

https://dspace.org/

On line bibliographic information retrieval in South Africa

Herholdt, Annette de Villiers

2015-07-29
http://hdl.handle.net/10539/18157

Downloaded from a DSpace repository. https://dspace.org/

ONLINE BIBLIOGRAPHIC INFORMATION RETRIEVAL IN SOUTH AFRICA

Annette de Villiers Herholdt

A dissertation submitted to the Faculty of Arts, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Arts.

February 1987

ABSTRACT

This dissertation describes the development of online bibliographic information retrieval systems and services in general, and their introduction and application in South African library/information services in particular. Consequently, they are discussed in the context of the gradual introduction into South African library/information services of information technology. The factors which encouraged their usage and those which mitigated against it are examined. A survey of South African library/information services offering their users online information retrieval services is analysed, and the trends which it reveals are discussed. Despite a period of relatively rapid growth in the numbers of such services in the late seventies and early eighties, the prognosis for futher significant development in this area of library/information work in South Africa is not encouraging at present. Several factors which give rise to this conclusion are identified, but the currently overriding problem affecting the usage and implementation of information retrieval from remote databases from this country is its political instability.

DECLARATION

I declare that this dissertation is my own, unaided work. It is being submitted for the degree of Master of Arts in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

A. de V. Berrold.

Eighteenth day of February 1987

For my parents, "Boet" and Frances Herholdt

With love

PREFACE

This study was undertaken to meet the need for the proper documentation of the activities and progress of library/information services in South Africa. Online bibliographic information retrieval from remote databases has been carried out in this country for a period of ten years, and a retrospective survey becomes a useful starting point for the planning of future services.

It must be noted that the state-of-the-art of online bibliographic information retrieval as it is reflected in this dissertation is that which existed in June 1986. Like most matters related to modern information technology, the field as a whole is in a constant state of development and change.

Acknowledgement and grateful thanks must be given to

- the Computer Centre of the University of the Witwatersrand, for the provision of word processing facilities

- Lyn Hansen of the Department of Librarianship and Information Science of the University, for help with the typing of the first draft

- Vee Falk, of the University Library Administration staff, for typing the tables so carefully and meticulously

- Julie Wilcocks and Dick Pearson of the University Library's Library Automation section, for endless patience and time

- my supervisor, Prof. Reuben Musiker, for encouragement and support during a highly rewarding professional association.

ABBREVIATIONS

CSIR	Council for Scientific and Industrial Research
CSTI	Centre for Scientific and Technical Information
EUSIDIC	European Society of Information Services
IBC	Institute for Biomedical Communication
IML	Institute for Medical Literature
INCH	Institute for Contemporary History, University of the Orange Free State
INIS	International Nuclear Information System
ISCOR	Iron and Steel Corporation of South Africa
LIS	Library/information services
MEDLARS	Medical Literature Analysis and Retrieval System
MRC	Medical Research Council
NASA	National Aeronautical and Space Agency (US)
NCOH	National Council for Occupational Health
NIV	National Institute for Virology
NLM	National Library of Medicine (US)
PISAL	Periodicals in South African Libraries
SABINET	South African Bibliographic Information Network
SAIMR	South African Institute for Medical Research
SAILIS	South African Institute for Librarianship and Information Science
SAOUG	South African Online User Group
SARIS	South African Retrospective Information System
SASDI	South African Selective Dissemination of Information
SDC	System Development Corporation

TABLE OF CONTENTS

		Page
1.	Formulation of the problem and outline of the study	1
2.	Online bibliographic information retrieval	7
3.	History of online bibliographic information retrieval	36
4.	The online industry	49
5.	Current and emerging trends in the online industry	68
6.	Development of online search services in South Africa	94
7.	Online bibliographic information retrieval in South Africa - current situation	124
8.	Online bibliographic information retrieval in South Africa - current situation (continued)	153
9.	Summary and conclusions	176
10.	List of works cited	202
11.	Appendix A	216

LIST OF TABLES

		Page
1.	Year of institution of online search service (Tertiary education libraries)	128
2.	Hardware used by tertiary education libraries	129
3.	Database access software used by tertiary education libraries	130
4	Sources of online training (Tertiary education libraries)	131
5.	Attendance at database producer/vendor courses (Tertiary education libraries)	132
6.	Statistical record-keeping (Tertiary education libraries)	133
7.	Funding and cost recovery of online search services (Tertiary education libraries)	134
8.	Marketing/publicity of search service (Tertiary education libraries)	135
9.	Most frequently accessed databases (Tertiary education libraries	137
10.	Database vendor usage (Tertiary education libraries)	138
11.	Search statistics (approximate) (Tertiary education libraries	139
12.	Year of start of online service (Medical libraries)	140
13.	Hardware (Medical libraries)	141
14.	Database access software used by medical libraries	142
15.	Sources of online expertise (Medical libraries)	143
16.	Attendance at database producer/vendor courses (Medical libraries)	144
17.	Statistical record-keeping (Medical libraries)	145
18.	Funding of online search service (Medical libraries)	146
19.	Cost recovery for searches (Medical libraries)	147
20.	Marketing/publicity of search service (Medical libraries)	148
21.	Most frequently accessed databases (Medical libraries)	149
22.	Database vendor usage (Medical libraries)	150
23.	Search statistics (approximate) (Medical libraries)	150
24.	Year of institution of online service (Stautory body LIS)	154
25.	Hardware used in statutory body LIS	154
26.	Database access software used by statutory body LIS	155

27. Sources of online training (Statutory body LIS) 156
28. Attendance at database producer/vendor courses (Statutory body LIS) 157
29. Statistical record-keeping (Statutory body LIS) 158
30. Funding and cost recovery for online search services (Statutory body LIS) 159
31. Marketing/publicity of search service (Statutory body LIS) 160
32. Most frequently accessed databases (Statutory body LIS) 161
33. Database vendor usage (Statutory body LIS) 162
34. Search statistics (approximate) (Statutory body LIS) 163
35. Year of institution of online search service (Special libraries) 164
36. Hardware used in special libraries 164
37. Database access software used by special libraries 165
38. Sources of online training (Special libraries) 166
39. Attendance at database producer/vendor courses (Special libraries) 167
40. Statistical record-keeping (Special libraries) 168
41. Funding and cost recovery for online search services (Special libraries) 169
42. Marketing/publicity of search service (Special libraries) 171
43. Most frequently accessed databases (Special libraries) 173
44. Database vendor usage (Special libraries) 173
45. Search statistics (approximate) (Special libraries) 174
46. Hardware used for online searching in South Africa 177
47. Database access software usage in South Africa 178
48. Numbers of active online searchers in South Africa 179
49. Sources of online training in South Africa 181
50. Attendance at database producer/vendor courses 182
51. Statistical record-keeping 184
52. Funding and cost recovery 185
53. Marketing/publicity of search services 186
54. Most frequently accessed databases from South Africa 188
55. South African usage of overseas database vendors 189
56. Approximate search statistics for South African LIS 190
57. Year of start of online search service 197

LIST OF FIGURES

		Page
1.	A Venn diagram	16
2.	Search statement: boys OR girls	16
3.	Search statement: boys AND toys	17
4.	Search statement: fishes NOT saltwater fishes	17
5.	Search strategy - 1st database: ERIC	18
6.	Search strategy - 2nd database: LISA	18
7.	Prepared search strategy for input on DIALOG search service	19
8.	Search statement: school librar? OR public librar?	20
9.	Search statement: Sri Lanka OR Ceylon	21
10.	Search statement: ((school librar? OR public librar?) AND (Sri Lanka OR Ceylon))	21
11.	Possible record formats on DIALOG	21
12.	Inverted file structure	64
13.	Rand-dollar exchange rate - March 1984-June 1986	116

CHAPTER 1

Formulation of the problem and outline of the study

1.1 Introduction

People in all walks of life need information of all kinds. They need it to be at varying levels of complexity and in different quantities, depending on their needs and circumstances at the time when it is needed. Information can be actively sought, or it can reach an individual quite unbidden, such as when the sun sets, a person will 'know' that nightfall is near. Information can be informally communicated, often by signs, or by means of speech, or it can be formally communicated by means of the written word.

The ways in which people actively seek information, particularly those who need it in order to function efficiently and effectively in their work, or their lives generally, constitutes a fascinating study. The many ways in which man has endeavoured to impose order on the mass of information generated, so as to make it available to those who seek it is also an intensely interesting subject for research. This dissertation has to do with some aspects of the latter.

The increasing importance of readily accessible information in society is reflected in the fact that South Africa, despite its dual First World/Third World economies, is, like the rest of the civilised world, moving rapidly into what Bell (1) calls the "post-industrial society", and what Naisbitt (2) has termed the "information society". This type of society is characterised by the transition from a goods-producing society, in which most workers are to be found in the agricultural and industrial sectors, to a service society, in which most workers are engaged in producing, processing and distributing information services and goods. Examples of these activities are to be found in computer manufacture, telecommunications, printing and publishing, the mass media, advertising, accounting, and education. Also included are large sections of the finance and insurance business, and risk-management industries. (2, p.20-21)

CHAPTER 1

Formulation of the problem and outline of the study

1.1 Introduction

People in all walks of life need information of all kinds. They need it to be at varying levels of complexity and in different quantities, depending on their needs and circumstances at the time when it is needed. Information can be actively sought, or it can reach an individual quite unbidden, such as when the sun sets, a person will 'know' that nightfall is near. Information can be informally communicated, often by signs, or by means of speech, or it can be formally communicated by means of the written word.

The ways in which people actively seek information, particularly those who need it in order to function efficiently and effectively in their work, or their lives generally, constitutes a fascinating study. The many ways in which man has endeavoured to impose order on the mass of information generated, so as to make it available to those who seek it is also an intensely interesting subject for research. This dissertation has to do with some aspects of the latter.

The increasing importance of readily accessible information in society is reflected in the fact that South Africa, despite its dual First World/Third World economies, is, like the rest of the civilised world, moving rapidly into what Bell (1) calls the "post-industrial society", and what Naisbitt (2) has termed the "information society". This type of society is characterised by the transition from a goods-producing society, in which most workers are to be found in the agricultural and industrial sectors, to a service society, in which most workers are engaged in producing processing and distributing information services and goods. Examples of these activities are to be found in computer manufacture, telecommunications, printing and publishing, the mass media, advertising, accounting, and education. Also included are large sections of the finance and insurance business, and risk-management industries. (2, p.20-21)

Zaaiman investigated the extent to which South Africa could be termed an information society,and established that some 40% of workers active in the First World economy of the country work in the services sector, thereby showing that the world-wide trend had manifested itself in this country as well. (3, p.132)

Two further important characteristics of the information society are that, in such societies, greater use is made of theoretical knowledge, and, secondly, that great store is set by the making of decisions based on scientific analysis. (2, p.xvi) In order to carry out scientific problem-solving efficiently and effectively, accurate, timeous and relevant information in suitable formats and quantities must be readily available. In the nineteen-eighties, the availability of such information is inevitably linked to modern computer and telecommunications technologies. These enable users to access information stored in computers in areas geographically remote from them - in other locations in the same building, town, city or province, or in other provinces, or even other countries, without imposing limits as to the physical distance between user and information. Developments such as these have greatly increased the scope, variety and volume of information available to scholars and research workers. They have made it possible for those who need it, to find information which would hitherto have been very difficult, if not impossible, for them to find.

1.2 Formulation of the problem

Those who need information are faced with two cardinal problems

- the need to know if information pertinent to their needs exists, and
- if it exists, where (and how) to find it with the least possible delay

This dissertation is concerned with one possible solution to both these problems, namely, online bibliographic information retrieval from databases stored at remote locations.

The librarian's traditional reference activities have always centred around the provision of information for users on request. The primary source of information in such a case was, traditionally, the collection of the library in which the request was made. However, no reference librarian worth her salt would ignore or neglect to use sources in other collections as well if this proved necessary, providing that their existence was potentially known and knowable. The development of information retrieval services using computerised storage and retrieval techniques extended the scope of the reference librarian's job far beyond the confines of her own library's resources, or even those available in its immediate vicinity.

These new services offered not only the possibility of retrospectively searching for information at astounding speeds, but also the possibility of providing current awareness services to users in a variety of formats. Furthermore, they provided another solution to the problem posed by both the information and the publication "explosions" with which the library/information world had been grappling since the end of World War II.

The primary objective of any library/information service is to meet the needs of its users, be they for education, information or recreation, and its functions will be geared to this end. Meeting the needs of users by means of online bibliographic information retrieval is yet another example of how the might of the microchip can be used to the general betterment of mankind.

1.2.1 Justification for the research

Online bibliographic information retrieval from remote databases by South African library/information services has been taking place for ten years. A review of the literature revealed that very little had been published in the local library/information literature specifically on aspects of online access of remote databases from this country. In the period January 1977 to March 1986, a total of eight articles on various aspects of the topic appeared in the journal of the South African Institute for Librarianship and Information Science. In the period 1980 to date, only

two papers on the topic have been delivered at local library/information conferences (the annual SAILIS conference), while four papers on South African aspects of the topic have been delivered at international conferences.

A study of completed masters' and doctoral research in South Africa at the time that the topic of this dissertation was registered in 1982 revealed that no study of any aspects of online information retrieval practices for these purposes had yet been undertaken. An overall picture of the current South African usage of remote databases in all its manifestations and ramifications, ten years after the first such search from this country took place, was therefore deemed a useful addition to the South African library/information literature and a worthwhile research project.

1.2.2 Objectives of the dissertation

The objectives of this dissertation are

- to provide an in-depth overview of the development of online bibliographic information retrieval systems and services
- to examine trends, developments, and problem areas pertaining to the above
- to provide an in-depth historical survey of the growth in usage of such services from South Africa
- to examine the implications of the above-mentioned trends, developments and problem areas for South African access of remote databases

1.2.3 Scope of the study

The subject of this dissertation, namely online bibliographic information retrieval, is limited to access of overseas databases from South Africa. This therefore specifically excludes access to the locally produced

WATERLIT database, the online press clippings service produced by the Institute for Contemporary History in Bloemfontein, and SABINET, the South African Bibliographic Information Network.

1.3 Methodology

Procedures used to collect the material used in this dissertation were

- an extensive study of the literature on online information retrieval systems and services
- a study of South African sources on library automation and online information retrieval in this country
- a questionnaire on all aspects of online searching was sent to respondents to complete and return to the candidate for analysis

1.4 Terminology

1. A distinction is drawn in this study between the "user" of an online search service, the "end-user" and the searcher/intermediary. "User" is used in a generic sense to include both searchers or intermediaries, who actually carry out online searches, and the end-users, who commission them.

2. The expression "search service" is used to mean either a database vendor (sometimes termed an "online vendor"), or the online search facility offered by a library/information service to its users. The context in which it is used will determine its meaning.

3. The expressions "library school(s)" and "Departments of Librarianship and Information Science" are used synonymously, as are "online searching", "online information retrieval" and "online bibliographic information retrieval".

1.5 Outline of the study

The study begins with a description of the equipment, techniques, and advantages and disadvantages of online bibliographic information retrieval (Chapter 2). This is followed by an outline of the conditions which gave rise to its development in the late sixties and early seventies, and a description of the first such systems (Chapter 3). The next chapter (Chapter 4) describes the online industry as it is today, explaining what its various components are, and giving examples and descriptions of each. Chapter 5 discusses current and emergent trends in online bibliographic information retrieval.

In Chapter 6, online information retrieval is placed within the context of library automation in South Africa, discussing as it does the introduction of computerised systems and services in South African library/information services, as well as the various factors encouraging the development of online information retrieval in this country, and some which mitigated against it. In Chapters 7 and 8, the respondents to the questionnaire are divided into four groups, and their responses are analysed and discussed in depth. Chapter 9 provides a summary of this analysis, noting trends and problems, to give an overview of current South African practice as far as online bibliographic information retrieval is concerned. It goes on to highlight some of these, and to discuss the possible future of online information retrieval from overseas databases from this country, particularly in the light of prevailing social and economic conditions.

References

1. BELL, Daniel. *The coming of the post-industrial society*. New York: Basic Books, 1976.

2. NAISBITT, John. *Megatrends: ten new directions transforming our lives*. Futura edition. London: Macdonald, 1984.

3. ZAAIMAN, R.B. The information society in South Africa - an exploratory study. *South African journal of librarianship and information science*, 53(3), September 1985, p.129-138.

CHAPTER 2
Online bibliographic information retrieval

2.1 Introduction

This chapter deals with the "how" and the "why" of online bibliographic searching of remote databases. It will attempt an explanation of what is meant and/or understood) by the term "online searching" in the context of this dissertation. An outlire of the apparatus and processes involved is given, followed by a description of the role played by the human intermediary in the total process. The chapter ends with a discussion of the advantages and disadvantages of online bibliographic searching as a tool for information retrieval in a library and/or information service.

2.2 Mechanics of online searching

2.2.1 "Online searching" defined

Hawkins and Brown have defined "online searching" as "the process of interactively searching for and retrieving information by computer from a machine-readable file (database) of information." (8, p.12) If this is the process, how then, can the entity, an "online search", be defined?

To begin with, the term "search", in a computer or automated context, is defined as a verb by two dictionaries in the field with almost identical definitions, viz ... "to examine a set of items in a given manner to determine one or more having a specified property" (12, p.306) and, simply, "... to examine a set of items for one or more having a given property." (13, p.462). This, in essence, is what takes place in an online search. The computer searches unit records (usually document surrogates) in a particular database for the presence of keywords or combinations of keywords, in different (often specified) fields and/or subfields of those records and then indicates in how many of these records they appear.

In the field of online bibliographic searching, however, there exist two schools of thought as to the precise definition of an online search.

The first maintains that "... an online search is one interactive computer access to one database" (8, p.12) ("access" being understood as "a continuous period of connection to an online database" (8, p.12)); the second, that "... an online search is as many interactive accesses by computer to as many databases as the searcher considers necessary to conclude the search." (8, p.12) The latter corresponds more closely with the traditional methods of keeping statistics as far as number of queries, users, etc., in a reference service in a library/information service are concerned, but the former has advantages as far as record-keeping is concerned. The lack of standardisation in the interpretation of precisely what may be regarded as an "online search" makes comparative statistical research extremely difficult, if not impossible, and has led to the usage of the qualifications "database" or "user" being used together with the term "online search", in an attempt to state unambiguously what is meant by "online search" in a given situation or context.

2.2.2 Performing an online search

In order to perform an online search, certain criteria as far as equipment, telecommunications and searching skills on the part of the human being(s) involved, must be met.

2.2.2.1 Equipment

In order to perform an online search, a searcher (intermediary) needs some kind of a terminal. A terminal usually has a keyboard and a means of displaying the images created by the searcher on the keyboard, and, in its turn, by the remote computer. This means of display can be a television-like screen, or it can be print on paper. Sometimes a terminal with a screen has a so-called "slave printer" attached to it, on which that which appears on the screen can also be captured in print on paper, usually when so desired by the searcher.

The current trend is towards using microcomputers as terminals, because they make it possible (by means of suitable software) for a searcher to store, edit and transmit both passwords and search strategies to the

remote computer without having to key them in while online. They also make it possible for the terminal to receive data such as bibliographic citations at very high speeds, which are then stored in the terminal to be printed later, thus saving expensive online time. Intelligent terminals can also be connected to external storage devices such as disk drives, on which search results may also be stored for later printing, or even for further processing, if the software is available. (1, p.162-163) This latter process is known as "downloading".

The connection of the terminal to the remote computer is achieved by means of a telephone via a telecommunications network. Telephone lines transmit messages in the form of analogue signals, which are not compatible with the digital signals output by terminals and computers. This problem is solved by means of the modem (modulator-demodulator), one of which is connected directly to the telephone at the terminal itself, and another to the remote computer. (An alternative type of modem is the acoustic coupler, which serves the same purpose. With this type of connection, the telephone itself is attached to the coupler by means of two rubber cups for the handset.)

In order to access the computer, the user dials the number of the nearest network node, which then connects the terminal to the computer storing the desired database. If the terminal is situated on another continent from that of the remote computer, the link is made via satellite. Telecommunications networks route messages very swiftly along the fastest path available by means of "packet-switching", a technology by means of which the data to be transmitted is divided up into "packets" which are individually transmitted and then reassembled in the original order of input at their destination. If the terminal is geographically close to the remote computer, a standard telephone line, either dedicated or independent, is sufficient to make the connection with the computer, but the modem, in whatever form, remains essential for the connection.

The last hardware element necessary for online searching is a computer with time-sharing capabilities. This means that more than one person can use the same facilities on the computer simultaneously. The computer stores the databases for searching by its central processing unit. By

means of specially-written programs, it performs all the logical operations necessary to match the searcher"s request with the data stored in its databases, as well as maintaining and updating the databases, and keeping accounting and financial records in order to charge searchers for usage of the system. It also stores the results of searches for later, offline, printing; very often it stores search strategies for SDI (selective dissemination of information) profiles and for searchers who wish to return to a search after a time (sometimes the next day, or later the same day) without having lost the previous results.

To summarise then, the equipment necessary for an online search consists of a terminal which could be a microcomputer itself), a telephone, a modem, a telecommunications network, another modem-type interface, and a computer with time-sharing facilities and (usually exceptionally so) large storage capabilities.

2.2.2.2 Software

The software necessary for online searching is that which is developed by each database vendor for the particular search system. An essential requirement for such software is a command language to be used by the searcher (intermediary), which will cause the computer to search the appropriate database for data which will meet the search request, and then to invoice the searcher for the use of the search service or system.

Command languages vary in structure and sophistication, as do the search systems themselves. However, the most basic commands necessary in such a "language" are those which allow the searcher to start a search, to end a search, to choose search terms for matching in the database by the computer, and, if necessary or so desired, to combine these terms according to a predetermined logical system. Also essential are the commands which will cause citations to be printed, either online or offline, as the need arises. Most command languages have many additional features, such as limiting the relevant citations (called "postings" by some systems) to those written in a particular language or published within a certain period, or saving a search strategy so that the searcher

can return to it, or sorting the output of a search according to certain specified parameters.

Other features of search system software could be the ability to switch from one database to another while online, to give searchers online tutorial help, to give news of system changes and improvements or enhancements online on a regular basis, to display indexes in alphabetical and hierarchical lists, and to allow users to order the full text of requested documents from suppliers. (4, p.55-56)

An online searcher must know and be able to apply the command language of a system in order to search it efficiently.

2.2.2.3 The searcher's role

2.2.2.3.1 The search interview

The role of the searcher in an online search is crucial, for it is this person who makes all the intellectual decisions during the search. An online search begins when an end-user approaches a searcher with an information need. (Sometimes the end-user will execute the search personally, but this practice is still less common than that of using an intermediary.) The searcher then conducts a search or reference interview with the end-user in order to establish, firstly, exactly what the information need is, and secondly, whether an online search will satisfy it.

The importance of the first objective is illustrated by Lancaster in the following excerpt:

> "While the requester himself might successfully browse through the literature on the basis of an ill-defined need, it is impossible to prepare a successful searching strategy for machine search on the same vague basis. If a machine search is to yield useful results, we must do as much as possible to obtain request statements that explicitly delineate the actual information need The wider

the gap between stated request and information need, the less successful the search is likely to be." (11, p.240)

Often the information required can be found in a printed source, or is not available in machine-readable form for searching. An example would be a topic in the field of ancient history, or one in a largely interdisciplinary field such as anthropology. Other examples of questions which are difficult to answer by means of an online search are hypothetical questions, practical, ethical or moral questions, and questions which involve ranges of comparisons. (1, p.23)

Borgman, Moghdam and Corbett give a broad outline of the kinds of topic which lend themselves to online searching, viz.

- those which require the coordination of two or more distinct concepts
- those which are too new or obscure to have appeared in indexes or as subject headings
- those which would have appeared in the more [illegible]y updated machine-readable format
- those which may be described by so many synonyms that manual searching would be unnecessarily lengthy
- those which are relatively narrow in scope and likely to result in a small number of postings
- those which would be found in databases with no printed equivalent (1, p.21-22)

2.2.2.3.2 Analysis and preparation of the search

Having decided that the end-user's request could possibly be answered by an online search, the searcher then begins to analyse the search request carefully in order to isolate possible concepts for searching either singly, or in combination with other concepts relevant to the search

topic. This is known as developing the search strategy, and can be defined as

> "...the process of stating the information request in precise terms, specifying the logical relationship of concepts and the exact terminology used."(1, p.29)

(It has been shown that a useful "spin off" of the careful formulation of a search strategy in conjunction with the end-user, is that the latter becomes much more articulate in stating subsequent information requests, whether they be for manual or for online searches. (2, p.276))

Search systems usually allow searchers to use two main kinds of search terms, namely, terms from a controlled vocabulary (usually a thesaurus), and natural language or "free text" terms. Using the controlled vocabulary, the searcher attempts to "translate" the concepts into the indexing language of the database concerned, and covers the possibility of synonyms or terms which do not appear in the indexing language by means of the use of natural language terms.

The next step is to decide how the terms are to be combined, which terms are to be combined, and how they are to be combined. Automated (computerised) searching of large collections of bibliographic data is done, on a very simple level, by means of a "matching" process. The searcher requests the computer to search a specific database for all citations which have, say, the word "library" in their titles. This it does by comparing every meaningful word in every title in the complete database with the word "library". The total number of citations which fall into this "class", as it were, that is, the class of citations having the word"library" in their title is then presented to the searcher. The, if the searcher so wishes, the actual citations may be presented for scrutiny, either on- or offline.

This matching process is facilitated by the structure of the database. Databases for online searching are divided into different files, some of these being inverted indexes of all meaningful terms in all (or only some) fields of each record in that specific database. (cf. 4.3.2) If a

searcher wishes to search for all citations having the word"library" in their titles, as well as the word "catalogue", the computer will search the inverted index in the same way for citations which have both terms occurring simultaneously in their titles (if indeed, the specified field for searching in the title field).

