequently ()
 - ii) Occasionally ()
 - iii) Very little ()

7. Have you used electronic bulletin board(s) before?
Yes () No ()

8. If the answer is 'Yes', which bulletin board(s) have you used?

9. Have you used electronic mail before?
Yes () No ()

10. If the answer is 'Yes', how often have you used electronic mail?
- i) Frequently ()
 - ii) Occasionally ()
 - iii) Very little ()
11. Have you used word processing before?
- Yes () No ()
12. If the answer is 'Yes', how often have you used word processing?
- i) Frequently ()
 - ii) Occasionally ()
 - iii) Very little ()

Screen # 1



1



2



3



4



5



6

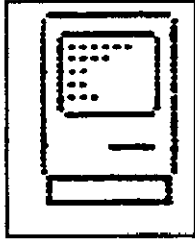


7

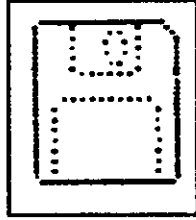
Screen # 2



1



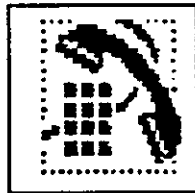
2



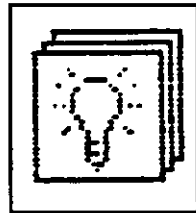
3



4



5



6



7

Screen # 3



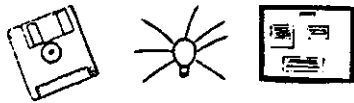
8

9



10

11



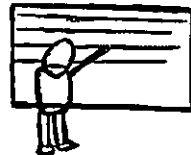
12

13

14



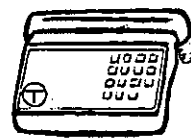
8



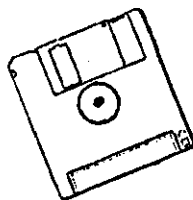
9



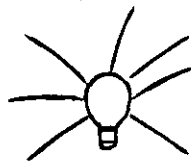
10



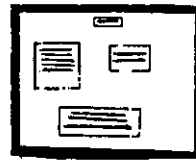
11



12



13



14

Screen # 5



15



16



17



18



19

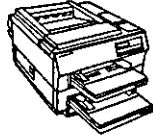


20



21

Screen # 6



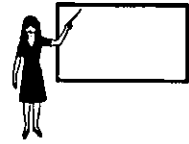
15



16



17



18



19



20



21

Screen # 7

PRINTER

CONFERENCES

SEARCHING

22

23

24

HELP

COMPUTER
SOFTWARES

DATABASES

25

26

27

PRINTER

22

CONFERENCES

23

SEARCHING

24

HELP

25

COMPUTER
SOFTWARES

26

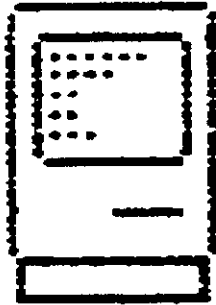
DATABASES

27

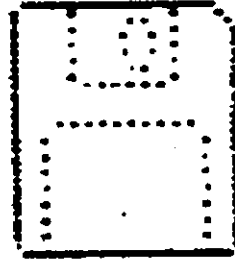
Screen # 9



1



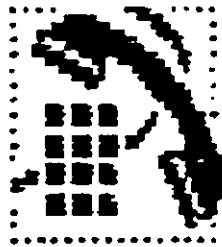
2



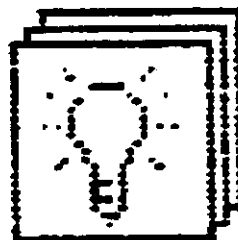
3



4



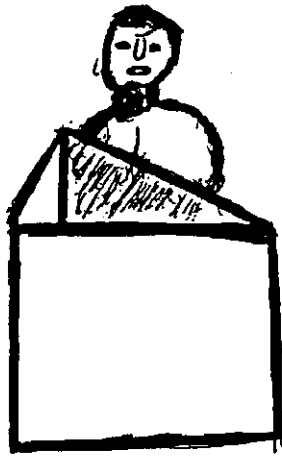
5



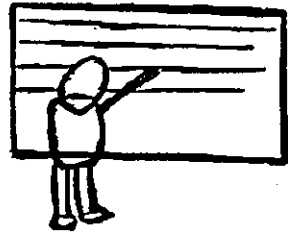
6



7



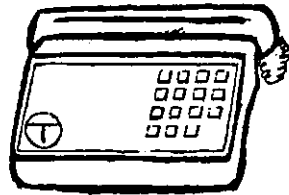
8



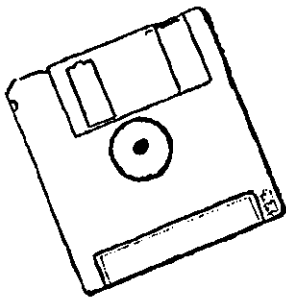
9



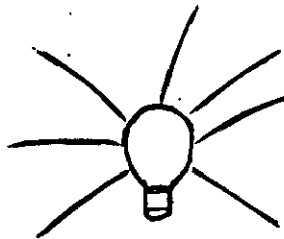
10



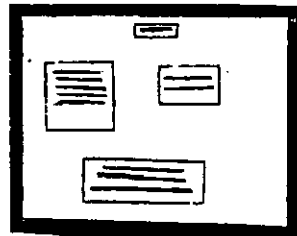
11



12



13



14

Screen # 11



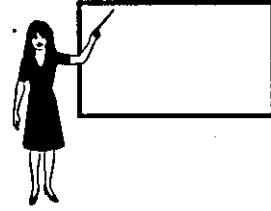
15



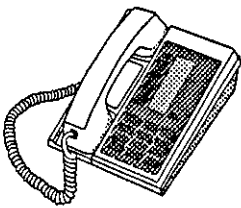
16



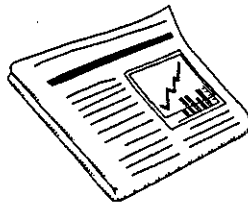
17



18



19



20



21

PRINTER

22

CONFERENCES

23

SEARCHING

24

HELP

25

COMPUTER
SOFTWARES

26

DATABASES

27

SHEET 1 (Recognising the picture in the small size)

1. What do you think these pictures are supposed to represent?

Picture

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.
- 18.
- 19.
- 20.
- 21.
- 22.
- 23.
- 24.
- 25.
- 26.
- 27.