The procedure is dependent on the principle of coordinate indexing, which basically entails entering indexing terms and phrases relating to the document surrogates (citations) in the database independently, and then combining them in various ways at the time of searching. The way in which search terms are combined is based on a system of symbolic logic devised by an English logician, George Boole (1815-1864). According to Boole's system, three "operators" or "connectors' as they are sometimes called, are used to combine indexing terms in symbolic form. These are:

- the logical sum, expressed as + or AND
- the logical product, expressed as x or OR
- the logical difference, expressed as - or NOT

An English mathematician, John Venn, later expanded on Boole"s work, using what are known as Venn diagrams to express the Boolean logical relationships graphically. The software of all online bibliographic information retrieval systems uses this method of combining search terms to form search statements - concise representations of the search strat to be executed. The search statement may be stated in narrative f , e.g., ((boys OR girls) AND toys), or it can be expressed diagrammatically as a Venn diagram, as in Figure 1.

Often the diagram is easier for a lay person to understand than a verbal explanation alone by an intermediary. In the above figure, the shaded area represents the class or group of citations requested.

The OR operator is used to broaden a search strategy. It causes the computer to search for the "class" or group of citations, in the above example, in which either "boys" or "girls", or both "boys" and "girls"

simultaneously, (with no field specified), occurs, appear. Diagrammatically, the search statement (boys OR girls) may be represented as follows, with the shaded area depicting the class or group of citations which meet this criterion, as shown in Figure 2.

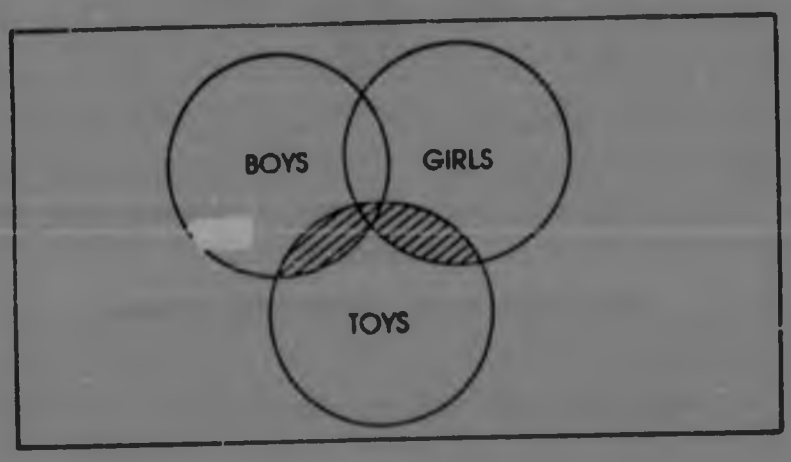


Figure 1
A Venn diagram

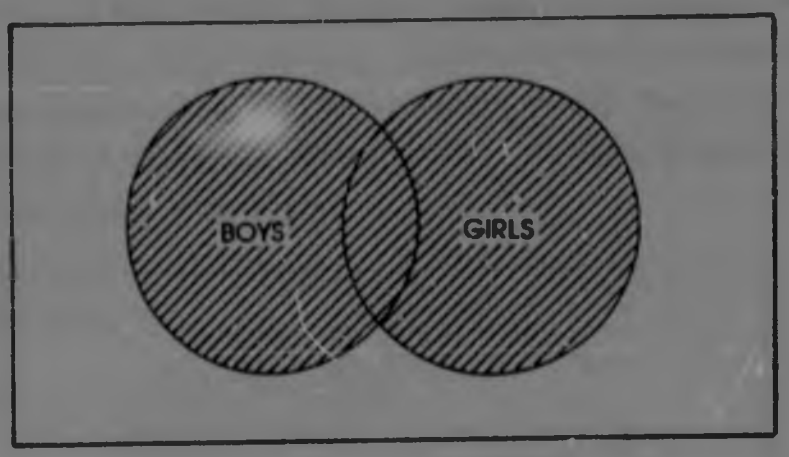


Figure 2.
Search statement: boys OR girls

AND is used to narrow a search, because it causes the computer to search a class, or group, of citations in which more than one term is present simultaneously. To return to the example: this means that citations with the terms "boys" and "toys" simultaneously present must be found; the same applies to "girls" and "toys". Diagrammatically, the class or group of citations containing both the term "boys" and the term "toys" may be expressed as shown in Figure 3.

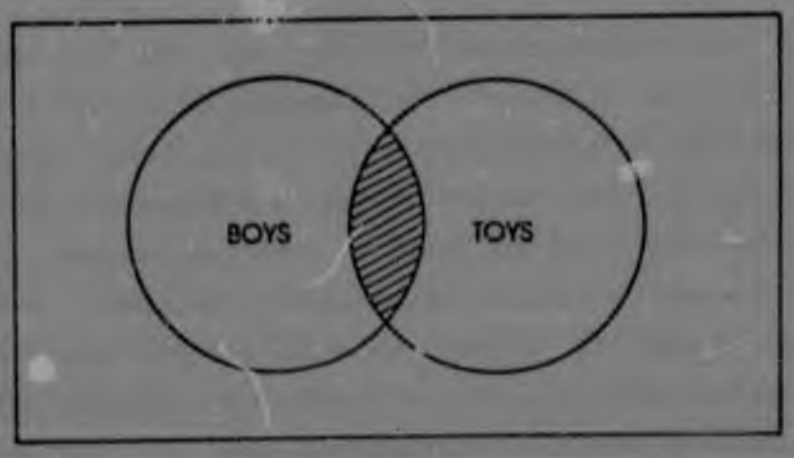


Figure 3.
Search statement: boys AND toys

Again, the shaded area represents the desired citations.

The NOT operator specifically excludes a concept from a search statement. If a request for information on "fishes" was received, simply entering the search term "fishes" would retrieve citations having to do with both fresh water and salt water fishes. If the end-user were only interested in fresh water fishes, the search statement could specifically exclude salt water fishes by using the NOT operator. A Venn diagram illustrating this combination would appear thus:

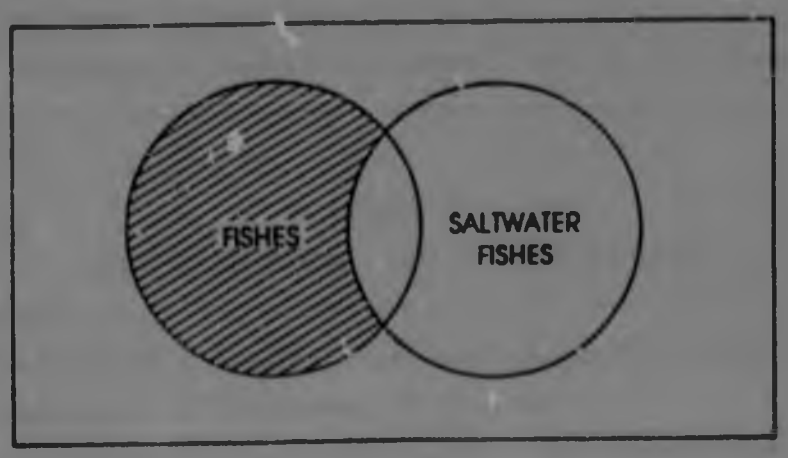


Figure 4.
Search statement: fishes NOT saltwater fishes

Venn diagrams are useful for explaining search statements to end-users, who may find such statements presented in narrative form more difficult to understand.

Once the end-user and the searcher (intermediary) have agreed on the composition of the search statement(s), the online search strategy proper can be compiled. This is a plan of more or less what the searcher intends to do once the interactive process with the computer has been set in motion. The expression "more or less" has been used here, because the responses of the searcher are dependent on the information received from the computer, and this can only be guessed at before actually going online. The searcher, in effect, actively directs the progress of the "conversation" with the computer towards a desired outcome. Searching in this way is an heuristic process - defined by the **Concise Oxford dictionary** "...serving to discover; (of computer problem-solving) proceeding by trial and error; ..." The search strategy will consists of the codes for the database(s) to be searched, and one or more search statement(s).

An example of a search strategy for a search on "the use of school and public libraries in Sri Lanka" follows. Each term will have been verified in the controlled vocabulary of the database concerned (if it has one) by the searcher.

Search statement 1 (school libraries OR public libraries)
Search statement 2 (Sri Lanka OR Ceylon)
Search statement 3 (search statement 1 AND search statement 2)

Figure 5.
Search strategy - 1st database: ERIC

Search statement 1 (school libraries OR public libraries)
Search statement 2 (Sri Lanka OR Ceylon)
Search statement 3 (search statement 1 AND search statement 2)

Figure 6.
Search strategy - 2nd database: LISA

The above example is extremely simplistic. In practice, every search system makes provision for the searching of word stems (which, for instance, would allow the searcher to retrieve all words beginning with or containing that stem, thereby saving search time and expense), for indicating what the proximity of certain search terms to others must be, and for indicating which field of a record must be searched (for example, should the term "public libraries" as requested in the previous example appear in the controlled vocabulary indexing field, the abstract field, the title field, or all three?); in addition, many make provision for stipulating the language in which the literature to which the citations refer must appear, the timespan during which it was published, the type of document required (monograph, journal article, etc.), and for storing search strategies for later execution on either the same database or another.

2.2.2.3.3 Execution of the search

In practice, the above search executed on the DIALOG system would appear, as a prepared strategy, as follows:

```
B1
SS ((school(W)librar?/DE,TI OR public(W)librar?/DE,TI) AND
   (sri lanka/ID,TI OR Ceylon))
SAVE TEMP
B61
```

Figure 7.
Prepared search strategy for input on DIALOG search service

B1 means "BEGIN File 1", a command which will cause the computer to retrieve file 1 (the ERIC database) for searching. The next command comes in the form of a compound search statement, which, broken down into its component parts would appear thus:

SELECT (i.e., find) all citations indexed under the terms SCHOOL LIBRARY or SCHOOL LIBRARIES in the descriptor field (terms from the controlled vocabulary, the ERIC thesaurus) as well as in the

title field. The (w) tells the computer that the two words must be adjacent and in this order.

OR

SELECT all citations indexed under the terms PUBLIC LIBRARY or PUBLIC LIBRARIES in the descriptor field as well as in the title field.

AND

SELECT all citations which have been indexed under the term SRI LANKA in the dentifier (natural language indexing terms) field as well as the title field.

OR

SELECT all citations which have been indexed under the terms CEYLON.

This means that there are two search statements thus far, diagrammatically represented thus:

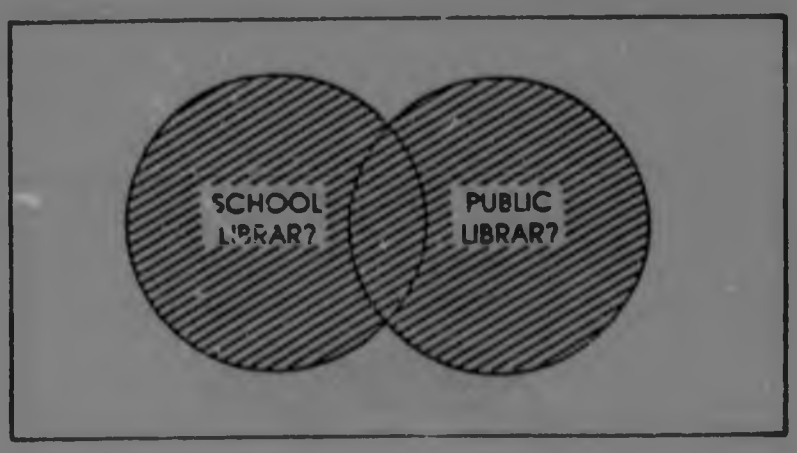


Figure 8.
Search statement: school librar? OR public librar?

and

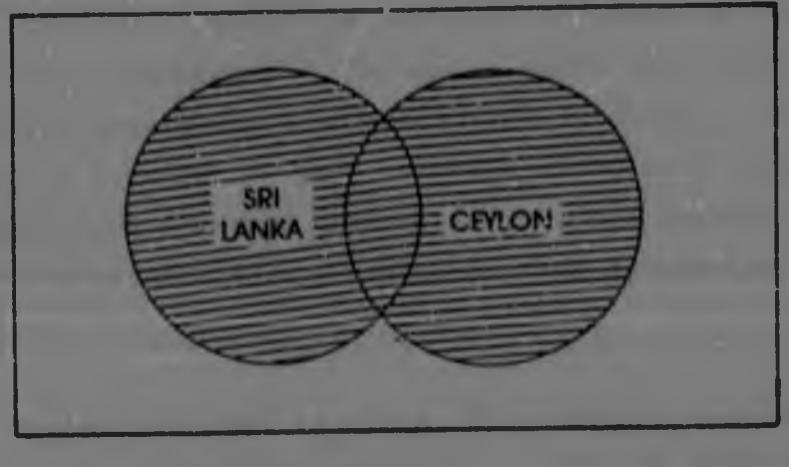


Figure 9.

Search statement: Sri Lanka OR Ceylon

Each of these concepts has been combined using the Boolean logical operator OR, which results in the so-called logical product of the two concepts, as illustrated in the Venn diagrams above. The two search statements must now be combined, using the AND operator, which will result in the following class or group of citations being retrieved:

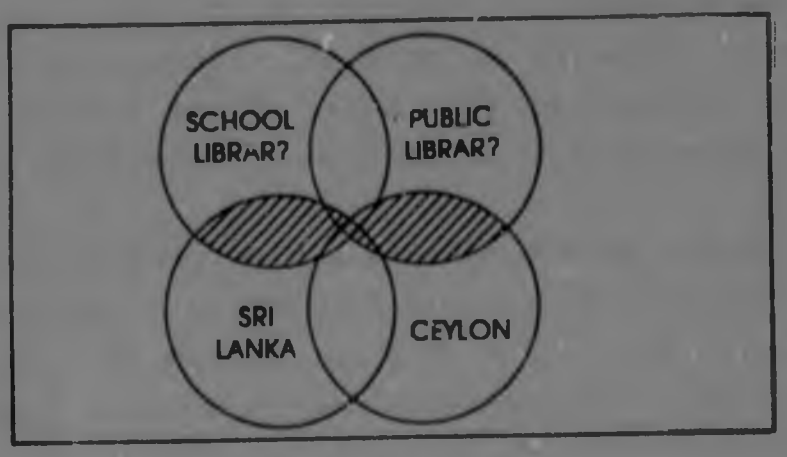


Figure 10.

Search statement: ((school librar? OR public librar?) AND (Sri Lanka OR Ceylon))

Once the search has been executed to the satisfaction of the searcher, and, possibly, the end-user if (s)he is present, the searcher may decide to execute the same search on another database to see if further information can be obtained. The way in which this would be done would be to save the previously executed search strategy. This is done by entering one of a series of SAVE commands, which will cause the computer to store the search strategy entered prior to the command. The computer then assigns an identification number to that particular strategy, say, TQ945.

Once this number has been assigned, the searcher can request the next database to be retrieved for searching. This is done by entering the command B, followed by the number of the database desired, e.g., B61. (61 is the number assigned to the LISA file, the Library and Information Science Abstracts machine-readable database on the DIALOG search system.) Once the computer has retrieved the database, the searcher enters the EXECUTE STEPS command (EXS), followed by the identifications number assigned by the computer to the saved search strategy, viz. EXS TQ945. The computer will then execute the search strategy in exactly the same manner as it did on the first database, without the searcher having to type in anything more.

Two questions remain to be discussed in connection with the actual execution of the search. The first is the matter of obtaining the citations retrieved by the search, and the second is the question of altering the search strategy while online if this becomes necessary.

Once the search strategy has been executed, and the computer has indicated how many citations in the database being searched fall into the group or class required, the searcher may wish to view some or all of them to ascertain their relevance to the information need. They may be requested for viewing and printing both online and offline in a variety of formats. These vary from search system to search system, but a representative sample of the possibilities are those offered by DIALOG, viz.

Format number	Description of record content
1	DIALOG accession number
2	Full record without abstract
3	Bibliographic citation
4	Abstract (if any) and title
5	Full record
6	Title only
7	Bibliographic citation with abstract
8	Title and subject indexing terms

Figure 11.
Possible record formats on DIALOG

On the same system, command T (for TYPE) causes specified retrieved postings to be displayed in a particular format online, and the command PR (for PRINT) will cause specified postings to be printed offline in whatever format requested, to be posted to the user.

Once of the most important advantages of online bibliographic information retrieval is its iterative and heuristic nature, and the ability to modify searches as a result of what has already been retrieved is unquestionably one of its greatest attractions. Houghton and Convey (10, p.54-57) describe different methods of modifying a search strategy while online. The commonest occasion calling for a modification of search strategy is when the number of postings (citations) retrieved is too large (it should be borne in mind that "too large" is a relative concept in this context). One of the simplest ways of dealing with this problem is to narrow the search down by introducing another concept and combining it with the other concepts already searched for by means of the logical operator AND. This method will lead to greater precision and lower recall. Another method of narrowing a search in order to retrieve a more manageable (again, relatively speaking) number of citations is to specifically exclude a particular concept using the NOT operator. Other ways of doing it are to use available facilities for limiting sets of citations to a range of

dates, accession numbers (assigned by the search system) , or volume numbers, to a specific language, or to a particular document type. These facilities vary from database to database within a search system.

It is also sometimes necessary to revise or alter a search strategy if the number of citations is less than could reasonably be expected. In this case it is necessary to broaden the search strategy, increasing recall and (sometimes) reducing precision. This can be done by introducing generic rather than specific search terms, natural language terms, class or concept codes (if these are available for searching), truncation of search terms to word roots, e.g., the search term COMPUT? (? = the truncation code on the DIALOG system) will retrieve COMPUTER, COMPUTERS, COMPUTING, COMPUTATION, COMPUTERISED and COMPUTERIZED, and by making sure that all forms of spelling, e.g., SULFUR and SULPHUR, and every possible synonym for each search term has been thought of and included.

A further reason for modifying a search arises when the actual citations retrieved prove to be in sufficiently precise to meet the end-user"s information need, or when the proportion of irrelevant citations retrieved is judged to be disproportionately high. Any of the abovementioned methods could be applied in these circumstances, in particular, examining the search terms themselves more closely, and/or introducing a larger number of natural language terms if this is useful.

An online search which requires a great deal of modification while online could point to an inadequate pre-search interview with the end-user, and not a fault or an omission on the part of either the search system or the database(s) being searched.

Many more experienced online searchers try to make the search itself a joint effort on the part of the end-user and searcher by having the former present when the search is executed. In effect, this practice brings about the combination of the subject knowledge of the end-user and the searching skills and system knowledge of the searcher (intermediary). It means that, to some extent, the advantages of a manual search of the literature such as the subjective approach of an individual, and the

so-called "serendipity factor" ("serendipity" being defined by the Concise Oxford dictionary as "The faculty of making happy and unexpected discoveries by accident;...") are possible.

2.3 Advantages and disadvantages of online searching

A survey of the literature on this topic reveals, not unexpectedly, an overwhelmingly positive response to online bibliographic information retrieval. It is almost as though authors are competing with each other to find the greatest number of advantages to using such systems, so great is their enthusiasm!

Negative comment, on the other hand, is very limited, and, as will be shown, many of what were quite serious disadvantages have now been overcome. When the terms "advantage" and "disadvantage" are used in this context, they are used in relation to manual searching of printed reference tools.

2.3.1 Advantages

The first advantage of online searching is that it is possible for the online searcher to immediately and repeatedly, if necessary, modify, amend, and alter a search strategy in response to the information received from the computer. It means that the searcher, is, in effect, in control of the procedure. Both precision and recall can be increased or decreased, citations can be accepted or rejected, and the size and the format of the output can be specified. Although a "trial and error" method of searching is not always desirable in certain cases it can be useful or necessary, or in some cases it can even be used as one method of starting to plan a more formalised search strategy. The facility which allows such searching is an inestimable boon to the librarian or information worker both in terms of time and cost. (7, p.1;9, p.3;14, p.255;17, p.17)

The speed with which it has been made possible to satisfy end-users' information needs is another important factor in favour of online searching. Vast quantities of data can be thoroughly searched in a

matter of minutes, sparing the librarian/information worker from having to lift and/or carry heavy volumes and/or scanning page after page of tiny print. It is difficult to pinpoint an exact length of time for an "average" online search, as there are too may variables involved for such an entity to be quantified, but, all things being equal, an online search yielding a satisfactory list of citations can take anything from ten to twenty minutes, and is frequently of an even shorter duration. (4, p.57;5, p.82;7, p.1;9, p.4;10, p.5;14, p.255)

Because online searching takes far less time then does a manual search, it has also led to a significant advance in the level of service offered by libraries/information services, particularly in the case of libraries, where, with the introduction of online search services, it became economically possible in terms of staff time to offer retrospective searching of the literature for patrons. Before the advent of online search services, it was unusual for such services to be offered as a matter of course because of the high expenses in terms of staff time involved. (4, p.57)

Such services also mean that a larger number of end-users can be helped than was previously possible. Closely related to the factors of speed and the new opportunity for service in the form of retrospective searching is the capacity of the search systems to present the results of such searches in a form which is acceptable to the end-user, i.e., a printed list of citations. Such a list is, in effect, a printed individualised bibliography, compiled without any clerical effort on the part of the library or information service concerned, in a concise and standardised format which may be specified by the end-user. (3, p.33;5, p.82;7, p.2;9, p.4;10, p.59;17, p.17)

Further to this ability of the computer to search a database at great speed and to produce a tailor-made bibliography as a result, is the thoroughness, given an accurately entered command or commands by the searcher, with which such a search is executed. Manual searches may be hampered by weary eyes and wandering attention on the part of the searcher, which means that it is possible to miss important and relevant information in a printed source through human fallibility. An online

bibliographic search is therefore frequently more complete than a manual one. Another reason for this is that it is possible to search more than one database, again, at great speed, in order to explore every possible source of information for the end-user (4, p.57;5, p.82;9, p.102)

In addition to this feature of completeness and thoroughness of searching is the fact that access to an online search system increases the number of sources available to the end-users of the institution providing the service. It is impossible for any one library/information service to provide the range of sources available for online searching. Their numbers are growing daily, and furthermore, more and more of them are only available in machine-readable form. Examples of some such databases are ECER (Exceptional Child Education Resources), and ABI/Inform, a business-oriented database. Online search services also remove the problem of geographical isolation from sources of information; online ordering of full-text copies of documents referred to by citations in databases is now commonplace. (5, p.82;10, p.59-60;14, p.255-256; 17, p.17) In theory, at least, online search services can reduce the disparity between information-rich and information-poor communities as far as distance from physical sources of information is concerned.

Complex, multitopical search strategies which would be impossible or extremely tedious to perform manually are made possible by several features of online search systems. The combination of single or complex search terms as dictated by the topic of the search is the first of these. An end-user searching for citations on "online searching in university libraries" would, depending on the indexing methods used by the source (database), search either all entries under "university libraries" to see if any had specifically to do with online searching in this context, or, conversely, all entries under "online searching" would have to be perused to see whether any of them had anything to do with online searching in university libraries. The point is, however, that whichever strategy was adopted, every single one of the entries under that particular indexing term would have to be examined. The computer would do this as well, "matching" the search statement with each record in the database, but in a fraction of the time required to do it manually. If the simultaneous presence of two or more concepts is required, a manual search

becomes even more difficult, whereas the computer can execute it without any difficulty. It is also possible to perform cross-disciplinary searches (albeit sometimes with difficulty) because it is a simple matter to move from one database to another.

The large number of access points offered for searching on machine-readable databases compared to the (relatively) rather limited author/title/subject access offered by printed sources also helps make searches with more variables present possible. Typical access points of online databases are author, meaningful words in the title and abstract (e.g., not words like "and", "by", "with", "of", etc.), controlled vocabulary indexing terms, natural language indexing terms (often proper nouns unique to a particular document, or specific terms as opposed to the generic terms found in the controlled vocabulary), journal titles, document type (e.g., review, journal article, monograph, etc.), language of source document, and classification or subject codes. If a searcher wishes to double-check the thoroughness of a search, alternative strategies can be executed in the same database and the results combined to eliminate duplicate citations. (3, p.34;4, p.47;5, p.82;7, p.2;9, p.3-4,102;10, p.58;17, p.16-17)

The citations retrieved by an online search are frequently more current than those retrieved by means of a manual search. This can be a "mixed blessing", so to speak, as the usefulness of a citation which refers to a document not yet available in print or in a particular country is debatable; nevertheless, the currency of machine-readable databases is commendable. (10, p.60;17, p.17) Once more and more documents are stored *in toto* in machine-readable form, this feature of an online search service will no doubt prove to be a powerful motivating force for the use of such systems.

Another aspect to the currency of online databases is that it is often possible to retrieve information on topics which are too current to have been included in the subject indexes of printed sources. The updating of indexing terms in controlled vocabulary lists for online databases is much speedier than for their printed counterparts. (17, p.17)

Futhermore, with an online database, it is not possible to loose or misfile sections or parts of it as can so easily happen with issues of journals, or any other serial publications - the database as it is presented for searching is as complete as its most recent update (often monthly, and sometimes even bi-monthly), so that so-called "file integrity" is virtually guaranteed. (10, p.59)

The high costs of online searching have frequently been a target for attack. In order to remain solvent in a highly competitive field, it is necessary for search systems to keep pace with changing user requirements as well as changing technologies, and, again relatively speaking, it is remarkable how low rates have been kept, given these stringent demands. On the whole, users only pay for use of the system and for information retrieved, which means that it is possible to weigh up the costs of buying rarely used printed items against the costs of doing an online search. (3, p.34;5, p.82;9, p.102;10, p.102) In addition, the fact that online services have to be bought and paid for has meant that users have had to become aware of the monetary value of information. Manual searches cannot be costed as accurately as online searches, consequently, their intrinsic value has not been appreciated by managers as it should, which, in turn, has affected the status and professional standing of those performing such services.

Finally, librarians and information workers themselves have gained immeasurably from the introduction of online searching into their professional activities. A faster, more efficient service for a greater number of users has led to an improved professional image; use of information technology increases professional skills, status and job satisfaction. The advent of online access to information, and with it the possibility of obtaining access to both bibliographic information and numeric data situated remotely, has also led to the emergence of a new kind of information worker, the "information broker", an entrepreneur who finds information for clients for a fee, which further emphasises the concept of information as a saleable commodity.

To summarise the advantages of online searching, the following points can be emphasised:

- interactive, heuristic searching
- speed
- "tailor-made" output
- completeness and throroughness
- access to an increased range of resources
- complex, multitopical searches
- currency
- relatively inexpensive
- professional enhancement

2.3.2 Disadvantages

Many of the initial disadvantages inherent in the setting up of an online search service in a library/information service have subsequently been overcome, but for the sake of completeness they are being included and discussed in this section.

The first problem would-be searchers had to overcome was that of equipment. In the late seventies, when online searching began its rapid growth in popularity, few library/information services could count either terminals or any other kind of computer hardware among their standard equipment. The initial outlay required for such equipment was relatively high, especially on terms of library budgets, and it was difficult to persuade management or financial administrators to be forthcoming with such sums.

Today, however, the picture has changed somewhat. Library/information services have been automating many processes, and mini- and microcomputers and word processing equipment have fast become standard

library tools. The relative cost of the equipment has decreased, and it is now uncommon to find an item of computer hardware only used for one purpose, as was the case in the past. Breakdowns in equipment which previously caused much frustration and delay are also far less frequent. Breakdowns in telecommunication lines have also become rarer with the advent of packet-switched network systems instead of direct dial connections. Equipment for online searching then, although still a major consideration when establishing an online search service in a library/information service, no longer presents the kinds of problems experienced earlier.

Another problem, and, in the early days of online searching, a major stumbling block, was that of the need for an intermediary to do the search. (9, p.4;17, p.20) Searchers had to go expensive training - the first searchers in South Africa went to the United States to be trained, and, even today, searchers are prevented from spending long periods online because of the costs involved - and, despite this, few could claim complete nonchalance when faced with a computer for the first time! There is, however, a problem endemic in the use of an intermediary in information seeking - the end-user is, after all, in Taylor"s words, trying to describe for someone else "...not something he knew, but something he does not know" (16, p.180) - and the chance of misinterpretation or misunderstanding on the part of the searcher is real.

In Lancaster's Medlars evaluation study carried out in 1966-1967, it was found that the best search results were obtained when there had been no personal interaction between the end-user and the searcher (intermediary). It appeared that when there had been a "failed" search after a face to face interview between end-user and intermediary, it was often due to a distortion of the request. This seemed to be due to premature attempts on the part of either (or both) parties to "translate" the search topic into MeSH search formulations. It was established that the most satisfactory searches were those where the end-user formulated the detailed request in natural language, and a skilled MEDLARS search analyst then converted it into a MEDLARS search strategy.(6, p.537-538)

The more complex and sophisticated online bibliographic search systems become, though, the less likely it becomes that online searching *per se* will become an activity which can be left entirely to end-users. The trend nowadays is to regard the whole search process as a joint effort of the end-user and the intermediary, and a recent study (15, p.553) would certainly indicate that it has become more, rather than less, common for the end-user also to be present at the time when the search is executed. This practice brings with it an optimum utilisation of both subject knowledge (usually on the part of the end-user), and search skills (normally the province of the intermediary). A sudden plethora of online search services aimed specifically at end-user searching, e.g., BRS/After Dark, The Source, Knowledge Index, etc., has not succeeded in changing the norms for searching, these are deliberately limited in their database coverage and search capabilities. The latter characteristic makes them easier for end-users to use, but the finer nuances of searching are missing, which could lead to less effective searches.

Another objection to online searching has been that the coverage of material on the available databases was too limited. Added to this if the complaint that coverage of monographs is inadequate, and that even journal articles in many databases are highly selectively included. Most databases nowadays date back to about 1970, with some, like CASearch going back as far as the 1967 literature. The average cut-off point is probably about 1974, which would provide a searcher with at least a ten-year coverage of the literature. Nevertheless, an end-user wanting a search done on a section of a database which has not yet been mounted on a search system is forced to do the search manually. (3, p.35;5, p.82;9, p.4;17, p.19) Selective inclusion of material is a more problematic issue, but searchers are usually well aware of the contents, indexing policies and inclusion policies of database producers, so that a too selective (particularly if erring on the subjective side) inclusion policy will discourage usage.

Other disadvantages are the problem of poor coverage by the available databases of some subject areas. (5, p.82;17, p.19-20) The arts and humanities are generally not very well represented - it is difficult to find material on film, journalism, or literature, for example.

Interdisciplinary topics are difficult to search, because database producers have generally tended to remain within the boundaries of the traditional subject disciplines in their products. Consequently, areas such as anthropology and women"s studies are affected. (17, p.18-19) Another problem has to do with the fact that the nature and expense involved in online searching does not really allow for browsing, so that searchers have to be fairly specific in their search strategy formulations, which is not always possible. (3, p.34;17, p.20) Finally, there is often some unavoidable duplication of material between databases, which would be extremely difficult, if not impossible, to eliminate. (5, p.82)

In summary, the disadvantages of online searching, are, to a greater or lesser extent, the following

- the need for relatively expensive equipment
- the need for an intermediary
- selective inclusion of document types and sources themselves in databases
- limited coverage of retrospective material
- limited or poor coverage of arts and humanities and interdisciplinary sources
- need for specific questions
- duplication of material

3.4 Conclusion

Online bibliographic information retrieval is a technologically sophisticated means of meeting some of the information needs encountered in modern library/information services. This chapter has described the

process as a whole as it is currently taking place in major centres in the western world.

References

1. BORGMAN, Christine L., Moghdam, Dineh & Corbett, Patti K. *Effective online searching: a basic text*. New York: Dekker, 1984.

2. COGSWELL, James A. On-line search services: implications for libraries and library users. *College and research libraries*, 39(4), July 1978, p.275-280.

3. COLLIER, H.R. The on-line terminal: a revolution, or an additional information tool? 1st International On-line Information Meeting, London, 13-15 December 1977. [*Proceedings*.] Oxford: Learned Information, [1977], p.33-38.

4. FENICHEL, Carol H. & Hogan, Thomas H. *Online searching: a primer*. Marlton, N.J. :Learned Information, 1981.

5. FLYNN, T., Holohan, P.A., Magson, M.S. & Munro, J.D. Cost effectiveness comparison of online and nmanual bibliographic information retrieval. *Journal of information science*, 1(2), 1979, p.77-84.

6. FOSKETT, A.C. *The subject approach to information*. 4th edition. London: Bingley, 1982.

7. HALL, James N. & Brown, Marjorie J. *Online bibliographic databases: a directory and source-book*. 3rd edition. London: Aslib, 1983.

8. HAWKINS, Donald T. & Brown, Carolyn P. What is an online search? *Online*, 4(1), January 1980, p.12-18.

9. HENRY, W.M., Leigh, J.A., Tedd, L.A & Williams, P.W. *Online searching: an introduction*. London: Butterworths, 1980.

10. HOUCHTON, Bernard & Convey, John. *Online information retrieval systems: an introductory manual to principles and practice*. 2nd edition. London: Bingley, 1984.

11. LANCASTER, F.W. Interaction between requesters and a large mechanized information retrieval system. *Information storage and retrieval*, 4(2), June 1968, p.239-252.

12. LONGLEY, Dennis & Shain, Michael. *Dictionary of information technology*. London: Macmillan, 1982.

13. ROSENBERG, Jerry M. *Dictionary of computers, data processing and telecommunications*. New York: Wiley, 1984.

14. ROWLEY, J.E. & Turner, C.M.D. *The dissemination of information* London: Deutsch, 1978.

15. SALOMON, Kristine & Burgers, Curt. Patron presence d[illegible] the online search: attitudes of university librarians. *Onl[illegible]eview*, 8(6), December 1984, p.549-558.

16. TAYLOR, Robert S. Question negotiation and information seeking in libraries. *College and research libraries*, 29(3), May 1968, p. 178-194.

17. THESING, Jane I. Online searching in perspective: advantages and limitations, *in* Maloney, James J., *ed*. *Online searching technique and management*. Chicago: American Library Association, 1983, p.16-21.

CHAPTER 3

History of online bibliographic information retrieval

3.1 Introduction

The development of early computerised methods for retrieving bibliographic information in an online, real-time mode took place over a period of approximately fifteen years, spanning the late nineteen-fifties, the sixties and the early seventies. Although the concept was mooted in the early fifties, at a time when first generation computers were still in use, the technology then in existence could not support such an application. Once it had been developed to a sufficient level of sophistication, however, online bibliographic information retrieval became a reality, culminating in the introduction of the first commercially available search service in 1972, which was swiftly followed by others. In this chapter, the developments in computer technology, telecommunications and computer software which led to their development are described.

3.2 General

The last three decades have brought with them dramatic and far-reaching changes in the nature of the publication and delivery of scholarly information. This phenomenon can be attributed to several causes. Firstly, the Second World War spawned a great deal of research which would eventually find peacetime applications, but the need for secrecy and a shortage of materials such as paper prevented the results of this research from being published until well after hostilities had ceased. Secondly, the fifties and sixties saw a considerable increase in government-funded research, the results of which consequently poured forth from the printing printing presses of both the Old and the New Worlds in ever-increasing proliferation. Finally, and also as a direct consequence of the Second World War, institutions of higher learning underwent a period of rapid growth and expansion in order to meet the needs of returning ex-servicemen. This phenomenon also contributed to what was, in effect, an exponential growth in the volume of published scholarly literature.

This veritable flood of publications brought about a series of economic and intellectual problems for the library community, particularly special and university libraries, and, simultaneously, created economic opportunities for the then infant information industry. The problem of bibliographic control became acute, and gave rise to a variety of new methods for storing, retrieving and disseminating information. Underlying most of them were the theories of scholars like Bush (3), who had been closely associated with the application of science to wartime activities, but later turned his attention to the myriad problems of making man's vast accumulation of knowledge more accessible to those who seek it. He said: "A record, if it is to be useful ..., must be continuously extended, it must be stored, and, above all, it must be consulted." (3, p.102) He identified the root cause of the problem as the "artificiality of systems of indexing" (3, p.106), and he described what he termed "a sort of mechanised private file and library", called "memex" (3, p.106), in which the indexing was what he termed "associative", that is, it worked, like the human brain, by association. This meant that if an item was selected, another press of a button could automatically recall, other, related, items. These items could be further articles on a topic, pages of comment on it inserted by the owner of the "memex", other related articles, authors, further references, etc..

3.3 Development of computers

Before the nineteen-forties, "hardware" for information retrieval *per se* consisted for the most part of card catalogues and printed book indexes. 1944, however, heralded the dawning of the computer age, in which the descendants of Charles Babbage's "Difference Engine" were to have an important effect on man's conception and handling of the products of scholarly research and creativity. It was in this year that the first computer, called an "Automatic Sequence-controlled Calculator", built at Harvard University, was installed. The first completely electronic computer was built at the University of Pennsylvania, and installed in 1946. It was known as the ENIAC (Electronic Numerical Integrator and Calculator). ENIAC was followed in rapid succession by the EDVAC (Electronic Discrete Variable Automatic Computer), also built at the

University of Pennsylvania and described as the world's first commercial electronic data processing machine; various general purpose computers developed by IBM (the IBM 604 and the IBM 701), and EDSAC (Electronic Delay Storage Automatic Computer) developed by a team working at Cambridge University, which in turn led to the production of the first computer for commercial use in the UK, the LEO (Lyons Electronic Office) in 1951. (4, p.8-9)

3.4 Other solutions to the "information problem"

In the meantime, in order to cope with what had been termed the "information explosion" (which it truly was, at that time, as opposed to the "publication explosion" of the seventies), existing abstracting and indexing services expanded their coverage, and new services were created, but the problems related to the retrieval of information from the the greatly increased number of documents available, remained acute. Indexing methods themselves, remained unchanged.

However, Dr. Bush was not to remain alone in his thinking about information retrieval systems based on the working of the human brain. At an international scientific conference held under the auspices of the Royal Society in 1946, a request for a conference devoted to the "information problem" was made. This resulted in a Scientific Information Conference, which was organised by the Royal Society, and took place in London in 1948. Its aim was to examine the possibility of improvements in the production, collection, indexing, abstracting and distribution of scientific literature.

Many novel mechanisms for use in information retrieval were described at this conference. One of these was an optical coincidence system, which was developed by Dr. W.E. Batten during the Second World War for the retrieval of British patents on plastics. (13, p.685-689) Underlying the system was the principle of post-coordinate indexing, which was further developed by Cordonnier in France, and by Mooers and Taube in the US in the late forties and early fifties.

Other semi-mechanised approaches to the problems of information retrieval during this period included the use of edge-notched cards, and the first microfilm searching system, the so-called Rapid Selector. (10, p.2)

3.5 New computer applications

Meanwhile, computers continued to develop apace, but their usage was primarily confined to that of "number-crunching", i.e., the rapid manipulation of numerical data. However, according to Bourne (2, p.155), researchers were already considering the application of the computer to bibliographic searching as early as 1951, but the lack of appropriate technology (time-sharing facilities, remote terminal equipment and telecommunications mechanisms) prevented its implementation until the early sixties.

3.5.1 KWIC indexes

Various research projects in the fifties had amply demonstrated the computer's ability to manipulate bibliographic information. One of these took place in 1961, when the Chemical Abstracts Service (CAS) of the American Chemical Society produced a computer-generated alphabetical subject index to six hundred of the most important journals covered by **Chemical abstracts**. It was called **Chemical titles**, and appeared in the format of a KWIC index.

KWIC is the acronym for Keyword-in Context. Such indexes (for there are several variations) are rotated indexes based on the actual titles of references. Each significant word in the title is "centred" in a column, with the rest of the words in the title "wrapped around" it, placing the word itself in context. The significant words of a series of references are then arranged in alphabetical order in the column. The process eliminated the need for intellectual, human, subject indexing, and was, in effect, a forerunner of the natural language and full-text searching facilities now available on most commercial online search systems. A KWIC index was (and still is) relatively cheap and quick to produce and the result was that the process was swiftly adopted by other abstracting and indexing services, many of which still use it (e.g., Biological

abstracts (8, p.10-11) In South Africa, for example, the WATERLIT database grew out of a collection of local and foreign literature on water and water-related topics indexed in this way.

3.5.2 Batch search systems

The precursors of online information retrieval systems were batch search systems, and the first public demonstration of such a system took place in 1954. (2, p.155) Continued research and development led to the institution of regular batch services by a few libraries in the US over the next ten-year period. Most of these were precipitated by the application of computer technology to the production of abstracting and indexing publications, a useful by-product of which was the storage of the entire contents of publications such as these on machine-readable magnetic tape. It must be remembered, however, that the "information problem" as such had still not been solved by these developments, as traditional indexing practices still prevailed. It became clear though, that the computer could be used to search these machine-readable records, or databases of records, which led, in turn, to substantial research and development efforts towards the design of programs which would make this possible. During the fifties and the early sixties, these all had some noteworthy characteristics in common. Firstly, they accepted as the material on which they were to work the databases produced as an offshoot of the computerised printing process; secondly, almost all of them intended using batch processing for their searches; and, finally, current awareness or selective dissemination of information, rather than retrospective searches, were emphasised. (6, p.1828)

The first such publicly available computerised system was MEDLARS, which began operation at the National Library of Medicine in Washington, D.C., in January 1964. It was followed by services offered by the Chemical Abstracts Service, the Bio-Sciences Information Service, a service offered by the Institute for Scientific Information, a service emanating from the US Agricultural Library, and yet another from the US Office of Education, together with many others. (11, p.76-77)

With the advent of these systems, it became possible for the first time to apply the principles of post-coordinate indexing on a large scale to the retrieval of information, which was a step in the general direction of Bush's utopian memex. Because computers search databases by a "matching" process, it was (and still is) possible to request the presence of two or more search terms in an item. These could be words or codes from the text of a citation, or indexing terms describing subject content of d document referred to in it. This could not be achieved with any degree of efficiency by conventional library indexing systems, which, at this time, were using largely enumerative classification schemes or lists of subject headings (also fairly rigid in structure) to provide a subject approach to collections.

Batch search systems, however advanced the progress they represented towards the solution of some of the problems facing information workers and librarians at the time, were nevertheless unsatisfactory in many ways. The most important of these was the fact that the results of searches were comparatively slow to reach the user. If a search was unsatisfactory or a search strategy had been incorrectly formulated, or needed some adjustment, however minor, it had to be completely reformulated and run again from the beginning. In general, it was a slow process, frequently leading to end-user frustration and disillusionment with the system.

3.6 Setting the scene for the development of online systems

The development of online bibliographic searching was to be dependent on certain types of technological development, in particular, computers with time-sharing capabilities, that is, computers which are capable of sharing processing time between two or more independent activities; rapid (direct)access storage devices with a very high storage capacity; and telecommunications networks which would allow digital (computer) data to be transmitted across great distances with no loss in fidelity. In addition, it was necessary to develop machine-readable databases, and interactive retrieval software.

Prior to the start of the MEDLARS batch searching system, considerable time and attention was being devoted to the development of interactive

search systems. 1958 saw the IBM 709 emerge - a second generation computer using transistors instead of vacuum tubes, which meant a cheaper and more reliable product, although remote access was still not possible. By 1961, however, it had become possible to transmit digital information and computer programs over telephone lines to computer centres, because by this time the necessary audio-couplers and been developed. Third generation computers, with their miniaturised circuitry, began appearing on the market by 1964. (1, p.4-5) They were generally smaller and factor that their predecessors, had a larger internal storage capacity, and could provide more than one user at a time with real-time access (time-sharing), frequently from remote locations using data transmission lines, such as telephone lines. Part of the reason why this became possible was the widespread use of magnetic disks as a direct access backing storage medium. It reduced direct storage costs, helped in the development of communication links to remote terminals, and contributed to a substantial increase in operational speed. Other important trends during this period (the fifties) were the growing availability of higher-level (English-like) programming languages, and a new emphasis on standardisation and compatibility among different models of computers. (5, p.10-11)

The fifties also saw many experiments being conducted to see if the computer could retrieve meaningful information from natural language text. Programs were being developed for, amongst others, automatic indexing and abstracting and machine translation of natural language texts. This work led in turn to research into what was known as "question-answering" which if the process which takes place when a bibliographic database in interrogated, and was the beginning of today's expert systems. Several programs were developed as the result of this work, one of them being a program called ORACLE, which actually analysed the syntax of a question put to the computer, and then matched it with an answer which used the same syntactical structure. Such experiments led researchers to conclude that databases could be searched by using sub-sets of English, and that it was possible to vary the inquiry language within certain limits. (1, p.6-8)

3.6.1 Prototype online systems

Even prior to their introduction on any large scale, batch search systems were being overtaken by online systems. Government funding for research in the field in the US was readily forthcoming, and several projects to develop interactive search systems were launched. The result of this was that in 1960, the first public demonstrations of online searching of a bibliographic database took place. The program used was developed by the System Development Corporation, and was called Protosynthex. It used inverted file structures, and could perform proximity and truncated searches in an interactive time-shared mode. It could not, however, perform searches using Boolean logic, nor could it refer back to previous search statements. The terminal used was linked directly ("hard-wired") to the computer on which the data was stored and processed. The database on which the searches were performed was the complete text of the Golden book encyclopaedia. (2, p.155-156)

The second such demonstration was given by the Lockheed Missiles and Space Company in 1964, when its own online system, CONVERSE, was demonstrated interrogating an in-house library database. (2, p.156) This was followed by a demonstration in 1965 by the librarian of the Massachusetts Institute of Technology, Mike Kessler, of the TIP online search system on a file of 35 000 citations from the physics literature, using the MIT-developed Project MAC time-sharing system. (1, p.4;2, p.156) Kessler's systems was notable for several reasons, the most important being that it allowed searching not only on keywords from titles of papers, but it was also possible to create search strategies based on principles of citation indexing and bibliographic coupling.

At about the same time, another program had been developed at SDC, where it was used with a cathode ray tube (CRT) display for online searching - a further innovation. (2, p.156) It was known as BOLD (Bibliographic Online Display), and was developed by Harold Borko on a Q 32 military computer which possessed attributes of third generation computers long before they became generally available. BOLD was the precursor of SDC's ORBIT system, and many of the features of today's online search systems were incorporated in it. It could search the database from several

different access points, e.g., subject, author, title, various numbers, etc. The terminals were connected by cable to the computer, and a light pen was used. The use of a CRT monitor to display the results of a search meant that the searcher could be given the option to change the search strategy before the final citation were selected for printing. (1, p.9)

Simultaneously, Lockheed was developing its NASA RECON (REmote CONtrole) online retrieval system as the result of the awarding of a contract in 1965 by the US government to design, program and implement a bibliographic retrieval system for NASA. In November 1966, a regular online search service to the NASA Ames Laboratory was instituted; the service was later extended to include NASA headquarters, and, by 1970, it was serving twenty-four remote terminals from a database of 700 000 records. This project led, in turn, to the creation of the first version of DIALOG (the name given to the commercial version of the RECON program) being developed by Lockheed for the US Office of Education in 1969, the National Technical Information Service, and the European Space Agency. The latter service began in 1969, serving ten terminals in Seven European countries from a computer centre in Germany, and was Europe's first online retrieval service. The same program was used by the US Atomic Energy Commission from 1970. The work done by Lockheed for the last two organisations evolved into the DOE/RECON and ESA(IRS)RECON (now known as IRS - Information Retrieval System) online search services respectively. (2. p.156;7, p.11)

In 1963, the SDC won a contract from the US Department of Defense Advanced Researc. Projects Agency (ARPA) to design an online search system for about 200 000 bibliographic records, and, five years later, in 1968, it began working on a similar project to support 'Index medicus' publishing activities. This grew into the National Library of Medicine's AIM/TWX (Abridged Index Medicus via the Teletypewriter Exchange Network) system, an experimental online service using the ELLHILL software (so named for the Lister Hill National Center for Biomedical Communications), and a database comprising about 100 000 citations, a five-year coverage of AIM journals. The system was accessed via TWX terminals situated in medical libraries throughout the US, and the database was stored on an IBM 360/67 computer at SDC's Santa Monica headquarters. It developed into the

present MEDLINE service, which began operation in its present form in October 1971.

The software currently used by SDC's search service is ORBIT. Originally an acronym for Online Retrieval Bibliographic Information Timeshared, it now stands for Online Retrieval of Bibliographic Information and Text, and grew out of the ARPA and NLM projects. (11, p.79;3, p.11-12)

3.6.2 The telecommunications problem

One last problem remained to be solved before online bibliographic searching could begin effectively to meet the needs of an information-hungry world, and that was the perennial one of cost. It has already been mentioned that by 1961 it was technically possible to transmit digital data and computer programs over public telephone lines. The cost of these telephone calls was, however, inversely high in proportion to the other costs of online searching (for example, the costs of the hardware, software development, database creation and use, etc.) and this inverse proportion became greater as time passed and other costs decreased significantly. Even after the first commercial online search services had been established, with potential users at telephone receivers both countrywide and internationally, the problem of proportionately excessive telecommunication costs remained.

Solutions to the problem were to be found, however, for the nineteen-sixties also saw much research into the design and development of data telecommunication networks, and outcome of the launching of the world's first telecommunications satellite in 1957, Sputnik, by the USSR. During this time it was possible to obtain dedicated leased lines and other special dial-up data arrangements for online searching from telephone companies. Because these were not always entirely satisfactory, existing facilities were redesigned to cope with the need for digital transmission; in addition, computerised, value-added telecommunications networks were developed to supplement the telephone services.

Rosenberg (12, p.570) defines a value-added network (VAN) as follows: "a data network operated in the United States by a firm which obtains basic transmission facilities from the common carriers; for example, the Bell System, adds "value" such as error detection and sharing, and resells the services to users. Telenet and Tymnet are examples of VANs." This will be perceived as a somewhat parochial definition, but the principle applies equally to networks based elsewhere in the world. VANs are based on the principle of packet-switching, which means that the data which come into the system are divided into small segments, or packets, of data, which move through the system at very high speeds. By doing this, it becomes possible for many widely dispersed users to use the same lines simultaneously, because the system routes these "packets" of data along the fastest routes, which may not necessarily be the shortest ones, but rather those which are immediately available.

The first of these services was begun by Tymshare, Inc., and began operations in 1970. (7, p.13) Its service, which is still in existence today, is called Tymnet. Tymnet is a distributed network, which means that it consists of nodes, which may be mini- or microcomputers, which link various terminals to central computers. Data are transferred from node to node, in packets, as described above, along the fastest route, to their final destination, where the packets are reassembled in their original sequence.

Such networks are today capable of translating signals from many dissimilar kinds of terminal devices. Furthermore, they alleviate the problem of disproportionately high telecommunications costs, because a user is able to make a local telephone call to access a node, which, with very few additional charges, will enable him/her to access data stored on a computer many hundreds of thousands of kilometres distant.

Many other data communications services were instituted during the seventies, some of which used microwave transmission instead of telephone lines, with others, like the South African SAPONET network, using satellite transmission. (7, p.13-14;9, p.6)

3.7 Conclusion

As is typical of innovations during any period in the history of the world, online bibliographic information retrieval developed as the result of many interrelated and simultaneously occurring phenomena. Chief amongst these were the urgently-felt need for better control of, access to, and dissemination of information which took place during the immediate post-World War II period; the rapid development of sophisticated, multi-purpose computers during the late fifties and sixties; and the accelerated space race between the USSR and the US, which in turn led to the development of new telecommunications technologies. It has been shown that none of these factors could, in isolation, have given rise to what has been termed the "online revolution", a development which was to have far-reaching effects and unforeseen implications for, *inter alia*, librarians, information workers, and the producers of abstracting and indexing journals. A further effect has been the emergence of a new industry, trading, for the first time in history, in a self-generating commodity, namely, information.

References

1. BECKER, Joseph. A brief history of online bibliographic systems, *in* Sherrod, John, *ed.* Information systems and networks: eleventh annual symposium, March 27-29, 1974. *Proceedings*. Westport, Conn.: Greenwood, 1975, p.3-13.