SHEET 2 (Recognising the picture in the medium size)

Picture

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.
21.
22.
23.
24.
25.
26.
27.

SHEET 3 (Relating the pictures to their functions on the computer facilities)

2. What functions of the system do you think these icons are supposed to represent?

Icon

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.
- 18.
- 19.
- 20.
- 21.

QUESTIONNAIRE

1. Did you have any difficulties in relating the icons to the functions they represent?

Yes [] No []

2. If 'Yes', what were your main problems?

3. You have been shown three different sizes of icon, which do you think is best for frequent on-screen use?

a) Small []

b) Medium []

c) Large []

4. What factors had you in mind when you chose the above answer?

5. Which form of entry to the system would you prefer for frequent on-screen use?

a) Icons []

b) Words []

6. What factors had you in mind when you chose the above answer?

Students' comments and suggestions

The Pictures and Functions of the icons

Icon No.	Description of the pictures	Functions of the pictures
1.	Question Mark	Help facilities
2.	Mac monitor	Software
3.	Diskette	Database
4.	Printer	Printing facilities
5.	Telephone	Modem
6.	Light Bulb	New ideas
7.	House	Main menu
8	Laser printer	Printing facilities
9	Personal Computer	Software
10	World map	Geographical places
11	Teacher and board	On-line teaching class
12	Telephone	Modem
13	Newsletter	Electronic newsletter or journals
14	Diploma	Degree requirements
15	Envelope	E-mail
16	Telephone	Modem
17	Person giving speech	Computer Conferences
18	Teacher and board	On-line teaching class
19	Diskette	Database
20	Light Bulb	New ideas
21	Bulletin Board	Electronic Bulletin Board

APPENDIX VI

Dear

I am Mubarak Sulaiman from King Saud University. I am doing my PhD at Loughborough University of Technology, UK. My study is concerned with GULFNET, especially how to improve access and understanding of its operation. I am approaching you because you are eligible to use GULFNET. I would be grateful if you would first of all simply acknowledge receipt of this message so that I know that communication from the UK is working satisfactorily. I also hope to send you a questionnaire about GULFNET via the electronic mail within about two to three weeks from receiving your acknowledgement. If you do not wish to receive further correspondence from me, please say so in your acknowledgement of this message.

Thank you very much for your help.

Yours

Mubarak Sulaiman

4. If you use electronic mail, how would you rank the user-friendliness of the network electronic mail services?

- A. Excellent []
- B. Very good []
- C. Good []
- D. Poor []
- E. Very poor []

5. What problems have you encountered in using electronic mail?

6. Why do you use electronic mail?

- A. Because it saves time []
- B. Because it is more convenient []
- C. Because it is good for communication on the campus []
- D. Because it is good for national communication []
- E. Because it is good for international communication []
- F. Other (please specify)

7. Do you think that GULFNET users need to have some training in how to use the network services?

Yes [] No []

8. If the answer to question 7 is 'YES' what method(s) of training would you prefer?

- A. Workshop []
- B. Lectures and seminars []
- C. Electronic bulletin board []
- D. Electronic mail []
- E. Floppy diskette(s) []
- F. Manual(s) []
- G. Other (please specify)

9. What do you expect a training package to contain?
- A. General introduction to GULFNET []
 - B. Instructions about using the network []
 - C. Instructions about using the services on GULFNET []
 - D. Practical exercises on how to use GULFNET []
 - E. Other (please specify)

10. Are there specific items that you would expect to see in a training package?

SERVICES SECTION

(Note: You can select more than one choice to answer any question as applicable).

11. Do you think that the available services on GULFNET are adequate?
 Yes [] No []

12. If the answer to question 11 above is 'NO', what additions to existing services do you think are necessary?
- A. Access more databases []
 - B. Access the library catalogues of other institutions
 in the Gulf States []
 - C. Other (please specify)

13. Please indicate your opinion of the following possible new services as part of GULFNET:

Indicate importance on a scale of 1-3, where:

1. Unnecessary 2. Useful 3. Worthwhile

(Note: Please insert the appropriate value from this ranking scale. The following services, if introduced, would be made available to all the academic institutions in the Gulf States).

- | | | | |
|-----|---|---|---|
| 1. | Newsletter | [|] |
| 2. | Conferences and meetings | [|] |
| 3. | Academic staff: new and recent publications | [|] |
| 4. | Projects in progress | [|] |
| 5. | Library collection news | [|] |
| 6. | Comments from users | [|] |
| 7. | Electronic mail (addresses) | [|] |
| 8. | Addresses of academic institutions in the Gulf States | [|] |
| 9. | Addresses of academic departments | [|] |
| 10. | Recently established activities | [|] |
| 11. | Other (please specify) | [|] |

Subjects' comments and suggestions

Appendix VII

USERBUL printed screens

Section L1A

Page 1 of 5

JANET : an overview

JANET, the United Kingdom Joint Academic Network, was established in 1984 by the Computer Board for Universities and Research Councils. It now links users to the facilities of over 1700 registered computers on more than 150 sites. All universities and polytechnics are connected, as are the units funded by the research councils.

JANET is managed by the Joint Network Team (JNT), based at the Rutherford Appleton Laboratory outside Didcot. The JNT is also responsible for developing and approving UK academic networking applications funded by the Computer Board.

Use of the network is currently free to users within the Academic Community. The costs of operation are met by the major funding agencies responsible for research and teaching in the universities, and by fixed annual charges for connection to other organisations.