2. BOURNE, Charles P. On-line systems: history, technology, and economics. *Journal of the American Society for Information Science*, 31(3), May 1980, p.155-160.

3. BUSH, Vannevar. As we may think. *Atlantic monthly*, 162, July 1945, p.101-108.

4. FRY, T.F. *Computer appreciation*. 2nd edition. London: Newnes-Butterworths, 1977.

5. FRY, T.F. *Computer appreciation*. 3rd edition. London: Butterworths, 1981.

6. GARDNER, Jeffrey J. & Wax, David M. Online bibliographic services. *Library journal*, 101(16), September 15 1976, p.1827-1832.

7. HOOVER, Ryan E. Overview of online information retrieval, *in* Hoover, Ryan E., *ed*. *The library and information manager's guide to online services*. White Plains, N.Y.: Knowledge Industry, 1980, p.1-29.

8. HOUGHTON, Bernard & Convey, John. *Online information retrieval systems: an introductory manual to principles and practice*. 2nd edition. London: Bingley, 1984.

9. KNAPP, Sarah D. Online searching: past, present, and future, *in* Maloney, James J., *ed*. *Online searching technique and management*. Chicago: American Library Association, 198[illegible], p.3-15.

10. LANCASTER, F.W. & Fayen, E.G. *Information retrieval online*. Los Angeles: Melville, 1973.

11. ROGERS, Frank B. Computerized bibliographic retrieval services. *Library trends*, 23(1), July 1974, p.73-83.

12. ROSENBERG, Jerry M. *Dictionary of computers, data processing and telecommunications*. New York: Wiley, 1984.

13. ROYAL Society. Scientific Information Conference, 1948. *Reports and papers submitted*. London: Royal Society, 1948.

CHAPTER 4
The online industry

4.1 Introduction

By the period 1971-1973, the scene had been set for online bibliographic information retrieval systems to begin offering their services to different categories and groups of users, which in effect meant creating conditions for public access to their databases. Advances in computer and telecommunications technology had made the widespread availability and use of online retrieval systems feasible. The online industry was ready to be launched.

In this chapter, an historical overview and a description of the major online search services in the United States, the United Kingdom and Europe is given. A discussion of the nature and activities of database producers, followed by a brief description of the types of users of online search services completes the section on the online industry as a whole. The databases themselves are then examined.

4.2 The online industry

Three primary factors contributed to the coming into existence of the online industry and its subsequent development.

The first is the production of compilations of bibliographic material, for example, printed indexes, by many different learned societies, companies and similar organisations. Once the computer began to play an ever-increasing role in their production, it was realised that the resulting machine-readable data could be manipulated for other purposes as well. MEDLARS is a prime example.

The second factor has already been discussed in some detail in the previous chapter, namely, essential technological developments in computing and telecommunications. Computers with time-sharing capabilities and large online and back-up storage facilities were necessary, as well as telecommunication networks which could handle and

transmit digital information at high speeds. Telenet and Tymnet answered this need.

The third factor concerned the development of the software to make online, real-time simultaneous searching by many users possible. These programs were needed to create the machine-readable databases which were to be searched, and to make interactive, heuristic searching of them possible. A further complication was that these programs had to result in "user friendly" systems - that is, they had to be relatively simple and easy to use, while allowing the searcher (user) to exploit every possible nuance of searching and every access point to any record in a database. (12, p.6-7) Both DIALOG and SDC/ORBIT fulfilled these stipulations at the time.

Today, as then, the online information retrieval industry can be divided into three distinct components, viz.

1. database vendors or search services

2. database producers

3. users.

(15, p.14)

4.2.1 Database vendors

4.2.1.1 United States

4.2.1.1.1 National Library of Medicine

The first online bibliographic database to become generally available was MEDLINE (MEDlars onLINE). The pilot project which led to the institution of the MEDLINE service was AIM/TWX (cf.3.6.1), although a move toward the institution of online services had been made as early as the autumn of 1967, when SDC began online experiments with ORBIT on a small neurology database for NLM. AIM/TWX was enthusiastically received, and in October

1971 a fully d.. eloped MEDLINE service was launched. It provided users with access to a database consisting of references from 1 200 journals covered by **Index medicus**. (15, p.12)

By February 1982, the database had been upgraded to contain the complete indexed contents of 1 200 journals, worldwide in scope, taken from the MEDLARS database. The database was updated monthly, and covered the current year plus the three preceding years. Rental agreements with the Tymshare Corporation made it possible for users to access MEDLINE through local telephone calls by means of forty nodes in major metropolitan areas throughout the United States. By July 1973, there were 193 institutions in the United States which were searching MEDLINE regularly; ten organisation in Canada were already using the system, as well as three in the United Kingdom and France, who accessed it via the Tymnet node in Paris. (20, p.79)

Today, the current MEDLINE files cover over 2 500 source journals, and are marketed throughout the world by many different vendors, including DIALOG in the United States, BLAISE-LINK in the United Kingdom, and DATA-STAR in Switzerland. (15, p.13)

4.2.1.1.2 **DIALOG Information Services, Inc.**

DIALOG Information Services, Inc. is an independent subsidiary of the Lockheed Missiles and Space Company. Until 1982 it was known as Lockheed Information Systems.

DIALOG, as it is commonly known, began its commercial operation in 1972 with three databases, namely, ERIC (125 000 citations), NTIS (190 000 citations) and PANDEX (400 000 citations), which were available to Lockheed subscribers through the Tymshare network, Tymnet By 1975, the service offered users twenty-four databases, by 1980 there were more than a hundred, while by mid-1986, there are in excess of two hundred and fifty. The system itself has remained basically the same, although it has become much more sophisticated than it was originally, with many enhancements and capabilities being added to it over the years. (14, p.11;17, p.81) Its development was made possible by the advent of the IBM

360 third generation technology with random access disks and the possibility of CRT terminal enquiry. (21, p.11)

The software has recently undergone a major re-write (during 1984), so that as from January 1985, DIALOG2 has become available. The new system has incorporated many suggestions from users, and aims at greater processing efficiency, increased ease of incorporation of new features into the system, and provision for larger, consolidated databases, as many of these have had to be split up into two or more files as the number of citations on the original database grew too large, e.g., CASearch and SciSearch. Other features of the new system are simplified procedures for searching of multifile databases and the choice of an optional security password. The intention is to make these new features backward compatible, but by now (June 1986), they have all but superseded the 'old' DIALOG, although new features will still be introduced incrementally as they become available. (19, p.17)

A recent development in online searching has been end-user searching, where the end-user actually does the search himself instead of obtaining the assistance of an intermediary or search analyst in the form of a librarian or information worker to do the search. The increased availability and use of microcomputers has greatly encouraged this trend, which has created a demand for ergonomically designed systems for 'lay' users. The response from the major database vendors has been to provide greatly simplified versions of their search services, with only a small number of database available on them, for searching by end-users in off-peak times.

In response to this trend, DIALOG introduced its Knowledge Index service in 1982. The service consists of approximately twenty databases grouped into subject sections, e.g., agriculture, business information, education, magazines, medicine, etc. It is particularly user-friendly in that it has less commands than the parent system, running in a menu-driven format, but nevertheless retaining its power and flexibility. (18, p.31-33)

Another interesting development which could mark the beginning of a new trend in the provision of online search services, is the introduction by DIALOG of a private data communications network, with public nodes located in cities in the United States having large concentrations of DIALOG users. Reasons for taking this step have been given by Roger K. Summit, President of DIALOG Information Services, Inc., as being able to provide users with a better service in the form of faster response time, better reliability, higher speed, and certain special services, such as overnight printing on local terminals, and automatic SDI (selective dissemination of information) to terminals. An important benefit of such as envisioned private network is the circumvention of postal service, which cause delays in the receipt of offline prints, by transmitting them instead directly to a customer. (19, p.17)

4.2.1.1.3 System Development Corporation

The Systems Development Corporation's ORBIT service began commercial operations in January 1973, also with three databases, viz. MEDLINE, CHEMCON, and ERIC. By 1980 it could offer more than sixty, and the system had increased considerably in sophistication. Its connection with the National Library of Medicine was severed in 1976, however, when the NLM itself assumed the role of vendor of its own databases. (14, p.12-13)

Today, about 40% of the hundred or so databases on the system are unique to SDC. (15, p.15)

4.2.1.1.4 BRS Information Technologies

The search service offered by BRS Information Technologies, formerly known as BRS Information Services, Inc., and simply known as BRS, became operational in 1977. (3, p.197) It evolved from a system developed at the State University of New York (SUNY), and initially offered a range of nine databases, one of which was MEDLINE. It uses a modified version of the IBM STAIRS (Storage and Information Retrieval System) software. In 1984 it had grown to more than fifty databases.

BRS, unlike the other major vendors, who operate mainly on a pay-for-use basis, also offers customers this facility, but is better known as a subscription service. The customer agrees to purchase, in advance, a certain amount of search time.

The service has also attempted to reduce the high costs of storing large databases online, and consequently stores only two or three years of the most recent data online. The rest of the database is searched by means of an automatic process overnight, with the results available for online inspection the next day. (12, p.8)

Like DIALOG, BRS has also adapted its service to enable microcomputer owners wanting to do their own online searches to use its service. The service is known as BRS/After Dark. It recently also introduced BRS Brkthru, which, unlike BRS/After Dark, available only at non-peak searching times, as its name suggests, is available day and night, weekends and holidays. BRS/After Dark became available in December 1982, when eight databases were offered, five of wnich overlapped with those offered on DIALOG's Knowledge Index. An innovation was a newly -created (by BRS) database of microcomputer literature, DISC, consisting of tables of contents to leading microcomputer journals; it also offered users a strong core of databases in the medical literature field, with MEDLINE, BIOSIS Previews, CASearch (Chemical Abstracts), Health Planning and Administration, and IPA (International Pharmaceutical Abstracts) all being available from the inception of the service. By 1984, the number of databases available for searching on BRS/After Dark had grown to twenty-nine, with eleven in science and medicine, four in education, eight in the social sciences and humanities, four in business and **Books in print** and the full-text **Academic American encyclopedia**.

After Dark is menu- rather than command-driven, and like Knowledge Index, databases are grouped into "subject libraries". Four print options are available. Plans for the future include access to Datalines, the After Dark newsletter, online, a software service, a "swop shop" to facilitate tracking of computer equipment and software, online notices of new system features, and electronic mail. MCI (machine check interruption) electronic mail is available on all BRS systems. (18, p.33-34;16, p.652)

BRS Brkthru is also a menu-driven system, offering over sixty-five databases in business, health, the biosciences, science, technology, social science, humanities and general reference. BRS claims that new users should be able to retrieve information within a matter of minutes, but it caters for those with slightly more experience in the form of abbreviated instructions (still menu-driven). (4)

The systems which have been described thus far are all based in the United States. All of them, however, are available for searching from outside that country as well, e.g., from the United Kingdom and many other countries both in Europe and elsewhere.

4.2.1.2 United Kingdom

In the United Kingdom there are two major online vendors, viz. BLAISE (British Library Automated Information Service) and Pergamon InfoLine. Many other vendors in the UK offer one, or sometimes more, databases for searching, mostly by subscribers.

BLAISE started operating in April 1977, using software based on the ELLHILL software. It is an example of a fully integrated system, with online information retrieval from UK and LC/MARC records and all the MEDLARS files, including Toxline, Cancerlit and Chemline, online cataloguing, automatic document request for inter-library loans and photocopies from the British Library Lending Division (BLLD), and computer output microfilm (COM) catalogue production using the BLAISE Editor and LOCAS (Local Cataloguing Service) software options. It can be accessed from the United States, from Australia, Africa and Europe either by direct dial or by means of a telecommunications network. (13, p.265;12, p.8)

In 1982, BLAISE was divided into two different sections, viz. BLAISE-LINK, which links users to NLM for medical and related subject field searches, and BLAISE-LINE, which offers the nonmedical databases from a centre in the United Kingdom. (15, p.13)

Pergamon InfoLine began its existence as Infoline, operated by a consortium of British organisations and institutions which included the British Library, the (British) Department of Industry, Derwent Publications and the Institution of Electrical Engineers. It was taken over in 1980 by Pergamon Press. It provides most of the more popular databases, and has managed to obtain exclusive rights to some, e.g., RAPRA. Pergamon InfoLine is concentrating on files in science and technology with a special emphasis on the patent literature. The system uses an enhanced version of the BASIS (Batelle Automated Search Information System) software. By January 1985 it was able to offer almost thirty databases online. (23, p.335)

4.2.1.3 Europe

Until recently, online searching in Europe took place mainly by means of the European online network, EURONET, which became operational in November 1979, A packet switched network, it was developed by the post, telegraph and telephone authorities (PTTs) of the countries then belonging to the European Economic Community. (5, p.20)

Database vendors in these countries created the Direct Information Access Network for Europe (DIANE), which allowed access to their databases via EURONET. Many of the databases on offer in this manner were small, private databases of European origin, which otherwise have remained inaccessible. (5,p.20)

As of March 1983, there were forty vendors offering in excess of 370 databases for searching via EURONET/DIANE, as it was known, one of which was the British Library's BLAISE service. (15, p.13)

An important contributor to DIANE was the ESA/IRS, the information retrieval service of the European Space Agency. (cf. 5.1) Now accessed by means of its own network, ESANET, it was the first major information retrieval service for bibliographic information to be established in Europe, and was started by the European Space Research Organisation's (ESRO) Space Documentation Service (SDS) in the mid-sixties.

When the ESA service started in 1965, it was based on an exchange agreement with NASA, according to which it was granted access to STAR (Scientific and Technical Aerospace Reports) and IAA (International Aerospace Abstracts) information on magnetic tape, with microfiche documentation. In return, the then SDS undertook the indexing, abstracting and processing of relevant material from universities, research institutions and commercial enterprises in the ESRO Member States for inclusion in STAR (unpublished material) and IAA (journal articles, conference papers, etc.). (5, p.52-53)

It initially used a version of the RECON/DIALOG software deveoped by Lockheed, but when ESRO was superseded with the founding of the European Space Agency in 1975, the RECON software was replaced by the QUEST software in the Information Retrieval Service (IRS) which superseded SDS in 1979. The host computer is situated at Frascati, near Rome, in Italy. Access to databases which were initially limited to those pertaining to space research and technology, e.g., the NASA database, Chemical Abstracts and Biological Abstracts, has expanded to include over forty databases, covering mainly scientific and technical fields. (15, p.13;23, p.335)

Other important search services in Europe are Data-Star, a Radio-Suisse company which markets its products from offices in Switzerland, the United Kingdom, France and Germany, with representatives in many other countries, offering over twenty databases in the fields of business, and the physical life and social sciences; DIMDI (Deutches Institut fur Medizinische Dokumentation und Information), the West German medical information service with about forty databases; and Telesystemes Questel, based in France, also with about forty databases. (15, p.14-15)

4.2.2 Database producers

Many, but not all, of the bibliographic databases currently available for online searching are the machine-readable equivalents of printed indexes and abstracting journals. The history of MEDLINE is a typical example of how computers were used to produce a printed index more efficiently, which then led to the producers of the index using the increased

flexibility of the new production methods to repackage the references stored in the database. A further bonus was that this could be done in ways which were tailored to suit the needs of individual users.

This meant that the producers of the printed indexes and abstracting journals became database producers as well. Some of the database producers lease their products to the vendors instead of making them available for online searching themselves. When this happens, the vendor has developed software which enables searchers to conduct online searches on the machine-readable databases loaded into their computers. Before this is done, however, the database is converted into a format compatible with the vendor's information retrieval system, and the information on the database is loaded from its original magnetic tape onto magnetic disk for storage. (Magnetic tape is not the only storage medium used, but at present it is the most commonly used for these purposes.) Examples of producers who have chosen to become vendors themselves, are the American Chemical Society, the National Library of Medicine, and, more recently, The H.W. Wilson Company. (cf. 5.2.3)

Because the producers of printed indexes and abstracting journals have traditionally been learned societies and institutions, which have played an important role in the bibliographic control of the primary literature of their particular disciplines, some of them since the 18th century, it is these organisations who became, albeit unwittingly at first, the first producers of machine-readable databases. An example of one such organisation is the American Chemical Society, which has been publishing **Chemical abstracts** since 1907, and which still leases its databases to several vendors in Europe, the United Kingdom and the United States despite having become a vendor itself. According to Fenichel, however, in 1983, about 40% of the databases publicly available for searching on the three major United States-based search systems, viz., DIALOG, SDC and BRS, were produced by non-profit organisation, a further 40% by commerce and industry, and 10% by agencies of the United States government. (8, p.28)

Some databases available for searching on online systems have no printed equivalents, their producers initially setting out to create databases

for sale or lease to the database vendors, or, alternatively, with the intention of becoming vendors themselves. Producers of this type are primarily commercial organisations such as Data Courier Inc., producers of ABI/Inform, a database in the field of business. (11, p.45)

An interesting corollary to this is found in the situation where print publications are derived from the machine-readable database produced specifically for online searching. Examples are **Geocom bulletin**, **Geo-science documentation** and **Geotitles weekly**, all derived from GEOARCHIVE, a database produced by Geosystems in the United Kingdom and available for searching on various vendor systems. (Hall&Brown, p.153)

4.2.3 Users

The third sector of the online industry may broadly be termed the users, although "users" *per se* can be divided into the institutions or intermediary organisation which employ searchers (intermediaries) to do online searches, and the so-called "end-users", who are those who seek the information.

The first group includes libraries of every kind, including academic, special and public libraries, as well as information services and information brokers. Their common role in the information retrieval process is to retrieve information from database vendors in order to satisfy the needs of their clientele, the end-users. Many user studies have been conducted in connection with online information retrieval, and each of the above-mentioned groups will be considered in the South African context in this dissertation.

4.3 The databases

4.3.1 Typology

The literature of online information retrieval appears widely to have adopted Cuadra's (7) typology of databases available for online searching (2, p.71;6, p.243;15, p.16) Other typologies are based on a division according to the type of parent organisation, subject fields

covered and type of source material (9, p.8-12), yet others merely differentiate between bibliographic and non-bibliographic databases, or databases and databanks (11, p.3;6, p.243), which in essence concurs with Cuadra's typology. Cuadra divides databases into

- reference databases, and
- source databases.

4.3.1.1 Reference databases

Reference databases are most commonly the result of the photo-composition tapes from which printed abstracting and indexing journals and other such reference works are produced. They contain records that refer the user to a source document, but do not contain any information *per se* themselves. They can be divided into bibliographic databases and referral databases.

Bibliographic databases contain references to bibliographic records which are usually in the form of citations. They may consist of citations alone, or in combination with one or more of the following:

- controlled indexing terms
- natural language indexing terms
- abstracts
- subject or category codes

Examples of files such as these are NAPRA, INIS Atomindex and British Education Index. (11, p.257, 168, 79)

Referral databases are slightly different in that they direct users to names or sources which may be subject to change, such as a list of individuals working on a long-term research project, or a list of educational institutions and the courses they offer. Bibliographic

citations do not, of course, change. (6, p.244) An example of a referral file is BOOKSINFO, which has as its subject field English language books in print in the United States. (11, p.78-79)

Another form of the bibliographic database is the citation database in which a citation map of the literature as well as references to the documents in which the citations are to be found are provided. SciSearch and Social SciSearch are examples of this type. (11, p.266, 270)

4.3.1.2 **Source databases**

Source databases can be divided into four broad categories, viz

- numeric and statistical
- fact-answer oriented
- chemical and physical properties
- full-text

These databases are of particular importance in the fields of business, industry, trade and commerce.

Numeric and statistical databases consist of collections of data expressed, predictably, in the form of tables or 'time-series' (defined by Spiegel (22, p.258) as "... a set of observations taken at specific times, usually at equal intervals."). They are usually made up of blocks of data containing measurements, times (chronological periods) and different variables simultaneously. An example could be the length of time it took to manufacture ten plastic bowls of a particular size in 1964, compared (usually in tabular form) with the same activity in 1965, 1970 and 1975.

Numeric databases often possess some computational feature(s) which will allow the retrieved data to be analysed and manipulated. Librarians and information workers consequently do not make much use of databases like

these, and they are generally more likely to be searched by the end-user, rather than an intermediary. Typical end-users of databases such as these are individuals in large multi-national or national companies who need the information for planning and management decisions. For example, the General Electric Information Services Company (GEISCO) offer a number of programs for financial reporting and analysis, as well as databases comprising numerical data on the economies of a hundred different companies, on a world-wide computing system known as Mark III. The system provides users with specialised programs for the manipulation and display of this international economic data. Other producers of numerical databases are Automatic Data Processing, Inc. (ADP) and I.P.Sharp. (15, p.17-18)

Fact-answer oriented databases overlap largely with chemical and physical properties databases in their nature and function, presenting information in a very brief, factual form, which answers user's questions online. Like chemical and physical properties databases, the data contained in them may be both numeric and textual. Examples of chemical and physical properties databases (sometimes termed "dictionary" databases (2, p.71)) are CHEMDEX of the Chemical Abstracts Service, in which each record contains the CAS registry number, molecular formulas, chemical name, synonyms for the name, and ring system information pertaining to a particular chemical compound, and the (British) National Physics Laboratory's MANLAB, containing thermochemical data relating to 1 800 inorganic chemicals.

Full-text databases, as their name suggests, contain the complete texts of documents. At present, they are primarily to be found in the legal field, where several databases containing the full text of statutes, court decisions, etc. have come into existence in the last few years. Another field in which many of these databases is emerging is in current information, such as that to be found in newspapers. The growth of electronic publishing would seem to suggest that this type of database will become more prevalent during the next decade. Examples of this type of database are LEXIS, produced and marketed by Mead Data Central, NEXIS, also produced and marketed by them, and WESTLAW, produced and marketed by the West Publishing Company. Both LEXIS and WESTLAW offer the full

text of the United States Code (federal statutes), with state statutes of approximately six states available on LEXIS, which is, at present, the more extensive database. (10, p.214, 216-217) Another example is the American Chemical Society's ACS Journals Online, a full-text chemical information system, on which it is possible to scan the full text of articles published in eighteen American Chemical Society journals. (1, p.1)

4.3.2 Structure

Database producers make their products available for lease or for sale to database vendors. These are usually stored on some magnetic storage medium, such as tape or disk, and are frequently in a format based on the requirements for producing the database in print. The vendor must, on receipt of the database in whatever format it exists, reformat it, using a special reformatting program, so that it can be loaded onto the vendor's system ready for searching.

Machine-readable databases for online bibliographic information retrieval contain data which have been grouped together into "chunks", to quote Lancaster and Fayen (17, p.47), which are then known as records. In a machine-readable file containing bibliographic data, a record in this sense may represent a single monograph, a periodical article, a group of documents (such as a monographic series), or even the document itself (as in a full-text database). The latter case is still less usual, so records in this sense on such databases can be generally regarded as document surrogates. These records are in turn divided into fields - each comprising a different part of the record, most of which will provide different access points to that record. In a bibliographic record, such a field could be the document's accession number, the author's name(s), the title, the sub-title the name of a journal, date of publication, language of the document, the ISSN or Coden, index terms assigned by the database producer or the vendor, or the document type.

Databases such as these are divided into numerous parts called files. The files are of two kinds, namely bibliographic or linear, on which full (unit) records are stored, which are sequential files, with documents

stored one after the other, and inverted files, which are indexes to all or most of the fields in the record, and provide a means of random access to it. The inverted files (indexes) contain two types of information, viz. sorted entries for all the searchable parts of records, together with an accession, or any other unique number pertaining to particular records, and another single number which indicates the number of records stored in the database in which the particular terms occurs ('postings' or 'hits'). Diagrammatically, index files can be represented thus:

Document numbers	Indexing terms	Postings
1, 6, 10, 21, 30	Academic	5
2, 4, 7	Canada	3
1, 2, 21	Information	3
6, 9, 10, 13, 30	Library	5
1, 2, 6, 9, 10	Online	5
3, 7, 9, 11, 15	Public	5
2, 3, 9	Special	3
2, 4, 7, 10, 25	Users	5

(After Henry *et al*, 12, p.46)

Figure 12.
Inverted file structure

The exact file structure within the database is determined by the vendor's system software, and by the nature of the database's contents. For example, the ERIC database on DIALOG has one very large index called the Basic Index, consisting of all controlled language indexing terms, all natural language indexing terms, all the meaningful terms from the tile of the document, and all such terms from the abstract, if there is one. Author's names and journal titles are arranged in separate indexes. A bibliographic (linear) file contains the references themselves. Together all these different files make up the ERIC database on DIALOG.

All the major vendors of online information retrieval services use systems based on inverted files. The reasons for this are two-fold. Firstly,

such files are direct or random access storage mechanisms, and, as such, are able to yield data very swiftly when searched. Secondly, they lend themselves to post-coordinate searching, in which search terms are combined at the time of searching as the topic of the search dictates, which makes heuristic searching possible.

Lack of standardisation in database structure has meant that online searchers of bibliographic databases have had to learn to cope with the many variations which exist. According to Brown and Hall (11, p.6), while this is a negative characteristic of the online industry as a whole, it means also that "... while most would-be searchers can carry out searches online, only the skilled searcher is likely to know the many factors (both system-dependent and database-dependent) which may affect the search result (good or bad) as examined at the terminal." They consider moves toward standardisation of database formats and structures unlikely (11, p.6), while others (2, p.80) predict a gradual trend towards uniformity as a result of consumer pressure on database producers. Developments in database access software, however, may render this need obsolete.

4.4 Conclusion

Since 1973, the growth and development of online bibliographic information retrieval systems has been extremely rapid. The number of search services had grown, as has the number of databases available for searching, a phenomenon which will be explored more closely in the next chapter, which will explore the current trends associated with and implications of the rapid development of the online industry.

References

1. ADVERTISEMENT in *Online*, 9(1), January 1985, p.1.

2. BORGMAN, Christine L., Moghdam, Dineh & Corbett, Patti K. *Effective online searching: a basic text*. New York: Dekker, 1984.

3. BOURNE, Charles P. On-line systems: history, technology, and economics. *Journal of the American Society for Information Science*, 31(3), May 1980, p.155-160.

4. BRS introduces pay-as-you-go retrieval service. *Online review*, 9(4), August 1985, p.272.

5. BURKETT, Jack. *Library and information networks in Western Europe*. London: Aslib, 1983.

6. CRONIN, Blaise. Databanks. *Aslib proceedings*, 33(6), June 1981, p.243-250.

7. CUADRA, C. Spreading the word on non-bibliographic databases. *The information manager*, 2(2), May/June 1979, p.28-31.

8. FENICHEL, Carol Hansen. Databases and database producers and vendors, *in* Maloney, James J., *ed.* *Online searching technique and management*. Chicago: American Library Association, 1983, p.26-34.

9. FENICHEL, Carol H. & Hogan, Thomas H. *Online searching: a primer*. Marlton, N.J.: Learned information, 1981.

10. GREGURAS, Fred M. Legal research, *in* Hoover, Ryan E., *ed.* *Online search strategies*. White Plains, N.Y.: Knowledge Industry, 1982, p.213-239.

11. HALL, James N. & Brown, Marjorie J. *Online bibliographic databases: a directory and sourcebook*. 3rd edition. London: Aslib, 1983.

12. HENRY, W.M., Leigh, J.A., Tedd, L.A. & Williams, P.W. *Online searching: an introduction*. London: Butterworths, 1980.

13. HOLMES, P.L. The British Library Automated Information Service (BLAISE). *Online review*, 3(3), June 1979, p.265-274.

14. HOOVER, Ryan E. Overview of online information retrieval, *in* Hoover, Ryan E., *ed.*, *The library and information manager's guide to online service*. White Plains, N.Y.: Knowledge Industry, 1980, p.1-29.

15. HOUGHTON, Bernard & Convey, John. *Online information retrieval systems: an introductory manual to principles and practice*. 2nd edition. London: Bingley, 1984.

16. KESSLMAN, Martin. Online update: BRS/After Dark. *Wilson library bulletin*, 58(9), May 1984, p.652-653, 687.

17. LANCASTER, F.W. & Fayen, E.G. *Information retrieval online*. Los Angeles: Melville, 1973.

18. OJALA, Marydee. Knowledge Index: a review. *Online*, 7(5), September 1983, p.31-34.

19. PEMBERTON, Jeffery K. & Emard, Jean-Paul. DIALOG in 1984: an interview with Roger K. Summit. *Online*, 8(2), March 1984, p.13-20.

20. ROGERS, Frank B. Computerized bibliographic retrieval services. *Library trends*, 23(1), July 1974, p.73-88.

21. SMITH, Bev. DIALOG - patriarch of the online generation hold industry lead. *Information today*, 2(5), May 1984, p.11-13.

22. SPIEGEL, Murray R. *Statistics*. New York: McGraw-Hill, 1961.

23. TEDD, L. Computer-based information retrieval services, *in* Anthony, L.J., *ed.* *Handbook of special librarianship and information work*. London: Aslib, 1982, p.325-354.

CHAPTER 5

Current and emerging trends in the online industry

5.1 Introduction

Trends tend to be inderdependent, affecting one another, and in the online industry, the most significant cause of change and innovation has been technological development. Two technologies in particular have influenced the direction in which online search services, search modes, databases, and, consequently, the costs involved in online bibliographic information retrieval, have moved. They are cheaper, faster and more reliable telecommunications facilities, and the emergence of the micro- or personal computer. The latter phenomenon has brought with it a significant change in the user population; the former, a general increase in usage. Both have, in turn, affected the type of service offered by the large, established vendors, having brought about, either directly or indirectly, new types of services, databases. etc. Closely related to these are the inherent financial implications.

This chapter deals with trends in search services, software developments, innovations such as downloading, and changing patterns in costs and charging practices for online bibliographic information retrieval.

5.2 Search services

5.2.1 A move toward diversification

The most noteworthy trend in new services being offered by the various established and new database vendors is an increasing tendency to concentrate on the end-user segment of the market, bypassing the established intermediary-dominated consumer organisations. This has come about as a direct result of the increase in the number of privately owned microcomputers. Furthermore, it is a trend which can confidently be expected to continue - it has been predicted that by the year 1990,

more than 90% of the Western scientific community will have access to an interactive terminal. (3, p.19)

Examples of such services are the after-hours services, such as DIALOG Information Service's Knowledge Index and BRS Information Technologies' BRS/After Dark, as well as the full-time BRS Brkthru (cf. 4.2.1.1.4). The after-hours services operate during off-peak hours, offering a selection of bibliographic databases also available on the main search service, at considerably lower rates, and using specially developed (simplified) user-friendly, menu-driven search modes. However, prior to the emergence of this type of search service, the home computer market was catered for by non-bibliographic search services in the form of so-called consumer online services, such as The Reader's Digest's The Source, and the H.R.Block Company's CompuServe. Both these services may be seen as "information utilities" catering for users' individual and personal information needs as well as those of a professional and/or business nature. They offer a variety of services: communication services in the form of electronic mail services, bulletin boards, teleconferencing facilities and interpersonal communication (the so-called "CHAT" service); general and specific news coverage; special business and financial services such as coverage of securities trading, commodity trading and information about money markets; quizzes, the full text of encyclopaedias, such as Grolier's **Academic American encyclopedia**, online shopping facilities, airline, hotel and car reservations, and so on. (6;8)

Other end-user services introduced recently include BRS'stable of "colleague" services, viz. Medical Colleague and Educator Colleague, which are both daytime services aimed at the professional in his or her workplace. Another such service, jointly offered by BRS and John Wiley, the publisher, is EXEC INFO, an executive information service. (12, p.653) The National Library of Medicine (NLM) is now offering subsets of its MEDLINE bibliographic database for use on personal and institutional computers. (23, p.517)

5.2.2 The endangered intermediary?

Does the emergence of services such as those outlined above herald the demise of the online intermediary? There is already some overlap in the services offered by the end-user search services, in that bibliographic databases and research-oriented files, traditionally searched by intermediaries for end-users, are beginning to appear on the information utilities, and, conversely, facilities such as electronic mail services are becoming increasingly available on the conventional services. Furthermore, several university and school libraries in the United States and Canada have instituted user access to end-user search services or are considering doing so in the near future. Janke (11, p.15-16) attributes this trend to several factors, namely

- marketing of their services directly to end-users by vendors such as DIALOG and BRS

- widespread discussio and advertising of after-hours and other end-user services in popular computing magazines and newsletters

- ease of use and user-friendliness of such services

- realisation by librarian-intermediaries that end-user searching is becoming a feature of the online scene

Findings of a study of end-user searching on after-hours search services at the University of Ottawa corroborated Lewis' predictions of a new role for intermediaries, namely "... informing, advising and ... encouraging the user to become more involved with self-help systems". (19, p.71) The study revealed, *inter alia*, that "... the great majority of end-users prefer to run their own searches, *provided there is a librarian on hand to assist* them!" (11, p.20) (Janke's italics.) He came to the conclusion that "... even when a client is willing to run his or her own search, in most instances, he or she still wants and *needs* a professional searcher's advice, in order to produce really satisfying results." (11, p.20) (Janke's italics.)

5.2.3 Specialist services

A second major trend as far as online search services are concerned is the emergence of a new type of bibliographic service which aims at meeting the needs of a specific user group or at specialising in specific types of databases. An example of such a service is Pergamon InfoLine, which is concentrating on patent information, including the full-text of US and UK patents, patent law and international patent information. Most of the databases offered for searching by the service are produced in the United Kingdom, and several are exclusive to it, e.g., Electronic Publishing Abstracts and Management and Marketing Abstracts. Mead Data Central, a US-based search service, is concentrating on full-text databases. CAS Online offers searchers access to the bibliographic databases of Chemical Abstracts Services, as well as chemical substance searching online by means of the CAS Chemical Registry file. Unlike other vendors which sell its products, it offers the full abstracts for items from 1975 onwards. Its attractive fee schedules, the abstracts and structure searching make it an attractive proposition for regular searchers in the field of chemistry. (33, p.2009)

Another newcomer in this category is WILSONLINE, which offers sixteen of the famous W.H.Wilson periodical indexes online, plus three more databases which have no print equivalent. (24,p.102) The target audience for WILSONLINE is, of course, the library/ information service which uses the indexes.

According to Tenopir, services like these offer several advantages to the user, prime amongst which can be lower prices, exclusive access to specialised databases and an "increased responsiveness to a smaller clientele". (33, p.2009)

5.3 Software developments

The proliferation of databases and database vendors during the past five years has provided the online searcher with a greater volume and variety of information available online, but it has not made access to that information any easier. The online intermediary is consequently required

to master several different log-on procedures and command languages, and to know what search facilities and output formats are available on each of a multiplicity of systems.

The solution to this lack of standardisation and uniformity would be a software package which would permit the user to enter a natural language search statement, after which it would select an appropriate database on whatever system it was to be found, log on to it, formulate the search in the system's command language, and download the eventual result. Software such as this is known as "transparent", as it allows the user (searcher) to access many different search services without any knowledge of any of the procedures involved. (36, p.69) On a less complex level, another solution would be software which simply translates a standard command language into the individual languages of different vendors. (17, p.40) Systems such as these are being developed, but they fall, to some extent, into the realm of artificial intelligence, and remain a long way from viability. Software such as this would, of course, present an eminently suitable solution to the problems of end-user searching.

Early forms of these packages for use on microcomputers started coming onto the market in about 1983. (36, p.69) Typical functions would be all or some of the following

- terminal emulation, that is, enabling the microcomputer to "understand" messages sent from the remote computer and *vice versa*, without making use of its processing or storage capabilities

- communication, in which automatic dialling, logging on and off and password control are brought about

- file transfer, which enables search strategies to be prepared, entered offline (uploaded), with the results downloaded onto the microcomputer

- reformatting, which converts downloaded records into a format in which they can then be manipulated in whatever fashion desired

- search assistance, where the software performs, to a greater or lesser extent, the functions of the intermediary (17, p.39-40)

Developments as recent as these are often plagued with problems of terminology, and this one has proved to be no exception! The literature abounds with the terms "data-base access software" or front end processors" (31, p.1828), "gateways" (18;15, p.273), "gateway software" (18;29,p.6), "intermediaries" (28;39) and "front-end software" (15;9). Consequently, some consensus on terminology based on the function(s) of such packages has had to be found, and the necessary definitions were provided. (It must, however, be pointed out that the terminology in the literature is still very "loose" and that standardisation in this area has yet to be achieved.)

An umbrella term which is increasingly used for software which emulates some of much of the searcher's task, is "database access software". (31, p.1828;36, p.70) These programs can broadly be divided into two groups, namely gateway software and front end software. (9, p.31)

5.3.1 Gateway software

Gateway software performs such functions as dialling the telephone call, selecting the appropriate telecommunications network, logging on to the search service and sending the searcher's password. It therefore performs the communications function as outlined above. Many such systems also provide for uploading of a search strategy, and downloading the results of a search, thereby facilitating file transfer. Some of these packages also allow reformatting of downloaded information.

Examples of this type of software are Microstuf, Inc.'s CROSSTALK XVI and Perfect Software, Inc.'s Perfectlink (17, p.42), and Search Helper. The latter provides access to Information Access Corporation's databases on DIALOG, and was developed by IAC itself. (15, p.272) An example of a program which allows reformatting and integration of downloaded references with other files is the Personal Data Manager module of the Institute for Scientific Information's Sci-Mate package. (36, p.75)

5.3.2 Front end software

Front end software attempts to replace the human intermediary, translating commands into the language of the database vendor software. It may even select the database(s) to be searched, or leave this option open to the searcher. The searcher is (sometimes) precluded from having knowledge of Boolean logic or controlled vocabulary terms, etc. (9, p.31) Leggate and Dyer (17, p.41) call this type of software "search assistance software" as it performs precisely this function.

An early example is In-Search, which was hailed as the Visicalc of online searching (27, p.17) when it first appeared in 1984. A product of Menlo Corporation, it is a so-called transparent program providing access to DIALOG by means of IBM, IBM-compatible and TI microcomputers. The searching process is divided into three logical steps on In-Search, viz. database selection, searching the selected database, and retrieving records. It assists the searcher with database selection by means of an innovative screen which simultaneously contains windows of categories, (e.g., "biology and medicine", "business", or "government and news"), specific subjects within a broad search category, and short descriptions of appropriate databases within a chosen specific subject area. Once a database is chosen, the searcher enters search terms and logical connectors into yet another pre-prepared screen; the program automatically logs on to DIALOG and the search is run Viewing, printing and/or downloading the retrieved citations follows. DIALOG commands and features are input by means of pressing function keys, selecting from a list of alternatives, or by other, automatic, means. (31, p.1828-1829)

What In-Search cannot do, however, is to assist the searcher to develop a search strategy or to improve search results, that is, the intellectual input still has to come from a human being. (31, p.1829)

In-Search is a system-specific package for the DIALOG system, but other such packages exist which allow access in this manner to more than one search service. Examples of these are Sci-Mate's Universal Online Searcher module, and Data-Ease, Inc.'s IT (Information Transfer). (9, p.31) IT allows the user to type in information requests in natural

language, to which the response is a ranked order (with descriptions and costs) of possible databases for searching. The program then creates a strategy, runs it, and presents the searcher with the result. (15, p.273)

5.3.3 Other software adaptations

End-user searching is also clearly the aim of search services such as ESA/IRS and Data-Star, who have announced the development of new software which will give users the option of simplified menu-driven access to their files. (1, p.186)

Another development, this time not aimed specifically at end-user searching, is a move towards improving basic search software by some of the search services. Some of these are minor, and involve simply increasing search options, or making a command easier to use; others, like the major re-write of DIALOG's software, resulting in DIALOG2, and a similar re-write by Telesystemes Questel, having considerably more impact. (1, p.146) Important features of this new software are the possibility of searching several databases simultaneously, and more powerful proximity searching, the latter designed specifically with full-text databases in mind.

5.4 Downloading

Undoubtedly one of the key issues that has been attracting the attention (and concern, in some cases) of those involved in the online industry in the last four to five years is the thorny one of downloading. Downloading has been defined as

> "... the electronic transmission of databases or subsets of databases to local intelligent terminals or computers which themselves are frequently microprocessors or microcomputers." (37,p.1)

Downloading transfers data to a floppy disk or a hard disk. Advantages for the librarian/information worker are that

- search results can be reformatted or word-processed in any way required

- records from a number of databases can be merged, e.g., in-house records and records retrieved from a commercial database can be combined to form a new database

- records may be manipulated to create SDI or current awareness bulletins (20, p.30)

In other words, data which has been downloaded can be processed, coded and manipulated for further use, and reformatted and permanently stored on a user's computer. The downloaded data may then be searched and retrieved at will, thus bypassing the search service on which it was originally to be found.

There is no convenient way to detect or monitor this practice, and it has given rise to a host of problems concerning copyright and pricing structures. The possibility that commercial organisations could download substantial subsets of databases, and repackage them and sell them as their own, thus unfairly increasing competition for producers and vendors, thereby causing large-scale upheavals in the industry, is real. Also, the apparent costs savings for smaller users of the search services would soon be offset by raised prices for searching and even the withdrawal from the market of the less cost-effective databases. (37, p.2) On the other hand, by means of using database access software, it has become possible for a library to reformat references obtained by means of an online search, or to create a customised database for re-searching at no extra online cost. (32, p.1113)

However, the negative aspects notwithstanding, downloading appears to have become a permanent fixture on the online scene - yet another result of improved technology, it must be added, with increased storage and processing capabilities on microcomputers among the direct causes. The old adage, "If you can't beat 'em, join 'em" seems to have come into effect, though, as producers and vendors seem to have accepted the inevitable, and are looking beyond the purely commercial considerations

involved. They have perceived that there is a legitimate need among users to be able to create internal databases, some parts of which must be derived from downloaded data, for searching as frequently as they wish after their initial purchase of the information.

The result of this thinking on the part of the vendors has been that pricing policies are changing - PsycInfo, for example, severely reduced their online connect-hour charges early in 1983, but increased royalty charges quite substantially, the highest fees being for full records that have a high chance of being downloaded and the lowest for offline prints or partial records. In addition, more and more software packages which download data (e.g., Cuadra Associate's STAR) or manipulate it (e.g., Dow Jones' Market Software and their Microscope) are being developed and openly marketed. First ESA/IRS, then DIALOG, have solved the problem in another way with the introduction of new print formats specifically intended for downloaded references. These allow data to be taken from databases in an easily manipulable machine-readable form, simultaneously preventing copyright infringement. DIALOG is also developing its own software for this purpose. (14, p.119;1, p.146-147)

These developments, and the move toward so-called "ready-to-run" software, which, according to a Cuadra Associates survey conducted in August 1984, is rapidly becoming more common, are increasingly manifesting themselves, leading to a situation in which, to quote the survey, downloading will be "... viewed not as an act of piracy but as an essential part of the transaction". (16, p.101)

Another way of dealing with the problem has been the laying down of formal agreements by database producers, such as BIOSIS, CASearch and PsycInfo, with users, which allow, for an annual fee or subscription, the downloading of a specified number of records. The difficulty with such agreements, however, is that they have to be based on trust, as it is not possible to know exactly how much material is being downloaded. Also, that the policies of the database producers vary greatly, with some not charging for small amounts of downloading, while others automatically assume habitual downloading and charge accordingly high fees. In

addition, it becomes increasingly difficult for the user to keep track of which data was downloaded according to which agreement. (7, p.11)

5.5 Databases

Two main trends have characterised the database sector of the online industry in the past five or so years. They are, firstly, the rapid growth in the number of publicly available databases, and the development of new types of databases, notably numeric databases and full-text databases. Once again, advances in computer technology leading to increased but less costly storage capacities, and the development of fourth generation software, which has made more sophisticated, integrated-type retrieval systems possible, are the direct causes of these developments.

5.5.1 Increased numbers of databases

A 1984 study revealed that the number of databases available for searching by the public had grown more than 500% in the preceding five years, from 400 online databases of all kinds provided by 59 search services in 1979, to approximately 2 453 offered by 362 search services by late 1984. (16, p.12, 101) This, in itself, is an indication of the growth of the online industry generally; another survey revealed a growth rate inexess of 40% for 29 leading online search services during the first nine months of 1984, with a 32,8% growth in customer or password accounts during the same period. The findings of yet another survey, released in August 1984 by Cuadra Associates, indicated, however, that, during the preceding three months, access to the record number of seventy-two databases had been discontinued by search services. During the same period, though, more than 180 new databases had become available for searching. (16, p.12, 101)

5.5.2 The full-text database phenomenon

Included in the growth in the number of databases is the steadily increasing number of full-text databases. The online industry started with databases consisting primarily of bibliographic citation and indexing terms, mostly from controlled vocabularies. The fact that so

little source data was actually available online was generally inconvenient for users, but the (then) relatively high costs of computer storage put paid to any possibility of solving this problem on any meaningful scale. Decreasing storage costs and increased usage led to the inclusion of abstracts in the records on many databases, but it was document surrogates which were being retrieved, and not the documents themselves. The same factors today are contributing to a marked increase in the number of full-text databases, viz. lower computer storage costs (to which may be added the increased storage capacity of modern mainframe computers), increased usage of online search services generally, and end-user demand.

To date, the largest supplier of full-text databases has been Mead Data Central, which began with LEXIS, a legal full-text database (cf. 4.3.1), and NEXIS, a full-text business and current events database. In 1983, Mead was granted an exclusive contract to provide access to the database produced by the **New York Times**, which include the full-text of the newspaper itself. Examples of other newspapers available for full-text online searching are the **Washington Post**, the **Miami Herald** and the **Detroit Free Press** (5, p.90;32, p.1111) Also during 1983, DIALOG mounted two full-text wire services, UPI NEWS and PUBLIC RELATIONS NEWSLETTER, in direct competition with NEXIS. (5, p.90) Other full-text databases making their appearance on the online scene at about this time were several journals, notably the **Harvard business review**, now available on several search services including BRS and DIALOG, and encyclopaedias, such as the **Academic American encycopedia** and the specialised **Kirk-Othmer encyclopedia of chemical technology**. (5, p.90)

In 1984 a further development in the field of full-text databases took place with the announcement by the Information Access Company of what is believed to be the world's first publicly accessible commercial electronic professional journal, **Information publishing: an electronic journal**. It was due to be mounted or DIALOG during during 1985. Its coverage was heralded as being "... information storage and retrieval, online and other innovative distribution services, and information technologies related to electronic publishing and libraries." (10, p.83)

Another interesting full-text database to have emerged is NewsNet, which gives access to more than a hundred newsletters on all subjects. A few examples of these are Personal computers today, Financial management advisor, Petroleum information international, and Online database report. (32, p.1112)

Other trends in the area of databases are the emergence of a greater variety of, and simultaneously, more specialised databases. This has become possible with the increased volume of online searching, and, in turn, contributed to it. There is also a greater interest in retrospective files, another result of increased usage, increased storage capacity and its relatively lower cost, which has led to database producers including older data and/or records in currently available databases, or creating new ones specifically for these. (30, p.89)

Several implications for library/information services can be identified as a result of the trends in database content and proliferation as described above. Full-text databases are marketed primarily for end-users, so strategies for coping with, and adapting to, end-user searching will have to be decided on. Alternatives could extend to the provision of access time, hardware and training or be limited to assistance with search strategy formulation and development (in other words, consultancy) and loaning of search service documentation and other user aids to end-users with their own hardware and passwords. (32, p.1112)

Other consequences of these trends have been briefly mentioned in 5.3, but it is not inappropriate to discuss them in slightly more detail here. Firstly, searching full-text databases creates a demand for enhanced search software; in particular, there is a need for more sophisticated proximity searching (met very adequately by DIALOG2, and introduced in it for this very purpose). The spinoff of better search software is, in turn, an increase in the number of databases and searchers. Secondly, and this aspect has deliberately been omitted, except for brief mentions, as being beyond the scope of this dissertation, full-text databases offer primary source material to users of online search services, included in which is tabular or statistical (numerical) data. Such data is frequently downloaded and used as input for other systems, and as such,

also require more sophisticated search software, which, in turn, will allow connections with other programs, systems, etc. - in short, it is becoming necessary for retrieval systems to have post-retrieval processing capabilities, the "ready-to-run" software mentioned in 5.4. (30, p.89) Capabilities such as these allow microcomputers, for instance, to act as more than just information retrieval systems or record retrievers; they can serve as problem-solvers as well.

5.6 Costs and pricing policies

The costs of online searches can be divided into direct and indirect costs. Indirect costs include such things as the costs of equipment and the staff needed, while direct costs include telecommunication charges, database royalty charges and computing charges, all of which are paid to the search service by the user. Pricing policies of online search services have now reached the critical transition stage between the setting of initial policies and the development of new pricing strategies which can be adapted where necessary to accommodate changing circumstances. The final say is that of the database vendors. It is, however, affected by the interests of several other parties, viz. the database producers, competitors (other vendors), print-on-paper (parallel) publishers, and, of course, the consumers of the end-product, the users. To quote Martha Williams:

> "Database producers are at some disadvantage in setting price because they have no way of controlling the ultimate price to the user." (38, p.2)

Important trends affecting new pricing strategies are:

- cost-effectiveness of print-on-paper vs. online publishing
- variations in contracts between database producers and database vendors
- the rapid emergence of full-text databases

- developments in computer technology, including both hardware and software

5.6.1 Problems of parallel publishing

In 1979, it was noted that 20 - 40% of the direct costs of online bibliographic searching could be accounted for by database royalties. (2, p.195) These royalties are paid to the database producer by the vendor. Because many, if not most, of the bibliographic databases are produced by abstracting and indexing services as a spinoff of their printed products, income from online searching initially lagged behind that generated by the indexing and abstracting journals themselves. A study revealed that, in 1977, of the bibliographic databases which had been available for online searching for three years or more, most still derived less than 5% of their total income from online royalties. (2, p.196) By 1983, however, the scenario had changed somewhat, with the 50:50 mark for electronic vs. printed product revenues having been passed by several such database producers. (38, p.2) Some database producers are, of course, exclusively electronic publishers, not producing any printed equivalent to their electronic product, and they must generate all their income from online usage of their products.

The problem for those who have traditionally produced a printed product with an online spinoff has been the question of a reduced number of subscriptions to the printed product by library/information services and other, similar, information consumer institutions, thereby only buying their information when it is needed, via the online facility.

During the early years of online bibliographic searching, the database producers depended on the sales of their printed products to subsidise the online databases in order to encourage use and to help establish online searching. Now, however, a type of chicken-or-egg situation has emerged, in which database producers are required to perform a delicate balancing act. In essence, it consists of charging enough for the use of online files, so that their reliance on printed products is reduced, without discouraging online use by excessively high prices. If online usage of a particular database was to overtake use of its traditional

printed equivalent, it is obviously essential that the revenue realised must cover production costs.

Despite the financial problems inherent in parallel publishing, and the fact that a small drop in subscriptions to journals has been noted (35, p.104), it appears, from a comparison of changes in journal prices and those of their equivalent or similar online databases, that the general conclusion which can be drawn is that the two markets are setting independent pricing policies, with the online databases presently complementing their print equivalents, rather than showing signs of becoming a new, competitive market. (22, p.31,48) The decline in journal subscriptions could possibly be attributed to the normal causes associated with financial stringency, with budget cuts for subscribing library/information services being a specific example, or subscribers simply forgetting to renew subscriptions, and the like. Furthermore, it appears that an increase in the number of journals is taking place, particularly in the fields of science, technology and engineering, partly because of an increased number of submitted contributions, and partly because of a tendency towards specialisation, resulting in journals splitting to meet more specific interests of their readers. (22, p.31,45)

5.6.2 Contracts and royalties

As has already been mentioned in the previous section, it is clear that the issue of the contracts between database producers and database vendors which determine, *inter alia*, what royalties are to be paid to the producer, is a key one in the pricing and costs of online bibliographic information retrieval. Normally, the form of royalty (e.g., usage charge, subscription fee, charge based on information obtained or processed) and the amount (e.g., a specific amount or a percentage) are negotiated and set out in the contract. Royalties must be based, to a large degree, but nor necessarily exclusively, on the cost to the producer of producing the database, which varies according to the amount of preparation for the final machine-readable product undertaken by the producer. According to Barwise, (2, p.200), "... the most expensive task in producing a bibliographic database is the subject analysis needed for assigning index terms."