Options: HELP HINTS SEARCH MAIL POST QUIT M (Main Menu) or <RETURN> (Next Page)

Please select section name, page number, or option:

Section L1A

Page 2 of 5

JANET is an X.25, packet-switched network. There are gateways to other academic networks especially in Europe and North America (e.g. the Internet and NSFNET, IXI, EAN, USENET and EARN/BITNET) and to the public networks through PSS/IPSS. The network is completely 'open', though most of the computers attached to it accept only approved users.

JANET provides all the standard network services for collaboration and communication: interactive terminal-to-host access (remote login), file transfer, mail and remote job submission. Communication within the network currently depends on the 'Coloured Book Protocols'. The wide use of these standard utilities underpins the huge variety of applications and activities possible across the academic community. Several commercial firms maintain the same protocols to facilitate joint industry/university research. Open Systems Interconnection (OSI) will provide these facilities to computer users worldwide. Facilities for OSI applications (e.g. X.400, X.500) are increasingly available.

Options: HELP HINTS SEARCH MAIL POST QUIT M (Main Menu) or <RETURN> (Next Page)

Please select section name, page number, or option:

Gopher printed screens

About the Clearinghouse for Subject-Oriented Internet
Resource Guides
August 1993

The Clearinghouse for Subject-Oriented Internet Resource Guides is a joint effort of the University of Michigan's University Library and the School of Information and Library Studies (SILS). Its goal is to collect and make widely available guides to Internet resources which are subject-oriented. These guides are produced by members of the Internet community, and by SILS students who participate in the Internet Resource Discovery project.

Why Subject-Oriented Guides?

Many useful guides to Internet resources are organized by format or by information delivery tool. For example,
17% : <SPACE> - next screen, q - quit, /string - search

guides have been produced which solely describe LISTSERVs, or online library catalogs. However, as the scope of available information on the Internet broadens, and as the numbers of formats and delivery systems grow, it becomes increasingly necessary to organize information by subject. Many Internet users are more likely to search for information by subject than by a specific tool or format. Subject organization also provides a context for Internet resources and a means for comparing them.

Who can benefit from using these Guides?

1) Users who are interested in a specific subject, especially those who do not have access to the entire array of commonly used Internet tools. For example, a user who does not have access to Gopherized resources can still benefit from learning what Usenet newsgroups are relevant.

2) Internet trainers can combine these guides with their own teaching skills and general knowledge of the Internet. This allows trainers to reach audiences they may previously have shied away from due to a lack of subject expertise.

3) System builders can use these guides to help determine what resources exist and which of those are of
44% : <SPACE> - next screen, q - quit, /string - search

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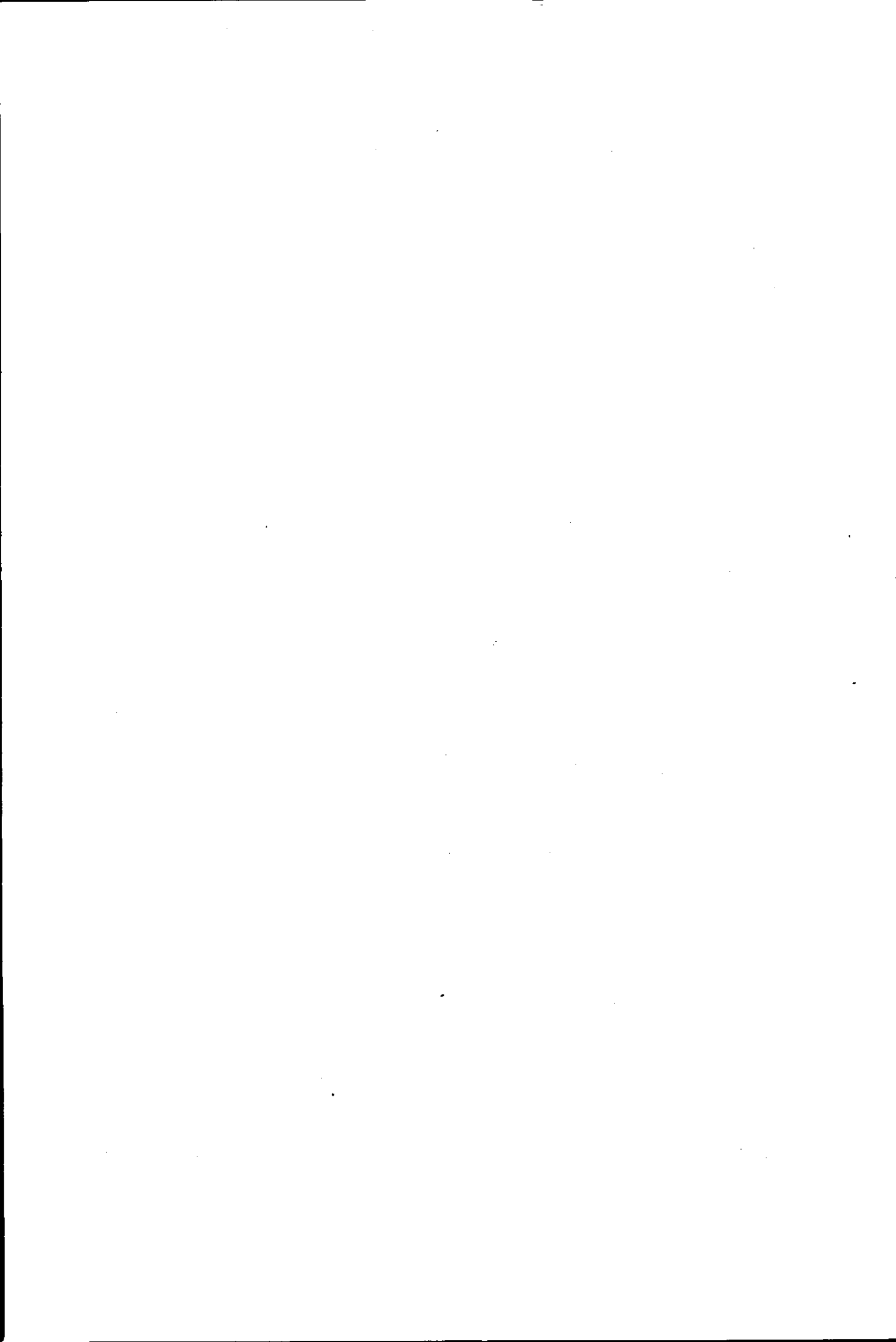
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Section K

Practical Exercises and LIS EDUCATION

- Section KA - Introduction
- Section KB - BASIC Exercises
- Section KC - INTERMEDIATE Exercises
- Section KD - ADVANCED Exercises

Section K2 - Subject Specific Machine-readable user education guides

Section K3 - Network Training Materials

Section K4 - LIS Courses

Section KW - Reference Expert System on LIBSOFT

Section KZ - EUDORA Exercises

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Please select section name, page number or option :

Esc-chr: ^z help: ^z? port:l speed: 9600 parity:none echo:rem VT102

Section KA

PRACTICAL EXERCISES

The exercises listed below are divided into three categories:

Section KB - Basic exercises:

- i) Using Library OPACs
- ii) Using Bulletin Boards: Janet.news
: Humbul

Section KC - Intermediate exercises:

- i) Posting from NISSBB
- ii) Sending E-mail
- iii) Scanning HENSA Software
Archives
- iv) Subscribing to PACS-L mailing
list

Section KD - Advances exercises:

- i) Using the PSS-Janet Gateway
- ii) File Transfer from HENSA

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- iii) File Transfer from Janet.news
- iv) Searching & Retrieving from PACS-L
Archive
- v) Sending a program from HENSA via
E-mail

The basic exercises require access to the JANET network from a terminal or micro running emulation software connected to a PAD.

Several of the intermediate and advanced exercises require access to a general purpose machine running JANET electronic mail and file transfer software.

For access of this type, you should be a registered user of a general purpose computer operated by your University's Computing Service. There is a variety of such machines (e.g. Vaxes, IBM mainframes, ICLs, Amdahls, etc.), and a variety of operating systems running on them (e.g. VMS, CMS, VME, Unix).

You do not need to be an expert in the use of these systems in order

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to use some of their software programs for JANET use, but you should take the time, upon registering as a user, to study the system documentation provided by the Computing Centre. Typically, this will consist of a user-manual for the relevant operating system. Read the sections dealing with JANET electronic mail, and file transfer procedures.

You will require an elementary knowledge of these instructions in order to carry out some of the intermediate and advanced level exercises below. If you have any problems with any of these exercises, please see your JANET Training Officer, Systems Librarian or Computing

Centre, or send a mail message to `jupiter@glasgow.vme`.

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(1) Basic Level Exercises

Exercise 1:

Perform an interactive search of some OPACs:

Connect to the pad> prompt.

To find the address to call:

Typically, the command for this is "Help address".

It may be that your PAD is set up to make direct calls to OPACs on JANET, using NRS names or their abbreviations.

If the NRS names:

HULL.LI.GEAC,

HULL.GEAC,

CAMBRIDGE.UNIVERSITY-LIBRARY,

CAM.UL,

LIVERPOOL LIBRARY,

LIV.LIB, or any variants appear in response to a "HELP ADDRESS" command, then simply entering, e.g. "Call HULL.GEAC" will be sufficient to connect you directly to that OPAC.

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Section D1 of Bubl contains details of NRS names and numbers for a host of OPACS.

If none of the three OPACs are listed in the PAD address file, call them from your PAD by means of their NRS addresses:

Hull: 0000 1230 0108;

Cambridge: 0000 0801 0060 79;

Liverpool: 0000 1050 0205. Do not include spaces.

Again, the way you do this depends upon your local system, and its interface with your local JANET switch.

You may simply be required to enter:

"Call ;name or address;" (eg "Call HULL.LI.GEAC" or "Call 000012300108").

Often, a 'J.' is required before the name or address (eg "Call J.HULL.LI.GEAC", or "Call J.000012300108").

Other systems may require quite different procedures.

Having entered the OPACs, spend a little time exploring them.
Does Cambridge have any books on JANET?

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Does it display circulation information?
How easy is it to log off?

What do you think of Hull's menu?

Does the catalogue have a book about JANET by an author whose surname is Stones?

Does Hull's OPAC give you circulation information?

What about Liverpool's system?

Is it a friendly system to enter?

Does it have a copy of Patrick Holligan's Access to academic networks?

If so, can you find out whether the book is on loan?

Exercise 2: Search:

the JANET.News

At the pad>call JANET.NEWS

logon using NEWS

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Locate the file 'LIBRARY.CATALOGS' in JANET.News.

Search that file for details of your own or another OPAC (instructions on file-searching will appear throughout your session, provided you answer "n" to the initial request about using the Bulletin Board's 'View' software).

What do you think of the JANET.News interface?

Search:

HUMBUL Bulletin Board 2121 0010 02.

When you log on to HUMBUL, you will be asked to register on the system. Take a note of your registration name for future reference. How does the HUMBUL interface compare with that of JANET.News?

Enter Section E.

Search for the reference to St. Pancras (enter SEARCH for details of searching in this Bulletin Board).

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Please select section name, page number or option : kc

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(2) Intermediate Level Exercises

Exercise 1:

Post an item from the NISS Bulletin Board to your own JANET mailbox. Note that this exercise requires you to have registered as a mail-user with your Computer Centre, and to have a mailbox address.

Enter the NISS Bulletin Board

(NRS Name: NISS; NRS address 0000 6220 0000).

Locate document E3.

Post the document back to yourself.

Check tomorrow.

Is it in your mailbox?

If not, you have obviously made a mistake.

Try again.

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Exercise 2:

Send electronic mail to a colleague.

This exercise is designed to introduce electronic mail to first-time users.

It requires some knowledge of how to use the mailer on any general purpose computing facility on your campus.

You should ideally have had some local training in using the mailer from your JANET Training Officer, Systems Librarian, or a Computer Centre representative.

Failing that, you should have some documentation on the mailer to hand.