Other factors influencing database royalties are those related to the potential market for online search services, such as the demand for information, a corresponding increase in usage of such services, and, it now appears, to a lesser extent, the impact of online searching on subscriptions to the traditional abstracting and indexing services. (2, p.199) It is also interesting to note that, as the costs of computing and telecommunications have decreased, so there has been a corresponding increase in royalty charges - this trend will be discussed later in this chapter. However, for the moment, it is relevant to note that the practice of charging searchers for all information accessed, whether on- or offline, is rapidly overtaking the earlier practice of charging for connect time and offline prints alone. Such pricing policies lead to higher royalty payments to database producers, which may be perceived to be beneficial to all concerned; indeed, as early as 1978, Collier stated: "... the lower the data-base producer's royalty, the more money the information community has to spend if a given data-base is to survive, and *vice versa*." (4, p.21)

5.6.3 Effect of the increase in the number of full-text databases

Although full-text databases can, as yet, for the most part be regarded as being reprint services with the "added value" of computer programs which allow accessibility to them, 1985 saw the emergence of several online-only full-text databases being offered by a major commercial search service (cf. 5.5.2). Even the most conservative predictions on the future of the database producer sector of the online industry must include a proliferation of full-text databases of all kinds.

The question of pricing these databases, particularly those which are only available online, is forcing producers to think in terms of the profits generated by the online databases themselves, as more and more often, there are no print equivalents to be relied on for profits. The actual cost and market value of the services being offered is also of import. The underlying philosophy of the pricing policies for these databases to date has been that users pay for the record or part of the record received, with relatively lower connect charges then being levied. The cost of having the full text of a journal article transmitted online is

approximately five times that of the average price of the printed article itself, which has obvious implications for journal subscriptions.

Many producers of such databases have been subsidised by public bodies (Butterworths (Telepublishing) Limited subsidised LEXIS as the first legal database in the UK) or funded by a parent body (Elsevier wrote off an initial investment in its Medical Science journals to research and development costs), which has consequently allowed them to pitch charges at a competitive level in order to attract the targeted segment of the online market. (22, p.63-64) Information Access, a US-based database producer/vendor is now charging users a price per article plus connect hour charges, regardless of the baud rate at which transmission takes place (22, p.65). Mead Data Central (producers and vendors of the full-text LEXIS and NEXIS) have reduced their connect time charge and instead charge for information received (the rate depends on the time of day, modifications of search strategies while online, connect time, offline prints and a monthly subscription fee). (34, p.1301;13, p.733) The practice of charging for search strategy modifications favours experienced searchers, and as such detracts from one of the principle benefits of full-text databases, that is, end-user searching without the intervention of an intermediary.

5.6.4 The influence of technological advances

The three technological advances which have influenced costs and pricing of online bibliographic information retrieval the most are the vastly increased random access storage capabilities of modern computers, the rapid proliferation of microcomputers, and the rapid development of telecommunications networks, some even being developed and installed by the database vendors themselves, which allow for lower communications costs. Implicit in the latter is the probability that higher-speed transmission will feature prominently in connect time charges in the future. (22, p.65)

Eight years ago, in 1979, Lois Granick of the American Psychological Association defended a decision to increase database usage charges on PsycInfo so that the database could move towards self-support:

"The major problem with pricing is that the concept of the connect hour is wrong ... it's no longer fair. Customers with fast terminals get much cheaper rates than those with first generation terminals ..." (26, p.1682)

To date, though, of the major commercial services, neither BRS nor DIALOG has discontinued the practice of connect hour charges. (SDC announced a minimum monthly charge of $100 in 1984.) However, database usage charges have increased significantly on both services, as has the practice of charging for online prints, mainly to compensate database producers in some way for potential revenue lost as a result of downloading.

This reflects the trend of paying for information received, as discussed in 5.6.3, but it can only really be viewed as more equitable for both database producers and searchers if online connect charges are simultaneously reduced for databases with online print charges. (34, p.1301) DIALOG sees no reason to change its pricing policies; in the view of the President, Roger K. Summit, connect hour pricing is a method which is easily understood by users, allows them to estimate search costs without too much difficulty, and can be "metered" by users as they search." (25, p.14) He does not regard it as the "best possible way of pricing" but feels that it should be judged "better or worse than some other scheme". (25, p.14)

Furthermore, and again according to Muller (21, p.65), the "... mounting and development of full-text databases is directly related to the expansion of the home market", which, of course, has as the hardware used, the microcomputer. Searching of full-text databases is frequently more user-friendly than searching those consisting of citations and index terms, with the result that search software has begun developing in this direction, e.g., DIALOG2.

The use of microcomputers for online searching has also accelerated the development of software enabling searchers to download search results. As has been mentioned, the result of this practice has been that database vendors have begun charging users for online prints, particularly those requested in full format, on the assumption that if full format is

requested, the record is being downloaded. Another consequence has been a period of experimentation with various types of agreements and contracts regarding downloading practices. (cf. 5.4)

5.6.5 Implications for library/information services and for intermediaries

The first and most obvious effect on library/information services of pricing policies of online search services and database producers is financial, affecting such issues as subsidisation of online searching and charges to end-users for searches. However, it is more than just the library's purse which is involved, as search strategy itself can be affected as well by such matters. Pricing policies which include charges for online prints could lessen the interactive nature of online searching by forcing searchers to rely more heavily on offline printing instead of viewing sample records online. Many searchers go online to get ideas for additional search terms by means of a few full-format prints, (34, p.1301), and this practice could certainly be affected.

According to Tenopir (34, p.1301), some of the more complex methods of charging for online searches can have positive effects on search strategy. She cites NLM's pricing policy of charging for the number of disk accesses and the number of characters retrieved as an example, explaining that, although the scheme also discourages online printing, it encourages thinking online and, in particular, the use of proximity operators - in other words, more efficient and effective use of the system. It also has the effect of forcing searchers to search in the most cost-effective manner, something to which South African searchers are no strangers!

Monthly subscription charges can also have far-reaching effects on online searching in libraries, leading to greater browsing possibilities, a reduced need for searching expertise, resulting in an increase in end-user searching, and, possibly, less variation or fluctuation in monthly online costs.

It would appear that the search for more equitable means of charging users of online search services is by no means over. Relying on connect time pricing is unfair to searchers and to database producers, favouring fast

typists, high telecommunications speeds and experienced searchers, as well as illicit (for free) downloading, but its main advantage remains its simplicity. The last few years have seen a move towards alternative pricing policies, but to date none has emerged that will satisfy the needs of all three sectors of the online industry, viz., the search services, the database producers and the users.

5.7 Conclusion

Online search services have grown from a handful of experimental databases and search services in the early seventies, to numbers approaching 3 500 for the former and 425 for the latter by 1986. As has been the case since time immemorial, the laws of market supply and demand have prompted the evolution of search services of this nature, and for two fundamental reasons. Firstly they made it unnecessary for individual user organisations to buy or lease data for processing, storage and/or manipulation on their own local computers. Furthermore, they made it possible for users to gain access to data of peripheral value at a fraction of the price and on an *ad hoc* basis. Secondly, by means of establishing search services it became possible to distribute the formidable costs of collecting, organising, storing and retrieving information online amongst many users, thus sharing not only the costs but making the service itself available to a larger potential market segment.

The advent of the microcomputer has not changed the fundamental basis of the online industry, but it has had several far-reaching and very influential effects on it. Initially, online search services depended on very large computers which could operate many programs and simultaneously serve many users. The high fixed costs of hardware were thus spread amongst many thousands of users. This situation still prevails, but the emergence of high-performance, low-costs microcomputers has meant that users can log in to search services more easily, using stored passwords, etc., store search strategies for online replay, thereby saving on connect time charges, and to download desired portions of databases for later manipulation to suit their own needs.

These practices have, in turn, led to the development of software to facilitate them more easily, and have led to changes in much of the previously available search software. Other effects have been the emergence of new user groups, a trend away from the traditional librarian/information worker intermediary searching on behalf of the end-user.

The rapid proliferation of full-text databases has come about as a result of user demand, and some changes in computer technology which have made them feasible and economically viable. A different balance of print-on-paper and electronic products has become apparent.

This chapter has traced current trends in the online industry in terms of their causes and some of their possible effects, in particular, as far as search services, databases, related software and financial considerations are concerned. An attempt has been made to view these aspects of the total online picture holistically, and in the light of the close interrelationships which exist between them.

References

1. ARTHUR, Adrian. Report on the 1984 Information Technology and Electronic Publishing Exhibition. *Program*, 19(2), April 1985, p.185-188.

2. BARWISE, T.P. The cost of literature searching in 1985. *Journal of information science*, 1(4), October 1979, p.195-201.

3. CLAYTON, Audrey & Nisenhoff, N. Changes in information delivery systems over the next two decades. 1st International On-line Information Meeting, London, 13-15 December 1977. [*Proceedings*.] Oxford: Learned Information, [1977], p.17-25.

4. COLLIER, H.R. Long-term economics of on-line services and their relationship to conventional publishers seen from the data base producers' viewpoint. *Aslib proceedings*, 30(1), January 1978, p.16-24.

5. CONGER, Lucinda D. Review of the year online: 1983. *Database*, 7(2), June 1984, p.89-92.

6. DEWEY, Patrick R. A professional librarian looks at the consumer online services ... The Source, CompuServe, Apple Bulletin Board, et al. *Online*, 7(5), September 1983, p.36-41.

7. DOWNLOADING - is it really the answer? *Outlook on research libraries*, 6(9), September 1984, p.9-11.

8. FALK, Howard. The Source v. CompuServe. *Online review*, 8(3) June 1984, p.214-224.

9. HAWKINS, Donald T. & Levy, Louise R. Front-end software for online database searching. Part 1: definitions, system features and evaluation. *Online*, 9(6), November 1985, p.30-37.

10. IAC announces the creation of the "electronic journal". *Online*, 9(1), January 1985, p.9-10, 83-93.

11. JANKE, Richard V. Online after six: end user searching comes of age. *Online*, 8(6), November 1984, p.15-29.

12. KESSELMAN, Martin. Online update: BRS/After Dark. *Wilson library bulletin*, 58(9), May 1984, p.652-653, 687.

13. KESSELMAN, Martin. Online update. *Wilson library bulletin*, 58(10), June 1984, p.732-733, 767.

14. KESSELMAN, Martin. Online update. *Wilson library bulletin*, 59(2), October 1984, p.118-119.

15. KESSELMAN, Martin. Online update. *Wilson library bulletin*, 59(4), December 1984, p.272-273, 302.

16. KIPI and Cuadra surveys show strong growth for online services. *Online*, 9(2), March 1985, p.11-12, 101-110.

17. LEGGATE, Peter & Dyer, Hilary. The microcomputer in the library: III. Information retrieval from external and internal databases. *The electronic library*, 4(1), February 1986 p.38-49.

18. LEVY, Louise R. Gateway software: is it for you? *Online*, 8(6), November 1984, p.67-79.

19. LEWIS, D[illegible]is A. Today's challenge - tomorrow's choice: change or be changed *or* The Doomsday Scenario Mk 2. *Journal of information science* 2(2), September 1980, p.59-74.

20. MICROHINTS: Downloading. *The electronic library*, 4(1), February 1986, p.30-33.

21. MULLER, P.H. Part II: Online pricing in practice, *in* Muller, Peter H. and Wilson, Roy. *Pricing policies for parallel publishing*. Oxford: Elsevier, 1985, p.59-67.

22. MULLER, Peter H. & Wilson, Roy. *Pricing policies for parallel publishing*. Oxford: Elsevier, 1985.

23. NATIONAL Library of Medicine offers subsets of MEDLINE. *Online review*, 8(6), December 1984, p.517-518.

24. O'LEARY, Mick. WILSONLINE: online power for every library. *Database*, 9(2), April 1986, p.102-107.

25. PEMBERTON, Jeffery K. & Emard, Jean-Paul. DIALOG in 1984: an interview with Roger K. Summit. *Online*, 8(2), March 1984, p.13-20.

26. "PSYCH Abstracts" price boost stirs protest. *Library journal*, 103(16), September 15, 1978, p.1681-1682.

27. SCHRADER, D B. & Portoghese, C. In-Search: bringing DIALOG to the end user. *Information today*, 1(7), July/August 1984, p.17, 29.

28. SHEPHERD, Michael A. & Watters, Carolyn. PSI: a portable self-contained intermediary for access to bibliographic database systems. *Online review*, 8(5), October 1984, p.451-463.

29. SPIGAI, F. Gateway software: a path to the end-user market? *Information today*, 1(2), February 1984, p.6-7.

30. SUMMIT, Roger K. & Meadow, Charles T. Emerging trends in the online industry. *Special libraries*, 76(2), Spring, 1985, p.88-92.

31. TENOPIR, Carol. Online databases: Database access software. *Library journal*, 109(16), October 1, 1984, p.1828-1829,

32. TENOPIR, Carol. Online databases: Full-text, downloading and other issues. *Library journal*, 108(1), June 1, 1983, p.1111-1113.

33. TENOPIR, Carol. Online databases: "Other" bibliographic systems. *Library journal*, 109(18), November 1, 1984, p.2008-2009.

34. TENOPIR, Carol. Online databases: Pricing policies. *Library journal*, 109(12), July 1984, p.1300-1301.

35 TRUBKIN, L. Economics of database enhancement. *Electronic publishing review*, 1(2), June 1981, p. 103-112.

36. VAN BRAKEL, P.A. Kriteria vir die evaluering van toegangsprogrammatuuur vir gekoppelde inligtingsoektogte. *South African journal of librarianship and information science*, June 1986, 54(2), p.69-7[illegible]

37. WILLIAMS, Martha E. Highlights of the online database field - statistics, downloading and microprocessors. National Online Meeting, New York, April 12-14, 1983. *Proceedings*. Medford, N.J.:Learned Information, 1983, p.1-3.

38. WILLIAMS, Martha E. Highlights of the online database field - statistics, pricing and new delivery mechanisms. National Online

Meeting, New York, April 10-12, 1984. *Proceedings* Medford, N.J.:Learned Information, 1984, p.1-4.

39. WILLIAMS, Martha E. Electronic databases. *Science*, 228(4698), 26 April 1985, p.445-450, 455-456.

CHAPTER 6

Development of online search services in South Africa

6.1 Introduction

This chapter presents the historical background to the emergence of online bibliographic information retrieval in South Africa. Online bibliographic information retrieval must be seen as one aspect of library automation as a whole. Consequently, an outline of the growth and development in the use of computerised systems in library/information services provides the context for a study of the topic. "Library automation", for the purposes of this dissertation, is understood to mean the application of computer technology to library/information processes and/ or services.

A description of those factors and circumstances which have directly or indirectly encouraged the emergence and growth of the use of remote databases as part of library/information work in South Africa is given. In the same way, their counterparts, those circumstances which, to a greater or lesser extent, have mitigated against the use of remote databases from South Africa, are also examined.

In order to gather material for this chapter, particularly for section 6.2 and its sub-sections, a study of the official journal of the library/information profession in South Africa was undertaken to determine the course of developments relevant to the study of online information retrieval in the country. Futher material was gathered by means of a questionnaire, the findings of which will be reported on and analysed in some detail in the next chapter.

6.2 Library automation in South Africa - historical background

Online bibliographic information retrieval from remote (overseas) databases in South Africa cannot be viewed in isolation, but must be seen as part of the gradual acceptance and utilisation by the library/information profession in this country of computers and their

allied information technologies. As such, an outline of the growth and development of library automation *per se* in South Africa is deemed to be appropriate.

6.2.1 The sixties

Not unexpectedly, the early South African library literature on the use of computers in library/information services is characterised by a rather loose usage of terminology - the terms "mechanisation" and "automation" are frequently used interchangeably, and to mean the same thing, viz the use of computers in library/information services. For the sake of clarity, the term "automation" will consistently be used in this dissertation to generically indicate the use of computer technology in library/information services.

The first mention of computerised information retrieval systems to appear in **South African libraries**, the official journal of the South African Library Association, as it was known then, was in the form of a reprint of a paper delivered by D.G. Kingwill, erstwhile Director of the (then) Department of Information and Research Services (IRS) of the CSIR, at a symposium on "Information for industry" held in September 1963 at the University of Natal. He mentioned, *inter alia* that

> "...although the use of computers for information processing is in its infancy, recent reports indicate that in the USA there already are some 700 organizations making use of mechanized storage and retrieval systems, using either punch-card or computer techniques." (16, p.128)

Not long after, in July 1964, an article by Peter Carel, entitled "Die rekenaar in die biblioteek" appeared in **South African libraries**. In it, Carel expresses no doubt as to the possibility of the automation of library functions, but states that the high costs should preclude libraries from automating individually; also that it was neither essential nor desirable that more than one computer be used in a country-wide system, thereby introducing the idea of networks at the outset. Carel went on to describe the outcome of a research project

commissioned by the US Council of Library Resources in 1961 to investigate the possible use of computers in the Library of Congress in order to improve its efficiency. The report contained a description of what could only be described as an online catalogue, stored in a computer having storage capacity far greater than any yet built, being "consulted" (he used the term "geraadpleeg") by many terminals simultaneously. The press of yet another button would then activate a machine which would fetch the book requested and deposit it at a specified point - in other words, an early robot. (13)

The inhibiting problem of (relatively) limited storage capacities in computers was mentioned more directly by Kingwill in an article which appeared in January 1965, in which he nevertheless predicted that this would be overcome, anticipating RAM (random access memory) of 10 billion bits by 1980, and even 10 trillion bits by the year 2000. (14) Even far-sighted thinkers of his calibre would have found computer configurations like those currently used by the DIALOG system, capable of handling 20 MIPS (million instructions per second), and having access to information stored on 300 disk drives providing more than 200 gigabytes (200 billion characters) of storage, mind-boggling! In the same article, Kingwill describes what could possibly be called a precursor system for library automation in South Africa - the transference of approximately 2000 periodical records in the CSIR library from a Kardex system to punched cards in a form suitable for translation to magnetic tape. (14, p.114,117) This would eventually take place when the CSIR took delivery of its new IBM 360/40 computer, with its third generation technology, which allowed random access disks and CRT (cathode ray tube) terminal enquiry, in early 1967. Software for the system was developed by a staff member at the CSIR. The system provided for administrative reports concerning periodicals records, and could indicate the non-arrival of journals each month, automatically printing a claim letter to be sent to the agent or publisher. (15, p.140-141)

Already in 1965, however, the ISCOR Information Service had used a computer to compile a KWIC (Keyword-in-Context) index to the British Iron and Steel Research Association's research reports. This was subsequently replaced with a coordinate indexing system (Termatrex), while the

thesaurus used to index the reports was updated, cross-referenced and printed by computer. (19, p.112)

The creation of the Rand Afrikaans University provided an ideal opportunity for a library/information service which could be automated from its inception, without the traumas of retrospective conversion, system duplication during implementation, and all the attendant myriad of problems which seem to beset even the best-planned conversion of existing manual routines to automated ones. In January 1969, a Senior Librarian at RAU, M.C. Boshoff, was able to describe the computer generation of a printed book catalogue and self-adhesive labels for spine-marking, using punched paper tape input, and an edge-punched card circulation system, soon to be replaced with a paper-tape input system based on book and borrower identification numbers. (3; 19, p.115) The two systems were integrated, and were probably the first such systems to be used in a South African library/information service.

A similar loan system, in which loans were recorded on punched paper tape by means of machine-readable book cards to correspond with borrower numbers, was instituted in the University of South Africa's library in 1968. (48)

Also in 1968, the State Library started having the South African National Bibliography (SANB) printed and indexed by computer in West Germany, under the terms of an agreement with the Zentralstelle fur Machinelle Dokumentation. (1) At the time, the technology available in South Africa was still unable to carry out the type-setting necessary satisfactorily.

6.2.2 The seventies

By 1971, an estimated 24 computerisation projects were either being planned or had been initiated in 12 library/information services in South Africa. The editor of **South African libraries** emphasised the need for coordination of such projects, and for cooperation between libraries in respect of computerisation in a July 1971 editorial. (13, p.9)

After the innovative use of computer technology in the Rand Afrikaans University library,. the East London Municipal Library was the next relatively large library system in South Africa to introduce automation on a noteworthy scale. Their integrated system was developed by a computer bureau in East London. At that time, it included the production of a book catalogue and a circulation system, which not only recorded loans to users from the main library, but could also keep records of library material circulating to, from, and between branch libraries. (43)

Apart from a brief mention in an article which appeared in July 1970 (49), in which a prototype information retrieval network linking nine medical libraries in New York State was described, possibly the first mention in the South African library literature of using computers specifically for information, as opposed to document, retrieval, was made in 1971, when Lodder (18) noted the intention of the CSIR to establish SASDI, the South African Dissemination of Information service. She then went on to anticipate the development of retrospective search systems using the same Boolean logic retrieval techniques.

In the same year, the CSIR library began the computerised production of PISAL. Internally developed software was used, resulting in microfiche and various printed outputs. (11, p.197)

For a time, it seemed that the card catalogue would be replaced by the computer-generated printed book catalogue, but the COM (microfiche) catalogue, although not without its detractors, both among librarians and users, was gaining in popularity. Not many library/information workers at this period envisaged that their most traditionally intellectual sphere of activity, reference work, would be strongly influenced by the capabilities of the computer to store and retrieve not only document surrogates, but also information *per se*. Cornelissen, in an article which appeared in July 1971 in South African libraries outlines many possible uses for the computer in a provincial library service, for example, keeping loan records of materials issued to the different libraries, automatic processing and payment of orders, production of lists for stocktaking, printed book catalogues, reading lists, etc. In those affluent days automatic reordering of books in heavy demand was also

envisaged. However, he contrasted these applications with the need for computerised information retrieval in academic and research libraries. (6, p.12-17) It is clear that there was an awareness of the potential use of the computer for information retrieval, although this could not have been very widespread.

The early seventies saw a great deal of attention being paid to the theory and principles underlying post-coordinate indexing, on which computerised information retrieval is based. The number of manual and mechanised systems using these techniques in library/information services was on the increase, and this was reflected on the cover of **South African libraries** of July 1972. It showed an 80-column punched card, an edge-notched card and an optical coincidence card. (33)

The first detailed description of how an online bibliographic information retrieval system would work to appear in the South African library literature is to be found in January 1973, when, in an article describing two possible automated information retrieval systems for the South African legal profession, a system based on that of the NASA Information System (DIALOG's precursor - cf. 2.4.5.1), LITE (Legal Information Thru' Electronics, a US Air Force system), and the MEAD DATA CENTRAL SYSTEM of the Ohio State Bar and Mead Data Central, Inc. was described. The author concluded that the costs involved in such a system would be prohibitive for South Africa, and recommended a system based on punched cards in its stead. (44)

The first computerized SDI service in South Africa came into operation at the end of 1972. It was run by the (then) Atomic Energy Board (now known as the Nuclear Research Corporation), mainly for the convenience of its own staff, but also, on request for outsiders, and formed part of INIS, the International Nuclear Science Information System. (17, p.56)

By 1973, all the technical processes in the Rand Afrikaans University library, with the exception of periodicals handling and control, had been computerised. (2, p.274)

The CSIR's SASDI service was fairly well established by 1974 (4; 38), and many library/information services were also displaying great interest in the potential of the MARC project. An editorial in South African libraries of October 1974 pleaded for cooperation amongst libraries and a willingness to submit to a degree of standardisation (the proposed SAMARC format) as far as cataloguing practice was concerned, in order to bring this about. (46)

As far as the state of library automation in the country at this time (1975-1976) was concerned, attention was chiefly being focussed on using computers for catalogue production. The concept of using the database for SDI and retrospective information retrieval was becoming more familiar, but the most pressing needs of South African libraries still lay in the direction of that most expensive of all library housekeeping routines, cataloguing. The first online searches of overseas databases took place during this period, with the first documented one being a MEDLARS search which was undertaken by the Institute for Medical Literature (IML), an institute of the South African Medical Research Council (MRC) in March 1976. The way in which access was gained was described in some technical detail in the article, published in January 1977. (29)

In July 1977, after the experimental S/RIS1, the CSIR's SARIS service came into operation. It was to have a considerable influence on the growth of online bibliographic information retrieval in South Africa, as will be shown.(cf. 6.3 1.2, 6.3.1.4)

A survey conducted during the same year revealed that 9 library/information services were already using computerised systems, while 44 were strongly interested in doing so. (24, p.vi)

At a conference on "Trends in information handing and library computerisation" held in Pretoria in April 1978, there was much discussion of networking, with a plea by John Willemse, University Librarian of the University of South Africa, for "an effective integrated library network". (47, p.125) Networking, and its corollary, cooperative and centralised cataloguing, continued to hold centre stage of the South

African library automation scene. Many libraries indicated that they would use such a service if it were to become available. Also, although very few libraries apart from IML and CSTI were doing it, the idea of computerised information retrieval services was becoming more commonplace, so that in a paper on library automation in South Africa delivered at a seminar in October 1979, de Bruin drew a clear distinction between what he termed "computerised library management systems" (technical processes such as ordering, receiving, cataloguing and circulation), and "computerised information retrieval", further described as micro-analytical information retrieval not usually based on items in a specific collection. (7, p.125) In 1981, the same distinction was being drawn. (20)

The end of the seventies saw automation projects growing apace, chiefly in university libraries and the CSTI library. By this time, though, the lack of software created specifically for library purposes was beginning to make itself felt; as a result, many library/information services in the country began to develop their own systems. On the public library front, the Transvaal Provincial Library and Museum Service produced a microfiche catalogue and various bibliographies by computer (11, p.196), and the Verwoerdburg Public Library developed a circulation system using the municipal mainframe computer with the cooperation of the town's data processing department. The system became operational in 1978. (11, p.197) Similarly, both Germiston Public Library (1976) and Krugersdorp Public Library (1979) began producing printed book catalogues, using batch processing methods and self-developed software on their municipal mainframe computers. (21, p.199) The Natal Provincial Library and Museum Service installed a self-developed cataloguing system in 1977. (45, p.194)

The same trend was discernible amongst university libraries, with RAU setting the precedent, mainly because of its unique circumstances. Wits closed its card catalogue at the end of 1974 and began producing, with limited retrospective conversion, a microfiche catalogue, using a self-developed - by the university's data processing department - batch process. (21, p.199) Similarly, the UWC also implemented its own,

self-developed, automated catalogue production system in 1976. (45, p.194)

Other self-developed systems on a smaller scale were to be found in the CSTI library, the ISCOR library, the Ferdinand Postma library at Potchefstroom University and at the UCT library. (11, p.198;8, p.192;45, p.195)

The State Library began using the DOBIS package for the production of the Retrospective SANB and for its Tswana bibliography. The SA UNICAT and SANB were produced by means of self-developed batch processing systems. (11, p.198)

Online information retrieval systems also began growing in number during the late seventies. At least two medical libraries (WML and the Frik Scott Medical Library at the UOFS) were conducting searches without the intervention of the IML for their users by then, and two university libraries other than medical branch libraries had also started online search services. They were Wits and Unisa.

The SAOUG was founded in 1979, with the specific purpose of promoting and improving computerised information retrieval in South Africa. (cf. 6.3.1.6)

6.2.3 The eighties

As far as library automation is concerned, the eighties have thusfar been characterised by an increase in the number of commercial software packages specifically developed for library/information services which have become readily available. and the rapid development of microcomputer technology, which allows small libraries to computerise services and processes more easily and cheaply.

By December 1984, Musiker was able to report extensive computerisation in some thirty library/information services in the country, as well as a predictable trend towards the use of commercially available software. These are currently in use in public and provincial, special and national,

and university libraries. The most popular are the DOBIS/LIBIS system, marketed by IBM, and the URICA system, marketed by UNICOM, both of which are fully integrated online systems. (22, p.69) However, several special libraries, notably those of the Anglo American Corporation, ESCOM and De Beers Diamond Research Laboratory were, by this time, using smaller, for the most part self-developed, systems, for specific, often unrelated, functions. (22, p.69) (Anglo American has subsequently purchased the URICA package.)

A corresponding growth in online information retrieval systems had also taken place in the early eighties Duffy (10) reported 14 organisations accessing overseas databases in January 1980, up from only 3 in early 1977 (CSTI, IML and the Anglo American Corporation library). 1979, particularly, was an important year in terms of the growth of online searching from South Africa, with an 118% increase in the number of searches done. At this stage, DIALOG was already the mos used database vendor (13 users, with SDC's ORBIT service next in line with 9, followed by Blaise and NLM - MEDLINE - with 3 users in the third position.) (10, p.64-65)

The introduction of SAPONET-P in February 1982 did much to accelerate the growth of library automation in South Africa, particularly those aspects concerned with computerised information retrieval from remote databases with the purpose of acquiring and exchanging cataloguing records, and online searching of overseas databases, or even remote databases within the country itself. SABINET provided its first service to users in December 1983, and by the end of 1984, 46 organisations had made the 10-year commitment to the system. (32, p.1) The announcement of its Associate Member Class in November 1985 meant that many smaller libraries which had been unable to commit themselves to the 10-year period initially required by the network, could now join it for a renewable twelve-month contract period, thereby placing computerised cataloguing and many other potential facilities well within the reach of smaller, less financially-able library/information services. (25, p. 1-2)

The new, much less expensive telecommunications network quite predictably had an effect on online searching of overseas databases, with a survey

undertaken in 1983 revealing an increase in usage of "at least 28%" in the 12 month period July 1982 - June 1983 over that of July 1980 - June 1981. (28, p.62) User organisations had grown in number to 20 by this time, with little change as to the most popular databases searched, but an increase in the number of database vendors accessed. (28, p.63)

Library automation in South Africa finally came of age with the theme of the annual SAILIS conference held in Durban in September 1982 - "Implications of new technology for librarianship and information science". One of the keynote speakers, Stella Keenan, from Loughborough University of Technology in the UK, read a paper on online information retrieval, in which she included the use of videotex systems, something quite new to South Africa at that time. (12) The previous year's SAILIS conference had seen a paper read by Steve Rossouw (31) on the possibility of local database vending, which created some considerable interest.

The use of microcomputers in library/information services, particularly the smaller ones, for accessing and downloading SABINET records via SAPONET-P and for running commercial library software packages on,is currently on the increase. It is to be expected that their use of overseas search services could increase if the costs can be justified and all other factors remain equal. (The current volatile political conditions in the country do not encourage predictions on any logical basis.)

6.3 Online information retrieval in South Africa - historical background

6.3.1 Factors encouraging online searching in South Africa

Before 1976, it was not technically possible to search overseas databases online from South Africa. As has been mentioned, the first online search of a remote database from this country took place in March 1986, when the MEDLINE ervice was accessed via the TYMNET node in Paris by searchers at the IML (now known as the IBC - the Institute for Biomedical Communication), an institute of the South African Medical Research Council. In November 1976, the System Development Corporation's ORBIT search service and Lockheed's DIALOG search service were accessed for the

first time by the Information Service of the Anglo American Corporation (30), although experimental links had also been achieved by some of the staff of the information service of the CSIR by this time. (40)

6.3.1.1 IML MEDLINE searches

The history of the growth in usage of remote online search services in South Africa can be traced within the context of several important events and circumstances, of which the search service instituted by the (then) IML for its users was one. Much of the provision of information for the biomedical community in South Africa is carried out by the IBC. As has been mentioned, the IBC functions as the South African MEDLINE centre. However, within eighteen months of the first online searches of MEDLINE taking place, the Medical Library of the University of the Witwatersrand had concluded an agreement with the Institute to conduct its own MEDLINE searches, with the first such search taking place in October 1977. Up to this time, such searches had been carried out by the IML for the library. Similarly, the Medical Library of the University of Pretoria also used the online search service of the IML for its MEDLINE searches, but two and a half years after the inception of these at the IML, they too began doing their own searches under a similar agreement to that concluded by the Wits Medical Library in January 1982. (27, p. 445-446) The same path was followed by the Frik Scott (Medical) Library of the UOFS, which started online searching independently of the IML as early as November 1977. (41)

6.3.1.2 CSTI services

A second important influencing factor on which the beginnings of online bibliographic information retrieval in South Africa were founded is that of the information services provided by the CSTI. By the end of November 1976, it had had introduced the first South African Retrospective Information System, unofficially known as SARIS1. This service searched purchased portions (on magnetic tape) of the machine-readable versions of **Chemical abstracts**, **Engineering index**, and **Science abstracts** on the local CSIR IBM mainframe using STAIRS software. The high costs of the service, which included an initial outlay for disk packs, in addition to

monthly rental costs for disk drive units, computer core storage, as well as operating software, led to the discontinuation of the service in December 1979. (41, p.25-26)

However, the demand for such retrospective services grew rapidly, and by July 1977 (41, p.27), what was to be SARIS1's successor, SARIS2, simply known as SARIS - the South African Retrospective Information System - came into operation, this time accessing first the DIALOG search service directly, and soon after, SDC's ORBIT search service as well. (41)

6.3.1.3 CSTI training courses

It was initially anticipated that end-users would conduct their own searches on SARIS1, and, with this in mind, all CSIR institutes were encouraged to have staff trained in the use of the system. Despite the fact that sixty users underwent training, it soon became apparent that very few actually made use of the system themselves (41, p.26), and it is assumed that, generally, the services of the CSTI staff were requested when searches were required. Consequently, the need for CSTI staff training increased, and 1977 saw the introduction of in-house online training at the CSTI.

However, outside professional interest in the techniques and technology of searching remote databases was so great by this time that by the end of 1977, the first DIALOG Online Training Course open to non-CSIR staff had been held at the CSTI in Pretoria. The course was repeated in 1978, and, in the same year, an ORBIT course was also held. These were followed by two such courses every year, held in Pretoria at the CSIR for the next four years up to 19[illegible]. (26, p.349) Demand was sufficient for the courses to be offered in other centres as well, and, up to the end of 1984, when online training courses given by the CSTI were discontinued, they were also held in centres such as Durban and Cape Town. Many South African librarians and information workers were thus introduced to the possibilities and advantages of online searching.

6.3.1.4 The CSTI precedent

Also to the credit of the excellence of the SARIS services is the fact that several library/information services have introduced their own online search services as a result of the good results achieved for their users by the SARIS service. Two university libraries, namely those of the University of Natal (Durban) and the University of South Africa were influenced in this way to start their own services.

Up to the beginning of 1982, the University of Natal in Durban used the SARIS service, and the results were so satisfactory that it was decided to implement an online search service in the University's Science Library. The same situation led to the introduction of online searching at the University of South Africa in October 1979, after a number of successful SARIS searches had been commissioned. (27, p.446-447)

6.3.1.5 Influence of the INCH newspaper clippings service

Another major impetus toward the introduction of online search services in library /information services in South Africa can be identified, particularly in the case of university libraries, some of which were among the first institutions to introduce online search services. Several of the Afrikaans universities were subscribers to and users of a South African online information service produced by the Institute for Contemporary History (INCH) of the UOFS. The database consists of a newspaper clippings from all South African newspapers, selected local periodicals, **Time** and **Newsweek**. Users subscribe to the service at a fixed annual fee, which entitles them to unlimited online access to the database within its hours of operation, a leased terminal, and a weekly set of microfiche copies of the actual clippings. (Telecommunications costs are additional and are borne by users.) Searching overseas databases could be seen to have been a logical extension of such activities; indeed, the terminals leased from INCH were put to good use for this purpose in several instances once the necessary passwords had been obtained.

6.3.1.6 The role of the SAOUG

Another important stimulus to the growth of online searching in South Africa was the founding of the SAOUG on the 6th April 1979 by the representatives of a group of organizations. Some of these were already offering their users computerised information retrieval services, others intended instituting them in the foreseeable future.

The Group was initially founded to act as a lobbying body for the reduction of the high local telecommunications costs involved in searching overseas databases, and to "promote and improve computerised information retrieval in South Africa." (34) The stated purposes of the Group were

- to represent the interests of South African users in dealings with the local postal authorities regarding data transmission
- to represent the interests of South African users in dealings with terminal suppliers
- to function as a forum for the exchange of experience concerning online database access
- to develop and share training facilities for users performing online database searches. (34)

The Group's aims and functions today are, briefly,

- to provide a forum for users of online and other computerised information retrieval systems to exchange experience and views
- to promote, coordinate and standardise training in the field of online and other computerised information retrieval systems
- to represent members in dealings with bodies such as database vendors, database producers, the South African Post Office, hardware and

software suppliers, and national or international commercial, professional or official bodies

- to compile and maintain registers related to online and other computerised information retrieval systems

- to monitor new developments in information technology which have a bearing on online and other computerised information retrieval systems (36)

The Group got off to a relatively slow start, with only one meeting each held in the years 1979 and 1980, but 1981 saw four meetings taking place, two of which were addressed by representatives of database producers, viz. Geoarchive and CAB (the Commonwealth Agricultural Bureaux database). An average of five meetings per year have been held ever since, with speakers on topics ranging from basic data communication to descriptions of specific local computerised information retrieval services, Reuters, front end software, SABINET and videotex. Attendance at meetings is generally high, ranging in numbers between approximately forty and more than seventy. Training activities undertaken by the Group have necessitated liaison with various other organisations such as the CSTI and the Department of Librarianship and Information Science of the University of the Witwatersrand in order to facilitate courses presented by database producers and database vendors, and other activities such as symposia and workshops. To date (June 1986), three database producers have presented training courses in this country, viz.

- CAB

- BIOSIS, and

- Excerpta Medica.

The first three courses were arranged in conjunction with the CSTI, while the last was an SAOUG project in which use was made of facilities at the University of the Witwatersrand and the Institute for Medical Literature.

Only one database vendor has presented tra' ng courses in South Africa to date, namely, DIALOG Information Services, Inc. After almost a year of negotiations, which were plagued as was every other activity in the country by increasingly unfavorable exchange rates and severe internal political disturbances, two representatives of the company came to South Africa in April 1986 to present a series of three different courses pitched at varying levels of expertise, as well a specialist course on accessing the wide range of business information available on the system. These took place over a period of three weeks in Johannesburg and Cape Town, and were attended by 94 people. (39)

Other efforts, this time more in the direction of education in online information retrieval systems, have been a one and a half day symposium on university education in computerised bibliographic information retrieval held in 1983, and a one day workshop, "Introduction to online", which was held in conjunction with SLIS, an interest group affiliated to the Southern Transvaal Branch of SAILIS, in July 1984.

Predictably, membership has increased considerably over the years as the introduction of computerised information retrieval systems in South Africa has grown. A branch of the Group was established in Cape Town as the Western Cape Branch on 25 October 1 4. Eight meetings have been held to date. (37) Membership has consequently grown from 16 in 1979, to 226 in June 1986, a figure which includes the 47 members of the Western Cape Branch. The Group itself has recently been granted affiliate status by SAILIS.

The Group irregularly publishes a newsletter, **Online user news/Koppelnuus**, of which number 16 appeared in June 1986. (Two double numbers have been published.) **Online user news/Koppelnuus** has grown from a folded sheet to a fully fledged newsletter with a series of regular columns. The Western Cape Branch also publishes a newsletter, but it remains local, and members of the Branch still receive the **Online User News**, which could now be said to have been elevated to national status! Another series, the **Online user guide** was begun, one issue having appeared to date, in April 1982. Called "How to motivate the introduction of an online syste ", by V.I.Plummer, a member of the Group,

it was intended f[illegible] members in approaching management with proposals for online search services which would be clear, accurate and convincing.

A committee of five elected members who serve for a two-year period runs the affairs of the group, and produces the newletter.

There can be no doubt that the South African Online User Group has played an important role in the promotion of online bibliographic information retrieval in South Africa. It maintains links with several such groups overseas, namely in Australia, Norway, Scotland, Sweden, the United Kingdom and West Germany, and, in so doing, helps to reduce some of the isolation experienced by online searchers in this country. The Group also has observer status in the EUSIDIC Working Group on European online user groups. (35) The regular meetings held on topics of great importance and relevance in the field of computerised information retrieval attract good audiences and provide a forum for meeting with other interested persons and for discussion and information.

6.3.2 Factors discouraging online searching in South Africa

It would present a very one-sided picture to omit from this section a discussion of the factors mitigating against or impeding the growth of online information retrieval services in South Africa.

6.3.2.1 High telecommunications costs

The most serious obstacle in the way of unbridled growth of these services in South Africa has been cost. Five years ago, it was very difficult for a library/information service to automate its services to any degree without the use of a mainframe computer, there was very little tried and tested software available for library/information service applications, and, generally, automation in organisations was concentrated on financial applications and aspects such as stock control. Very few managers were knowledgeable about computers, and certainly very few of them would have thought about computerisation in connection with the library/information service. The costs of introducing an online information retrieval service, using overseas databases, would have appeared to have been almost

ridiculously out of proportion to what the library/information service's usual budget demands were. The cost of a terminal might have been considered, but the high costs of performing such searches - also, the new concept of actually having to pay the visible costs generated by online searches - all conspired against the enthusiatic librarian/information worker wishing to offer end-users the best information services available by means of developing technologies.

The high costs involved in online searching in its first years in South Africa were mainly attributable to telecommunications costs. At the time, i.e., up to the end of 1981, the only means of accessing a remote database, be it in South Africa or elsewhere in the world, was by means of the public switched telephone network. There were no special rates for using the network for digital transmission, so users were obliged to pay normal usage charges, based on service units. The unfortunate result was that, frequently, the telecommunications charges for a search were greatly out of proportion to the actual costs of doing the search. Often, these would comprise up to two-thirds of the total visible costs of the search. ('Visible' costs exclude the preparation and execution of the search by an intermediary.) These high costs naturally represented a considerable stumbling block in the way of growth of online search services in this country.

However, in February 1982, the South African Department of Posts and Telecommunications' Telectronics Institute finally introduced the long-awaited packet switched telecommunications network, SAPONET-P, which meant that local searching of remote databases no longer had to take place by means of the public dial-up telephone network. (9)

Use of the expensive public telephone network for the international connections necessary for accessing overseas databases was an important inhibiting factor in the early growth and development of online search services in this country, as has been mentioned previously. Commenting on a survey of online usage in South Africa in 1980-1981, Rossouw stated:

> "It becomes clear then that the telephone, although it enables us to make use of the overseas vendors, is, because of its associated

charges, really the prime inhibitor of large scale use of overseas online databases." (31, p.183)

In 1981, for instance, the costs of using the telephone for these purposes was R3 per minute (R180 per hour). If the average search (if, indeed, there is such a thing!) lasts between ten and twenty minutes, thus an average of fifteen minutes, the cost then for telecommunications alone would have amounted to a staggering R45. At today's rates of R4,20 per minute (the tariff as from 1 April 1986), such a search would have incurred telecommunications costs of R63. Fortunately, consideration of a cost factor as high as this has been eliminated by the introduction of SAPONET-P. Additional bonuses have been a marked increase in data integrity as well as a considerable decrease in connection failures.

International data transmission costs were significantly reduced by the introduction of SAPONET-P, and the expectation that existing users would increase their usage of search services, as well as that other organisations/institutions would decide to introduce their own services instead of using those provided by the CSTI or other organisations, are being realised, albeit slowly. The number of organisations/institutions doing online searches has increased from only 2 in 1977, to approximately 45 in 1986. The number of people with search skills, or at least some knowledge of the process is also on the increase, mainly due to the CSTI courses, and those offered by the SAOUG.

The actual reduction in telecommunications costs is not easy to pinpoint accurately, as public telephone network charges are simply based on the number of connect time units, which are minutes in the case of international calls, whereas the packet-switched data network charges are more complicated, being calculated on usage time at R0,20 per minute, plus a packet count charge, which is based on segments of data transmitted(the so-called "packets"), at approximately R0,90 per equivalent of an A4 page (60 lines of 79 characters each). (The SAPONET-P charges can be quoted here because they do not increase annually, as do the telephone network charges.) Nevertheless, comparison of telecommunications costs incurred by the online search service based in the Wartenweiler Library at Wits yielded some interesting figures.

As has been mentioned, SAPONET-P charges have remained constant since its inception, so a comparison of costs does not necessarily have to be made between consecutive months, as a chronological gap will not make it invalid. The average monthly telecommunications bill for the service, using the public telephone network, for the four months immediately preceding the first usage of SAPONET-P, namely June, July, August and September 1984, was R1495. Accurate figures for the months of December 1985 and January and February 1986 indicated an average monthly telecommunications cost of R364 per month. (23) The same time spent online at the dial-up rate of R4,10 per minute, as it was then, would have cost an average of R1670 per month - a difference of 79%. It would be inaccurate and a gross exaggeration to claim that a decrease in costs as dramatic as this one appears to be was experienced by all online search services in South Africa with the introduction of the packet-switched network, but a reduction of an average of 50% in these costs would not be unrealistic.

Two further bonuses for users of SAPONET-P are, as has already been mentioned, greatly increased data integrity, and, in addition, the ability to transmit and receive data at faster speeds. Initially, using dial-up telephone access, it was only possible to send and receive data at speeds of 300 bits per second, but the advent of the packet-switched network made it possible to increase this speed to 1200 bits per second. It is now rare to find searchers who still search at the old speed of 300 baud - if this ever happens, it is more often due to the limitations of the equipment being used.

Further improvements in telecommunications, using optical fibre cables and microwave transmission, are envisaged with the introduction of DIGINET, a digital network, in which data communication will take place in digital form only, as opposed to the present analogue/digital system, which requires the intervention of (a) modem(s) for the conversion of signals before transmission. (9) At the time of writing (June 1986), the network is operating experimentally, with an optical fibre link between Pretoria and Johannesburg, and a digital microwave link between Durban and Pietermaritzburg currently in operation. It is hoped to link Cape Town and Johannesburg via Bloemfontein by October 1986, with further

As has been mentioned, SAPONET-P charges have remained constant since its inception, so a comparison of costs does not necessarily have to be made between consecutive months, as a chronological gap will not make it invalid. The average monthly telecommunications bill for the service, using the public telephone network, for the four months immediately preceding the first usage of SAPONET-P, namely June, July, August and September 1984, was R1495. Accurate figures for the months of December 1985 and January and February 1986 indicated an average monthly telecommunications cost of R364 per month. (23) The same time spent online at the dial-up rate of R4,10 per minute, as it was then, would have cost an average of R1570 per month - a difference of 79%. It would be inaccurate and a gross exaggeration to claim that a decrease in costs as dramatic as this one appears to be was experienced by all online search services in South Africa with the introduction of the packet-switched network, but a reduction of an average of 50% in these costs would not be unrealistic.

Two further bonuses for users of SAPONET-P are, as has already been mentioned, greatly increased data integrity, and, in addition, the ability to transmit and receive data at faster speeds. Initially, using dial-up telephone access, it was only possible to send and receive data at speeds of 300 bits per second, but the advent of the packet-switched network made it possible to increase this speed to 1200 bits per second. It is now rare to find searchers who still search at the old speed of 300 baud - if this ever happens, it is more often due to the limitations of the equipment being used.

Further improvements in telecommunications, using optical fibre cables and microwave transmission, are envisaged with the introduction of DIGINET, a digital network, in which data communication will take place in digital form only, as opposed to the present analogue/digital system, which requires the intervention of (a) modem(s) for the conversion of signals before transmission. (9) At the time of writing (June 1986), the network is operating experimentally, with an optical fibre link between Pretoria and Johannesburg, and a digital microwave link between Durban and Pietermaritzburg currently in operation. It is hoped to link Cape Town and Johannesburg via Bloemfontein by October 1986, with further

links to and between Bethlehem, Welkom and Klerksdorp. DIGINET must be linked to SAPONET, and offers the possibility of a permanent link to a SAPONET pad (packet assembler/disassembler), replacing leased line dedicated circuits to X.28 and X.25 pads, as well as X.28 dial-up access to the network. In addition, depending on the SAPONET link, it will be possible to transmit data at speeds of up to 6400 baud. (39)

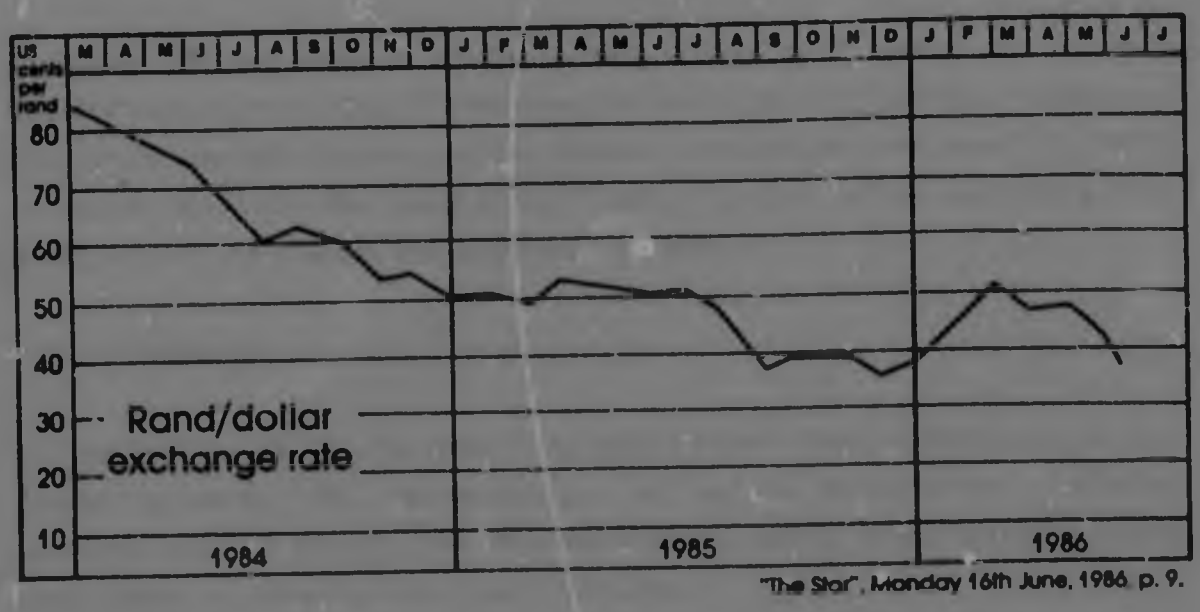
What the implications of the introduction of DIGINET will be for online searching in this country is still uncertain. Costs will almost certainly be based on similar criteria to those of SAPONET, but as yet, further clarification is yet to be forthcoming from the Department of Posts and Telecommunications.

6.3.2.2 Problems of database coverage

A second inhibiting factor was the fact that, in the early days of database vending, the systems were mostly based in the United States, which naturally led to a bias in the material available online. Unless South African authors of scientific and technical material, as well as those writing in the field of the humanities, had had their work published in international journals, or in journals which were abstracted by United States abstracting services, there was very little specifically South African material available online for searching. Another problem was that the databases available were still quite limited in their coverage, most going back only a few years.

6.3.2.3 Political factors

The political situation in South Africa has had its affect on the online information retrieval field as well. Since March 1984, when the US dollar-rand exchange rate was slightly in excess of R0,80 to the dollar, the exchange rate has plummeted with every new political crisis - and there have been many of them. Presently (June 1986) the exchange rate is hovering around the R0,42 mark.



"The Star", Monday 16th June, 1986 p. 9.

Figure 13.

Rand-dollar exchange rate - March 1984-June 1986

These developments have virtually doubled the cost of search service usage (connect time) and the database royalty charges levied for information received, which are calculated and paid for in the currency of the country in which the service is situated. It appears that beleaguered online searchers can never search and not count the cost! At present, it seems unlikely that there will be any change as far as this problem is concerned, unless the present government is overthrown and a black government comes to power.