This exercise requires you and a colleague to send each other a piece of mail SIMULTANEOUSLY.

You must know both your own and your colleague's mailbox address.

Ideally, you ought both to work at PAD-connected machines located in close physical proximity.

If this is not possible, arrange a time in advance for the exercise to begin.

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The following instructions should be followed by both parties.

Log on to the machine which runs your mailer.

Invoke the mailer (e.g. by the command 'Mail').

Indicate to the program that you wish to send a message (e.g. by the command 'send'; 'post'; 'compose', etc.).

Give your colleague's mailbox address as the recipient.

Note that some systems permit the address to be entered in a single string,

e.g. (prompt) To: (input) jupiter@glasgow.vme

Others, however, require that the address be split into its components, e.g.

(prompt) Remote username(s): (input) jupiter (prompt)

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At which site? (input) glasgow.vme

If your mailer prompts you to enter a subject here, call it 'Experiment'.

Send a message to your colleague, e.g.

"Dear Mark,

It has taken me a minute to send you this message.

Yours, Elizabeth"

The mailer will require you to indicate when the message is complete, and ready for transmission. Send your message according to the instructions from your mailer (for instance, this could be by entering a * or :, or hitting CONTROL/Z).

While you are composing your message, you may be informed that your mailer has just received a message.

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This means that your colleague has keyed faster than you. If this happens, once you have finished keying, read the message from your colleague. You may have to quit and then re-enter the mailer in order to do this. If you do not receive such a message, after finishing your keying, quit the mailer. Wait a moment or two: your mailer may tell you that a message has just arrived. If not, invoke the mailer again, and scan your mail. Is the message from your colleague there?

If, after several minutes, either or both of you have not received a message, then something has gone wrong. Check with your JANET Training Officer, Systems Librarian, or Computer Centre.

Exercise 3:

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Scan the indexes of the Higher Education National Software Archive. (HENSA/micros)
This is an interactive exercise.

Type at the pad>call uk.ac.hensa.micros
At the login: hensa (in lower case)
At the Password: hensa (in lower case)

You can also use the NISS Gateway to access, going through the menus until you find and select Higher National Software Archive options.

Once connected, read the introductory information presented. Type '?' at the prompt --> to read the list of available commands. Then type 'help'. Spend some time reading through the help information presented. Choose the help sub-topic 'basics', and read through the information it contains.

You want to scan the indexes of software.

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Press 'Return' until you are back at a - -> prompt.
Enter the command "more micros/index".
You can now page down through the indexes of software, to assess the software on offer to you via the service.
To actually obtain any software package requires the use of file transfer, electronic mail (see advanced exercises), or Kermit.
If you would like to try one of these methods at this stage, you should read the instructions given in the help files very carefully.

Exercise 4:

Subscribe to the US-based electronic mailing list for libraries, PACS-L.

This is a non-interactive exercise, involving sending a mail message via a UK gateway to a US host system.

Log on to the machine which runs your mailer.

Invoke the mailer.

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Send a message to "LISTSERV%UHUPVM1@EARN-RELAY".

Note that this message is being routed via two addresses - EARN-RELAY, which is a UK gateway for electronic mail to Europe and the US, and UHUPVM1, which is a machine at the University of Houston on which the 'listserv' program is running.

You should not use the '@' symbol twice in this sort of address, however.

It should only preface the UK mailbox address.

At other points in such an address string, '%' is used to denote 'at address'.

If your mailer prompts you for a subject, leave the field blank (you may have to enter an asterisk, or colon in order to skip this prompt).

The text of your message has to be read and understood by a computer program, therefore it is not written in natural English.
Case should not matter, but follow the wording below EXACTLY.

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Subscribe PACS-L your name (e.g. 'Subscribe PACS-L Mark Jenkins')

Send the message.

Log back into your mailbox later today or tomorrow morning.
You should be told that your subscription has been accepted, and you should now be receiving items of mail from other list members.
If this has not happened, check with your JANET Training Officer, Systems Librarian, or Computing Centre.

If you do not wish to remain on the list, send the following message to the same address:

Signoff PACS-L ;do not add your name;

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(3) Advanced Level Exercises

Exercise 1:

Use the PSS-JANET gateway to conduct an interactive session with a JANET host.

This exercise illustrates use of the gateway, which operates in both directions.

If your library does any online searching, you are likely to use PSS whether or not your campus has a PSS switch on site.

Call PSS.

If your campus has its own switch, you may simply have to key "CALL PSS" at the PAD prompt.

If your site connects to PSS via a leased line or via the telephone network, consult with your Systems Librarian or Computing Centre about the procedure involved in calling PSS.

Enter the JANET gateway NUA (23421920010069 or 23422351919169).

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The system should respond:

"Please enter your authorisation and address required in form:
(user,password).address"

As you are making a call to JANET, you may dispense with authorisation.

Simply enter a full stop followed immediately by the JANET address (which may be a mnemonic: a list of these is available in JANET.News - see file 'Gateways.PSS.JANET')

e.g. .000071100005 (this connects you to the OPAC of Glasgow University Library).

.NEWS connects you to the JANET.News Bulletin Board, as in Basic Exercise 2 -only this time your route is via PSS!

Exercise 2:

Obtain the help file "help/basics" from HENSA by means of file

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transfer over JANET.

For this exercise and the next, you will require to be familiar with the command sequence necessary to invoke the file transfer mechanism from a general purpose computer.

This is likely to be the same machine as the one on which your mailer resides, and you should therefore be registered to use it.

Note that, to perform this operation, you will not be logging on to

HENSA in interactive mode, as you did in a previous exercise, but to your own local mainframe instead.
Make sure you have your instructions regarding file transfer procedures to hand.

Log on to your mainframe.

The command to request a file transfer is typically something like 'transfer', 'transferfile' or even 'network'.
You will be required to provide five essential parameters after the transfer command (you will usually be prompted for each of these in turn).

They are 'input file', 'output file', 'NRS name', 'remote username',

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and 'remote password'.

These may be described differently in your system, and there may be additional parameters required.

You will need to consult your local documentation about these.

Enter an 'input file' name.

The 'input file' is the name of the file which you wish to transfer to your own filestore on your own mainframe machine, from the remote host on which it resides, i.e. "help/basics" (this must be entered in lower case).

Enter an 'output file' name.

The 'output file' is the name you assign to that transferred file.
Call this "helphensa".

Enter an NRS name. The NRS name (which may be prompted-for as "Location") of the service is UK.AC.HENS.MICROS

Check, however, to see whether a table of recognised locations resides on your local mainframe, and choose from it (such a table ought to be

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given in your documentation - either in hard copy or online).

Enter a remote username and password.

The remote username and password are required for security purposes.
In the case of HENSA, the username and password are "hensa" in both cases (note: these must also be entered in lower case).

If your file transfer attempt fails, it may be because your system translates lower into upper case characters.
Try enclosing all lower case parameters in double quotes.

If your file transfer works, you will have a copy of the "help/basics" file within your filestore on your mainframe.

You may consult it there, print it out, or even transfer it to your own micro.

Check with your Systems Librarian or Computer Centre for details.

Exercise 3:

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Obtain a document from the JANET.News Bulletin Board, by file transfer.

As in the previous exercise, you will require to log on to a mainframe running JANET file transfer protocols, and issue the necessary series of commands.

Note once more that you will not be logging on to the Bulletin Board itself, as you did earlier, but only to your own mainframe machine.

Log on to your mainframe computer.

Enter the command requesting a file transfer.

The parameters you require in this case are:

input file: 'news.library.catalogs'; remote username: 'news'; remote password: (leave this blank) NRS location: 'JANET.News'; output file: this can, of course, be anything you like, e.g. "JANET_OPACS".

Issue the file transfer command to your mainframe.

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Key in the required parameters, as shown above.

Once you have completed your file transfer, you will have your own copy of the list of OPAC addresses on JANET.

Exercise 4:

Search the PACS-L database.

In Exercise 3 of the Intermediate Level exercises (Section KC), you registered as a PACS-L subscriber.

Because PACS-L receives a lot of very useful correspondence, it stores all the contributions it receives in archive files.

These may be searched, not - as in a Dialog search, or a search on your library's OPAC - interactively, but by using electronic mail to send search commands to the database.

You are going to search the PACS-L archives for all references to JANET.

This involves sending a highly structured message to the Listserv program at the University of Houston, which can be interpreted by the

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program without human intervention. Your search will be run, and - within a short space of time - the results should be posted back to you as an electronic mail message.

Compose a mail message to "listserv%uhupvm1@earn-relay".

Enter the following text in the message, EXACTLY:

```
// Database search DD=rules //Rules DD * ;nb leave 3 spaces before
asterisk; Search JANET in PACS-L Index /*
```

What you should ultimately receive is, in fact, two separate mail messages.

The first simply indicates whether or not the job was successful, and

how much processing time it took.

The second is your search results file, which will be called DATABASE OUTPUT.

It will list all the items from the archive containing the word JANET. To choose a specific item, say number 2 (the messages are numbered at

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the left), you must send a second message to the listserver, containing the following text:

```
// Database Search DD=Rules //Rules DD * Search JANET in PACS-L Print  
all of 2 /*
```

This is a fairly complex exercise, and you may encounter problems. Remember, if you wish to search the database for other subjects, that it is a US-dominated mailing list (at least, for the moment), and that it only began in July 1989, so its archives are not great. Also, it is dedicated to automated systems in libraries.

If you encounter problems in using it, feel free to send enquiries to jupiter@glasgow.vme.

Exercise 5

Obtain a program from HENSA by electronic mail.

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In Exercise 3 (above), you obtained a help file from the NPDSA by means of file transfer.

In this exercise, you will use the simpler method of electronic mail, in order to fetch a piece of software to your own filestore.

This exercise involves Macintosh software, although any listed package could be used instead.

Once transferred to your filestore, of course, the software still has to be transported onto a microcomputer (probably using Kermit), and is likely to require to be 'decompressed'.

Check with your Systems Librarian or Computing Centre for information.

Log on to your Mailer.

Send a request for a particular piece of software to the HENSA service:

```
At "Mail:" enter COMPOSE ;Rz  
At "To:" enter ARCHIVE-SERVER@UK.AC.HENSA.MICROS ;Rz  
At "Subject:" enter * ;Rz  
At "Text:" enter SEND MICROS/MAC/K89 ;Rz * ;Rz
```

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```
At "Send now?:" enter Y ;Rz
```

Within an hour or two, you should begin to receive messages back from the archive mail-server, detailing the results of your job, and including the components of the software you requested.

PRACTICAL EXERCISES

The exercises listed below are divided into three categories: basic, intermediate, and advanced.

The basic exercises require access to the JANET network from a terminal or micro running emulation software connected to a PAD. Several of the intermediate and advanced exercises require access to a general purpose machine running JANET electronic mail and file transfer software. For access of this type, you should be a registered user of a general purpose computer operated by your University's Computing Service. There is a variety of such machines (e.g. Vaxes, IBM mainframes, ICLs, Amdahls, etc.), and a variety of operating systems running on them (e.g. VMS, CMS, VME, Unix). You do not need to be an expert in the use of these systems in order to use some of their software programs for JANET use, but you should take the time, upon registering as a user, to study the system documentation provided by the Computing Centre.

Typically, this will consist of a user-manual for the relevant operating system. Read the sections dealing with JANET electronic mail, and file transfer

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procedures. You will require an elementary knowledge of these instructions in order to carry out some of the intermediate and advanced level exercises below. If you have any problems with any of these exercises, please see your JANET Training Officer, Systems Librarian or Computing Centre, or send a mail message to jupiter@glasgow.vme.

(1) Basic Level Exercises

Exercise 1: Perform an interactive search of the OPACs of Hull, Cambridge and Liverpool University Libraries.

Connect to the PAD from your terminal or micro. Ask your System Librarian or Computer Centre for help if you have any problems. Your PAD may prompt you with the word "PAD", or some variation on this according to your local networking configuration. Make sure you know what the PAD prompt is.

At this point, check to see which remote services are directly accessible via a mnemonic from your PAD. Typically, the command for this is "Help address". It may be that your PAD is set up to make direct calls to OPACs on JANET, using

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NRS names or their abbreviations. If the NRS names HULL.LI.GEAC, HULL.GEAC, CAMBRIDGE.UNIVERSITY-LIBRARY, CAM.UL, LIVERPOOL LIBRARY, LIV.LIB, or any variants appear in response to a "HELP ADDRESS" command, then simply entering, e.g. "Call HULL.GEAC" will be sufficient to connect you directly to that OPAC.

If none of the three OPACs are listed in the PAD address file, call them from your PAD by means of their NRS addresses (Hull: 0000 1230 0108; Cambridge: 0000 0801 0060 79; Liverpool: 0000 1050 0205. Do not include spaces). Again, the way you do this depends upon your local system, and its interface with your local JANET switch. You may simply be required to enter "Call [name or address]" (eg "Call HULL.LI.GEAC" or "Call 000012300108"). Often, a 'J.' is required before the name or address (eg "Call J.HULL.LI.GEAC", or "Call

J.000012300108"). Other systems may require quite different procedures.

Having entered the OPACs, spend a little time exploring them. Does Cambridge have any books on JANET? Does it display circulation information? How easy is it to log off?

What do you think of Hull's menu? Does the catalogue have a book about JANET

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by an author whose surname is Stones? Does Hull's OPAC give you circulation information?

What about Liverpool's system? Is it a friendly system to enter? Does it have a copy of Patrick Holligan's Access to academic networks? If so, can you find out whether the book is on loan?

Exercise 2: Search the JANET.News and HUMBUL Bulletin Boards.

In the same way as you obtained an interactive connection to the three OPACs in exercise 1, you can connect to various Bulletin Boards on JANET. Again, check to see whether your PAD offers mnemonic forms of the names of these Bulletin Boards. If not, their NRS addresses are: JANET.News - 0000 5000 5002; HUMBUL - 0000 2121 0010 02.

Locate the file 'LIBRARY.CATALOGS' in JANET.News.
Search that file for details of your own or another OPAC (instructions on file-

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searching will appear throughout your session, provided you answer "n" to the initial request about using the Bulletin Board's 'View' software).

What do you think of the JANET.News interface?

When you log on to HUMBUL, you will be asked to register on the system. Take a note of your registration name for future reference. How does the HUMBUL interface compare with that of JANET.News?

Enter Section E. Search for the reference to St. Pancras (enter SEARCH for details of searching in this Bulletin Board).

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(2) Intermediate Level Exercises

Exercise 1: Post an item from the NISS Bulletin Board to your own JANET mailbox. Note that this exercise requires you to have registered as a mail-user with your Computer Centre, and to have a mailbox address.

Enter the NISS Bulletin Board (NRS Name: NISS; NRS address 0000 6220 0000).

Locate document E3.

Post the document back to yourself.

Check tomorrow. Is it in your mailbox? If not, you have obviously made a mistake. Try again.

Exercise 2: Send electronic mail to a colleague. This exercise is designed to introduce electronic mail to first-time users. It requires some knowledge of how to use the mailer on any general purpose computing facility on your

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campus. You should ideally have had some local training in using the mailer from your JANET Training Officer, Systems Librarian, or a Computer Centre representative. Failing that, you should have some documentation on the mailer to hand. This exercise requires you and a colleague to send each other a piece of mail SIMULTANEOUSLY. You must know both your own and your colleague's mailbox address. Ideally, you ought both to work at PAD-connected machines located in close physical proximity. If this is not possible, arrange a time in advance for the exercise to begin. The following instructions should be followed by both parties.

Log on to the machine which runs your mailer.

Invoke the mailer (e.g. by the command 'Mail').

Indicate to the program that you wish to send a message (e.g. by the command 'send'; 'post'; 'compose', etc.).

Give your colleague's mailbox address as the recipient. Note that some systems permit the address to be entered in a single string,

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e.g. (prompt) To: (input) jupiter@glasgow.vme

Others, however, require that the address be split into its components, e.g.

(prompt) Remote username(s): (input) jupiter (prompt) At which site? (input) glasgow.vme

If your mailer prompts you to enter a subject here, call it 'Experiment'. Send a message to your colleague, e.g.

"Dear Mark,

Log on to the machine which runs your mailer.

Invoke the mailer.

Send a message to "LISTSERV%UHUPVM1@EARN-RELAY".

Note that this message is being routed via two addresses - EARN-RELAY, which is a UK gateway for electronic mail to Europe and the US, and UHUPVM1, which is a machine at the University of Houston on which the 'listserv' program is running. You should not use the '@' symbol twice in this sort of address, however. It should only preface the UK mailbox address. At other points in such an address string, '%' is used to denote 'at address'.

If your mailer prompts you for a subject, leave the field blank (you may have to enter an asterisk, or colon in order to skip this prompt).

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The text of your message has to be read and understood by a computer program, therefore it is not written in natural English. Case should not matter, but follow the wording below EXACTLY.

Subscribe PACS-L your name (e.g. 'Subscribe PACS-L Mark Jenkins')

Send the message.

Log back into your mailbox later today or tomorrow morning. You should be told that your subscription has been accepted, and you should now be receiving items of mail from other list members. If this has not happened, check with your JANET Training Officer, Systems Librarian, or Computing Centre.

If you do not wish to remain on the list, send the following message to the same address:

Signoff PACS-L [do not add your name]

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(3) Advanced Level Exercises

Exercise 1: Use the PSS-JANET gateway to conduct an interactive session with a JANET host. This exercise illustrates use of the gateway, which operates in both directions. If your library does any online searching, you are likely to use PSS whether or not your campus has a PSS switch on site.

Call PSS. If your campus has its own switch, you may simply have to key "CALL PSS" at the PAD prompt. If your site connects to PSS via a leased line or via the telephone network, consult with your Systems Librarian or Computing Centre about the procedure involved in calling PSS.

Enter the JANET gateway NUA (23421920010069 or 23422351919169).

The system should respond:

"Please enter your authorisation and address required in form:
(user,password).address"

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As you are making a call to JANET, you may dispense with authorisation. Simply enter a full stop followed immediately by the JANET address (which may be a mnemonic: a list of these is available in JANET.News - see file 'Gateways.PSS.JANET') e.g. .000071100005 (this connects you to the OPAC of Glasgow University Library).

.NEWS connects you to the JANET.News Bulletin Board, as in Basic Exercise 2 - only this time your route is via PSS!

Exercise 2: Obtain the help file "help/basics" from PD-Soft by means of file transfer over JANET. For this exercise and the next, you will require to be familiar with the command sequence necessary to invoke the file transfer mechanism from a general purpose computer. This is likely to be the same machine as the one on which your mailer resides, and you should therefore be registered to use it. Note that, to perform this operation, you will not be logging on to NPDSA in interactive mode, as you did in a previous exercise, but to your own local mainframe instead. Make sure you have your instructions regarding file transfer procedures to hand.

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Log on to your mainframe. The command to request a file transfer is typically something like 'transfer', 'transferfile' or even 'network'. You will be required to provide five essential parameters after the transfer command (you will usually be prompted for each of these in turn). They are 'input file', 'output file', 'NRS name', 'remote username', and 'remote password'. These may be described differently in your system, and there may be additional parameters required. You will need to consult your local documentation about these.

Enter an 'input file' name. The 'input file' is the name of the file which you wish to transfer to your own filestore on your own mainframe machine, from the remote host on which it resides, i.e. "help/basics" (this must be entered in lower case).

Enter an 'output file' name. The 'output file' is the name you assign to that transferred file. Call this "helppdsoft".

Enter an NRS name. The NRS name (which may be prompted-for as "Location") of the service is UK.AC.LANCS.PDSOFT. Check, however, to see whether a table of

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recognised locations resides on your local mainframe, and choose from it (such a table ought to be given in your documentation - either in hard copy or online).

Enter a remote username and password. The remote username and password are required for security purposes. In the case of NPDSA, the username and password are "pdsoft" in both cases (note: these must also be entered in lower case).

If your file transfer attempt fails, it may be because your system translates

lower into upper case characters. Try enclosing all lower case parameters in double quotes.

- If your file transfer works, you will have a copy of the "help/basics" file within your filestore on your mainframe. You may consult it there, print it out, or even transfer it to your own micro. Check with your Systems Librarian or Computer Centre for details.

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Exercise 3: Obtain a document from the JANET.News Bulletin Board, by file transfer. As in the previous exercise, you will require to log on to a mainframe running JANET file transfer protocols, and issue the necessary series of commands. Note once more that you will not be logging on to the Bulletin Board itself, as you did earlier, but only to your own mainframe machine.

Log on to your mainframe computer.

Enter the command requesting a file transfer.

The parameters you require in this case are: input file:
'news.library.catalogs'; remote username: 'news'; remote password:
(leave this blank) NRS location: 'JANET.News'; output file: this can, of course, be anything you like, e.g. "JANET_OPACS".

Issue the file transfer command to your mainframe.

Key in the required parameters, as shown above.

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Once you have completed your file transfer, you will have your own copy of the list of OPAC addresses on JANET.

Exercise 4: Search the PACS-L database. In Exercise 3 of the Intermediate Level exercises above, you registered as a PACS-L subscriber. Because PACS-L receives a lot of very useful correspondence, it stores all the contributions it receives in archive files. These may be searched, not - as in a Dialog search, or a search on your library's OPAC - interactively, but by using electronic mail to send search commands to the database. You are going to search the PACS-L archives for all references to JANET. This involves sending a highly structured message to the Listserv program at the University of Houston, which can be interpreted by the program without human intervention. Your search will be run, and - within a short space of time - the results should be posted back to you as an electronic mail message.

Compose a mail message to "listserv%uhupvml@earn-relay".

Enter the following text in the message, EXACTLY:

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// Database search DD=rules //Rules DD * Inb leave 3 spaces before

asterisk] Search JANET in PACS-L Index /*

What you should ultimately receive is, in fact, two separate mail messages. The first simply indicates whether or not the job was successful, and how much processing time it took. The second is your search results file, which will be called DATABASE OUTPUT. It will list all the items from the archive containing the word JANET. To choose a specific item, say number 2 (the messages are numbered at the left), you must send a second message to the listserver, containing the following text:

```
// Database Search DD=Rules //Rules DD * Search JANET in PACS-L Print
all of 2 /*
```

This is a fairly complex exercise, and you may encounter problems. Remember, if you wish to search the database for other subjects, that it is a US-dominated mailing list (at least, for the moment), and that it only began in July 1989, so its archives are not great. Also, it is dedicated to automated systems in libraries.

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If you encounter problems in using it, feel free to send enquiries to
jupiter@glasgow.vme.

Exercise 5

Obtain a program from NPDSA by electronic mail. In Exercise 3 (above), you obtained a help file from the NPDSA by means of file transfer. In this exercise, you will use the simpler method of electronic mail, in order to fetch a piece of software to your own filestore. This exercise involves Macintosh software, although any listed package could be used instead. Once transferred to your filestore, of course, the software still has to be transported onto a microcomputer (probably using Kermit), and is likely to require to be 'decompressed'. Check with your Systems Librarian or Computing Centre for information.

Log on to your Mailer.

Send a request for a particular piece of software to the NPDSA service:

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```
At "Mail:" enter COMPOSE [R] At "To:" enter
ARCHIVE-SERVER@UK.LANCS.PDSOFT [R] At "Subject:" enter * [R]
At "Text:" enter SEND MICROS/MAC/K89 [R] * [R] At
"Send now?" enter Y [R]
```

Within an hour or two, you should begin to receive messages back from the archive mail-server, detailing the results of your job, and including the components of the software you