Online searching in this country has also not escaped the increasing tendency of the rest of the Western world to isolate it both economically and culturally. A planned visit to South Africa by representatives of Pergamon InfoLine, which was to take place in February 1986, and during which several training courses were to be offered, was cancelled due to the continuous rioting and other political disruption. It was felt by Pergamon that the safety of their representatives could not be guaranteed, which, judging by the unfavourable press coverage of events in the country in the UK, was perfectly understandable, but very disappointing to the SAOUG, who were organising the visit.

All these factors (and others mentioned in Chapter 2) tended to mitigate against online searching of remote databases from South Africa. However, the growth and development of the search services was so promising that it seemed possible that many of the factors against online searching from South Africa were bound to disappear in time.

6.3.3 Summary

In conclusion, it can be said that many factors have contributed to the growth in usage and implementation of online information retrieval services in South Africa, and that those which initially mitigated against them, have, to some extent, been overcome.

Positive factors can be summarised as

- the introduction of MEDLINE searching by the IML
- the SARIS services offered by the CSTI, and their high quality
- the training courses offered by the CSTI
- familiarity with the INCH newspaper clippings service
- the founding of the South African Online User Group
- increased awareness engendered by meetings, symposia, workshops, and lectures on the topic of online information retrieval retrieval
- a more concerted move on the part of South African library schools to provide training as well as education in online systems
- the increased availability of information technology both on a micro and on a macro level generally, and in the field of library/information work specifically

Negative factors influencing the growth and development of online searching in South Africa were, with some still remaining

- initial disproportionately high telecommunications costs, and, currently, high system usage costs, due to unfavourable foreign exchange rates

- a lack of South African-orientated material on the databases, or conversely, the American/British/European slant of much of the material contained in the databases

6.4 Conclusion

This chapter has sketched the context within which online bibliographic information retrieval in South Africa was introduced and began to become part of the library/information scene in the country. As will be shown in the next chapter, circumstances have not conspired to encourage its growth to any great extent. Nevertheless, it seems to be firmly entrenched in those organisations and institutions where its worth has clearly been demonstrated, with users and management perceiving its value to justify the costs incurred.

References

1. ASCHENBORN, H.J. Mechanisation of the SANB. *South African libraries*, 36(3), January 1969, p.112-120.

2. BOSHOFF, M.C. Die gerekenariseerde uitleenstelsel van die Randse Afrikaanse Universiteitsbiblioteek. *South African libraries*, 40(5), April 1973, p.274-283.

3. BOSHOFF, M.C. Die rekenaarmatige katalogus van die Randse Afrikaanse Universiteit. *South African libraries*, 36(3), January 1969, p.94-101.

4. BRUNT, A.G. Ontwikkeling van 'n SDI-diens in Suidelike Afrika. Deel I. *South African libraries*, 41(4), January 1974, p.173-178.

5. CAREL, Peter. Die rekenaar in die biblioteek. *South African libraries*, 32(1), July, 1964, p.8-10.

6. CORNELISSEN, A. Outomatisasie in 'n provinsiale biblioteekdiens. *South African libraries*, 39(1), July 1971, p.10-17.

7. DE BRUIN, H. Library computerisation in South Africa: the current scene. *South African libraries*, 47(4), April 1980, p.125-130.

8. DE BRUIN, Henk. 1 - Biblioteekrekenarisering in die Wes-Transvaal en Vrystaat. *South African journal for librarianship and information science*, 49(4), April 1982, p.191-193.

9. DE BRUIN, Henk. Technological developments in Southern Africa: an overview. Paper prepared for the Symposium on the National and International Availability of Publications, CSIR, Pretoria, 29-30 August 1984.

10. DUFFY, Neil. International on-line group go into action. *Systems/Stelsels*, 10(7), July 1980, p.63-65.

11. FOURIE, Johan. 3 - Biblioteekrekenarisering in die Noord-Transvaal. *South African journal for librarianship and information science*, 49(4), April 1982, p.196-198.

12. KEENAN, Stella. Videotex and information retrieval in British public libraries. *South African journal for librarianship and information science*, 50(4), April 1983, p.153-157.

13. [KESTING, J.G] Gesigspunt: Meganisering: dringende behoefte aan koordinasie. Editorial. *South African libraries*, 39(1), July 1971, p.9.

14. KINGWILL, D.G. Mechanization of library procedures: some possibilities. *South African libraries*, 32(3), January 1965, p.111-116.

15. KINGWILL, D.G. National functions of the S.A. Council for Scientific and Industrial Research. *South African libraries*, 34(4), April 1967, p.135-146.

16. KINGWILL, D.G. Scientific and technical information: an outline of past developments and present trends. *South African libraries*, 31(4), April 1964, p.125-128.

17. KINGWILL, D.G. & Van Houten, R. Bibliographic and information services: progress in the 1960's and 1970's. *South African libraries*, 44(2), October 1976, p.53-57.

18. LODDER, N.M. Computers and information retrieval. *South African libraries*, 39(3), December 1971, p.240-245.

19. LODDER, N.M. Preliminary survey of mechanized library and information services in South Africa. *South African libraries*, 39(2), October 1971, p.106-117.

20. LODDER, Margaret. Short state-of-the-art report on computerization in South African libraries: September 1981. *South African journal for librarianship and information science*, 49(4). April 1982, p.191.

21. MUSIKER, Reuben. 4 - Library computerization in the Southern Transvaal. *South African journal for librarianship and information science*, 49(4), April 1982, p.198-199.

22. MUSIKER, R. The new technology in South African libraries - an update to 1984. *South African journal of librarianship and information science*, 53(2), June 1985, p.68-71.

23. MYERS, Glenda. Personal communication, 12th June 1986

24. NATIONAL Library Advisory Council. MARC Working Group. Die aanvaarbaarheid van MARC vir Suid-Afrikaanse biblioteke en die ontwikkeling van 'n raamwerk vir gerekenaariseerde biblioteekdienste in Suid-Afrika; opgestel deur M.L. van As o.l.v. die S.A. MARC-Werkgroep. Pretoria: National Library Advisory Council, 1977.

25. NEW Associate Member Class. *SABINET bulletin*, 2(1). November 1985, p.[1] - [2].

26. PEARSON, Annette. Education and training for online bibliographic information retrieval in South Africa. 7th International Online Information Meeting, London, 6-8 December 1983. [*Proceedings*.] Oxford: Learned Information, [1983], p.341-352.

27. PEARSON, Annette. Online information retrieval in some African university libraries. 6th International Online Information Meeting, London. 7-9 December 1982. [*Proceedings*.] Oxford: Learned Information, [1982], p.443-453.

28. ROSSOUW, S.F. Choosing an online vendor. *South African journal of librarianship and information science*, 52(2), July 1984, p.62-69.

29. ROSSOUW, S.F. Hello from ELLHILL 3. *South African libraries*, 44(3), January 1977, p.109-112.

30. ROSSOUW, S.F. On-line training in Africa. Paper presented at the National Online Information Meeting, New York March 25-27 1980.

31. ROSSOUW, S.F. An online vendor in South Africa: possibility or pipe dream? *South African journal for librarianship and information science*, 49(4), April 1982, p.183-189.

32. SABINET: official opening. *SABINET bulletin*, 1(1), [n.d.], p. [1].

33. *SOUTH African libraries*, 40(1), July 1972.

34. SOUTH African Online User Group. *Online user news*, issue 2, April 1980, p. [1].

35. SOUTH African Online User Group. Report on activities and progress, presented at the Annual General Meeting, 2 May 1985, by the Chairman, N.Spicer.

36. SOUTH African Online User Group. *Constitution*. 6 March 1983.

37. SOUTH African Online User Group. Western Cape Branch. Annual report, 1985-1986, presented at the Annual General Meeting, May 1986, by the Chairman, Paul Meyer.

38. SPICER. N. Development of a SDI service in Southern Africa. Part 2. *South African libraries*, 41(4), January 1974, p.179-190.

39. SPICER, N. Personal communication, 12th June 1986.

40. SPICER, N. Personal communication, 1984.

41. STEYN, Daniel Pieter. Factors influencing the use of computerized scientific and technical information services in South Africa. M.A. Dissertation, University of the Witwatersrand, Johannesburg, 1984.

42. UNIVERSITY of Pretoria. Merensky Library. *Research project: The university library as an information service. Subproject 1.* Researcher: Miss E. Weyers. December 1984.

43. VAN DEVENTER, M.H. The East London Municipal Library mechanization project. *South African libraries*, 39(1), July 1971, p.18-25.

44. VENTER, M.H. Rekenaars en die Suid-Afrikaanse reg. *South African libraries*, 40(4), January 1973, p.230-235.

45. VIETZEN, Colleen. 2 - Library computerization in the Cape and Natal. *South African journal for librarianship and information science*, 49(4), April 1982, p.193-195.

46. VIEWPOINT, *South African libraries*, 42(2), October 1974, p.41.

47. WILLEMSE, J. Planning and development of a national library system in South Africa. *South African libraries*, 46(4), April 1979, p.125-129.

48. WILLEMSE, J. Die Universiteit van Suid-Afrika se gemeganiseerde uitleenstelsel. *South African libraries*, 36(3), January 1969, p.102-111.

49. WILLEMSE, J. Van samewerking tot netwerk: indrukke oor die ontwikkeling van biblioteekstelsels in die V.S.A. *South African Lib-aries*, 38(1), July 1970, p.26-31.

CHAPTER 7

Online bibliographic information retrieval in South Africa
Current situation

7.1 Introduction

7.1.1 Methodology

This chapter outlines the current situation (as of April 1986) of online bibliographic information retrieval from remote databases in South Africa. The information was gathered by means of a questionnaire (Appendix A) sent to forty-five respondents in April 1986. Of these, no response was obtained from four, with one respondent (a commercial information broker known for its fanatical obsession with secrecy in order to protect its clients' interests) returning the uncompleted questionnaire, having refused to divulge any information on its online searching activities. Another had temporarily discontinued its service due to lack of trained staff, and the remaining two could not be contacted, despite numerous attempts to do so. Three respondents revealed that they had discontinued online searching because it was not an economic proposition for their companies, and that they now use the SARIS service when an online search was needed. One respondent has only recently (April 1986) started a search service in her organisation; consequently, no meaningful data could be obtained from her responses, but the service is counted into the total of those accessing remote databases. Three respondents completed the questionnaire with regard to an envisaged service in their organisations, and the responses could therefore not be included in the survey analysis.

In the event of there being more than one search service operating within a single organisation, a questionnaire was sent to each service, except in the case of the CSTI, where data - as much as could be divulged for reasons of user and state security - was obtained for the SARIS service as a whole. The survey revealed a total of thirty-one organisations doing online searching, of which six operate more than one service, bringing the total number of actual search services *per se* in the country to forty-one. There is no doubt, though, that there must be scientists

in academic departments at universities and in research organisations who are conducting their own online searches (cf. 8.1.3), but there is no way of ascertaining their exact number, which must be relatively small.

A brief indication of how the number of organisations involved in online searching in South Africa would be relevant at this point. Duffy (3, p.79) gave twenty as an accurate figure for the number of online users in South Africa in January 1980. The figure given by Pearson, based on SAOUG figures in 1982, was eighteen (8, p.444), while a 1983 survey by Rossouw (10, p.62) indicated that twenty organisations were actively involved in online searching at that time, with another eight intending to begin doing so within the next year (1984). In a paper delivered at the 8th International Online Information Meeting in London In December 1984, the number of "users" (not clearly defined) in this country was estimated at thirty-six. (2, p.105) The survey conducted for the purposes of this dissertation has, as has been said, indicated a total of thirty-one organisations, with the number of active search services operating within their aegis totalling forty-one.

7.1.2 General remarks

At the time of the first online access of a remote bibliographic database from South Africa in 1976, the interest of the library/information profession in the country was primarily focussed on computerised cataloguing, and, amongst other possible solutions to the problem, the possibility of the use of a South African bibliographic network for centralised and cooperative cataloguing. The development of such a network was being hampered, apart from organisational and administrative considerations such as where the initial capital needed was to come from, and which existing organisation (if any) was to be responsible, by the absence of the necessary telecommunications infrastructure.

The installation of SAPONET-P was to solve this problem, and South African library/information workers could at last begin to anticipate more rapid growth and progress in the field of library automation generally. This was certainly to come about as far as the local bibliographic information network was concerned, but the uncertain political situation, with its

resulting unfavourable foreign exchange rates has certainly affected online information retrieval from overseas databases. It is to be expected that a survey of organisations regularly searching these under prevailing political and economic conditions in the country conducted a year hence (approximately June/July 1987) would reveal either a drop or no increase in the number of searches done, and little or no increase in the number of organisations doing online searches. Evidence of such a reverse trend could already be revealed by the research undertaken for this study, which showed that three organisations which had actually started online search services of their own have subsequently decided that they are too costly, and make use of the SARIS service when necessary.

When discussing the types of software used by South African online searchers, no mention will be made of what has been termed by Hawkins and Levy (4, p.39) "terminal emulation software". This type of software enables a microcomputer to operate like a "dumb" terminal, ensuring that understandable (to the machines involved, that is) messages are exchanged between it and the remote computer. No communications application can take place without it, and it is usually to be found as a standard component of other, more sophisticated software developed for the purpose of online searching.

7.2 Types of organisations accessing remote databases from South Africa

Three broad categories of organisations currently accessing remote databases from South Africa can be identified. They are

- tertiary education institutions
- statutory bodies
- commercial organisations

The tertiary education institutions include universities and technikons, although the latter are only now beginning to offer their staff and students online search services, whereas the university library/information services, particularly those with medical libraries,

have been at the forefront of online searching from the outset. The statutory bodies were naturally influenced by the services offered by CSTI. Commercial organisations range from manufacturing concerns to mining houses.

In analysing the responses to the questionnaire, the abovementioned broad categories will be followed with one exception, viz. all medical libraries will be grouped together and treated at a separate category. They form a natural group with the same aims and objectives and a clearly defined area of subject interest.

Each of the four categories of users of overseas online database vendor services will be analysed under the following headings

- service history
- hardware and software used
- intermediaries
- administration
- financial aspects
- publicity and marketing
- pre- and post-search procedures
- database and database vendor usage

The analysed responses of all four groups will finally be combined to present a composite view of the online scene in South Africa.

7.2.1 Online information retrieval in tertiary education institutions

Tertiary education institutions in South Africa accessing online search services overseas can be divided into two groups, viz. universities and

technikons, of which there is only one at present doing overseas online searches. As has been mentioned, several universities have more than one search service often having a separate one in a medical library if there is one attached to the university, and, in the case of UP, in a veterinary science library as well. Medical libraries will be treated as a group on their own, but the UP veterinary science service will be included in the tertiary education group.

7.2.1.1 Service history

The first university library to institute an online search service for its users was Unisa, in October 1979. The trial period was set at two years, with its primary objective to determine the usefulness of such a service in a correspondence university teaching mainly in the field of the humanities and the social sciences. It was anticipated that the many hundreds of bibliographies produced annually by the library's subject reference librarians would be compiled much more easily with the help of online searches. (8, p.446-447) UWL started its service in January 1980, followed by the two UP services, UOFS and RAU in 1982. UCT began doing online searches in 1984, and the Cape Technikon library started last year, in 1985.

It is anticipated that more technikon libraries will institute services in the near future. The number of services in university libraries has virtually doubled since a 1982 investigation (8), increasing in number from 5 to 9 (this includes the two UP services included in this group).

Table 1.

Year of institution of online search service

(Tertiary education libraries)

1979	1980	1981	1982	1984	1985
Unisa	UWL	Natal Potch	UP(M) UP(VS) UOFS RAU	UCT	CTek

7.2.1.2 Hardware and software used

Of these ten institutions in all, the trend in hardware usage is towards microcomputers, although this is not reflected in Table 2. Most respondents (three) of those using terminals indicated that the purchase of microcomputers for searching was imminent. UOFS uses a terminal linked to a minicomputer, which in turn is linked to the university mainframe, but is amongst those planning to implement the use of microcomputers in order to be able to download information. At present, information purchased from the DIALOG service which is urgently required is obtained via its DIALMAIL electronic mail service instead of through the post. (1)

Table 2.

Hardware used by tertiary education libraries

Type and make	User(s)
A. Terminals	
IBM 3101-22 TI Silent 700 HP 2621B	Potch Natal, UP(VS) UP(M)
B. Microcomputers	
IBM PC IBM PC/XT ONTEL Amigo	UWL, RAU, UCT Unisa CTek
C. Minicomputers	
ONTEL	UOFS

Three libraries use the gateway SEARCH software developed by UNICOM, marketers of URICA (cf. 6.2.3) to access SAPONET-P and the database vendors, to store passwords and search strategies for online retrieval, and for downloading retrieved information, while UCT uses CROSSTALK XVI for these purposes. A self-developed gateway package enabling telecommunications, vendor access and search strategy storage package stored on its minicomputer, is used by UOFS. It does not, however, permit downloading.

Table 3.

Database access software used by Tertiary education libraries

Type and make	User(s)
A. Gateway	
SEARCH	RAU, UWL, Unisa
CROSSTALK XVI	UCT
Other (including self-developed)	UOFS
B. Front end	
-	-

All these libraries access overseas services via SAPONET-P.

7.2.1.3 Intermediaries

None of the library/information services in tertiary education institutions have introduced end-user searching, therefore all online searching is done by intermediaries. They are most commonly to be found in the Reference Departments of such libraries. All the intermediaries at these institutions are professionals, that is, they possess qualifications in library and information science.

Numbers of searchers vary considerably. In most LIS in this category there are at least two intermediaries, but in those using the subject reference librarian system, as many as sixteen (Unisa), fifteen (UP(M)) and ten (UOFS), are found.

The term "information" has started creeping into the official titles of these librarians, with three respondents referring to "Information officers" ("inligtingsbeamptes") (UOFS and Potch), or an "Information Librarian" (UWL). However, the majority are called "Reference librarians" or "Subject reference librarians", or just plain "Librarian".

Responses to the questionnaire reveal a high percentage of attendance by staff at tertiary education LIS at courses specifically offering online training, particularly those held by, or under the auspices of, the CSTI, the IML and, lately, the SAOUG. Interestingly enough, only one respondent (Unisa) cited library school training as a source of online expertise.

Table 4.

Sources of online training (Tertiary education libraries)

	CTek	Natal	Potch	RAU	UCT	Unisa	UOFS	UP(M)	UP(VS)	UWL
CSTI courses		X	X			X	X	X	X	X
IML/IBC courses		X	X			X	X	X	X	X
SAOUG courses	X			X	X	X	X	X	X	X
Library school						X				
In-service training		X	X		X	X	X	X	X	X
Self-taught	X	X	X		X	X				X
Overseas training				X						

Table 4 provides an analysis of these responses. It shows an interesting increase in in-house training, compared with Pearson's (6, p.343) findings in 1983, which revealed only one formal in-house training program, viz. at UP's Merensky Library. It is, however, assumed that most in-house training is informal, with one searcher teaching another in the course of their work. Predictably, attendance at the few courses run by database producers and the single group of courses offered in South Africa earlier this year by a database vendor, was good, as illustrated by Table 5.

Table 5.

Attendance at database producer/vendor courses (Tertiary education libraries)

		CTek	Natal	Potch	RAU	UCT	Unisa	UOFS	UP(M)	UP(VS)	UWL
Producer course(s)	BIOSIS								X		
	Excerpta	X	X			X		X			X
	Medica										
	CAB					X	X		X		X
Vendor course(s)	DIALOG	X	X		X	X	X	X	X		X

7.2.1.4 Administrative aspects

All the library/information services in this category kept records of searches done. On the whole, very meticulous and detailed record-keeping was revealed by respondents. There was no noticeable difference in the level of detail of statistics kept between those libraries which provide online searches free of charge to their users and those who recover some or all costs incurred. The most notable exception is Potch library,

which charges its users the full costs of each search, billing them on receipt of the monthly DIALOG statement, and only keeping a record of the number of user searches done. (Telecommunications costs are calculated at a flat rate of R1,00 per minute.)

Table 6.

Statistical record-keeping
(Tertiary education libraries)

Type of statistic	CTek	Natal	Petch	RAU	UCT	Unisa	UOFS	UP(H)	UP(VS)	UWL
No. of database searches	X			X		X	X	X	X	X
No. of user searches	X	X	X	X	X	X	X	X	X	X
No. of "prints" (total)				X		X				
Separate "print" statistics										
- online "prints' (including downloaded "prints")	X	X					X	X	X	X
- offline "prints"	X	X			X	X	X	X	X	X
Connect time costs (database use)	X	X		X	X	X	X	X	X	X
Telecommunication costs	X	X			X	X	X	X	X	X
Cost of information ("prints") retrieved	X	X		X	X	X	X	X	X	X

All libraries except for two (UP(VS) and CTek) cumulated these statistics either monthly, annually, or both. RAU keeps an abbreviated cumulation consisting of the number of user searches done, together with their total costs.

7.2.1.5 Financial aspects

Two services recover all their costs from users, viz. those operating in the Science/Engineering Library at the University of Natal (referred to

simply as "Natal") and at Potchefstroom University, while two others (UWL and UCT) recover 50% of costs from end-users, thereby partially subsidising the searches. RAU provides all masters' and doctoral candidates with one free search, and, in so doing thus fully subsidises at least one category of searches done.

Only one service (UCT's fledgling but fast-growing service) is financed by monies emanating from sources other than the library budget as a whole, with the remainder being funded from the library budget.

Table 7.

Funding and cost recovery of online search services (Tertiary education libraries)

Source	CTek	Natal	Potch	RAU	UCT	Unisa	UOFS	UP(M)	UP(VS)	UWL
Library budget	X			X		X	X	X	X	X
Separate fund					X					
User (total)		X	X	X						
User (partial-subsidised)					X					X

In times of financial stringency and political uncertainly it is not always a simple matter to estimate costs for a future period with any degree of accuracy. Consequently, at least one library (RAU) makes provision for when its allocated funds have been exhausted - searches are then paid for fully by the university department concerned, or with money from internal research grants, or out of the end-user's own pocket.

Most services are willing to do searches for "outsiders' - that is, individuals or organisations not formally connected with the organisation offering the service. In this event, the common practice is to charge the user the full costs of the search, sometimes adding a handling fee

(Natal, Potch). The University of Pretoria has always added 10% to the full costs when doing such searches, but as from 1986 their services are charging end-users the total costs of the search plus R50,00 for DIALOG searches, and the total costs of the search plus R20,00 for MEDLINE searches.

7.2.1.6 Publicity and marketing

Most of the ten libraries in this category reported some form of publicity sought for their services. Many provide demonstration searches for selected groups, usually for new academic and research staff and postgraduate students. In the same way, talks are given to the same groups of people - sometimes as part of user-education programmes (UP services, UCT), and sometimes in response to requests from various potential user groups on campuses. Written publicity and marketing efforts are less common (and probably less effective), but UWL puts up posters (small) in all its eighteen divisional libraries, and gives a description of the service in the annually produced "Know your library", as does the Cape Technikon library in a similar publication, as well as in its current awareness bulletin. UCT displays posters on its campus. Natal displays one outside its "online office", and UOFS and CTek have an information leaflet to distribute to potential users

Table 8.

Publicity/marketing of search service
(Tertiary education libraries)

Method	CTek	Natal	Potch	RAU	UCT	Unisa	UOFS	UP(M)	UP(VS)	UWL
Demonstrations			X		X		X	X	X	X
Talks					X		X	X	X	X
Posters/flyers	X				X		X			X

Four university libraries mentioned specifically that they avoided any specific efforts directed at publicising and/or marketing their online search services. Reasons given were, *inter alia*, that online searching was seen as an extension of reference services, used as and when appropriate, and therefore not warranting any particular publicity or marketing efforts (Unisa); that the costs were too high, so users were not especially encouraged (UP(M)); and that there was a probability of being flooded with requests (Natal).

7.2.1.7 Pre- and post-search procedures

Only one of the libraries in this group (RAU) ever carried out searches for which the intermediary doing the search has not personally conducted the interview. Even then, it is always possible to contact the end-user if this does become necessary. The reason why this somewhat atypical situation exists is that the university library concerned has only one really experienced searcher on its staff (it does have two back-up searchers, but they have considerably less experience and expertise). However, it operates a subject reference librarian system, and these librarians then bring searches to be done. In a way, it could be said that they provide a knowledgeable substitute for the end-user. All nine of the other libraries have intermediaries directly interacting with end-users in pre-search interviews.

All the search services made use of a standard form on which to collect search topic and end-user details, and were more or less equally divided as far as completion of the form was concerned - five had the form completed by the intermediary, and five by the end-user. Two (Unisa and RAU) mentioned the use of a very simple form as opposed to an extremely detailed one, with, it is assumed, the intermediary making his/her own notes during the course of the interview.

None of the respondents was averse to the presence of the end-user at the time of the search, with four actively encouraging it, and the rest neither encouraging nor discouraging the practice. Two respondents commented that end-user presence at the time of the search could contribute quite substantially to its success.

Formal (i.e., written) evaluation of search results was lacking in all cases, although most respondents noted that frequently discussion of the results of a search with end-users does take place, which gives some indication of the success or otherwise of a search.

Six of the ten LIS in this group keep either the original or a copy of each completed search, and a majority (six) also keep some record of the topics of searches. Sometimes this is done in the form of a preserved copy of the search strategy itself; other organisations actually index the topics, while the remainder simply keep a chronological record of searches done by topic.

7.2.1.8 Database and database vendor usage

As is to be expected, the universal nature of the subject matter in

Table 9.

Most frequently accessed databases
(Tertiary education libraries)

Position	Database	No. of users
1	ERIC	9
2	SciSearch PsycInfo	8
3	CASearch Compendex	6
4	INSPEC	5
5	LISA	4
6	MEDLARS NTIS ABI/inform Soc SciSearch MLA Sociological Abs.	3

university and technikon libraries is reflected in an analysis of their database usage, but a reasonably clear picture emerges, as illustrated by Table 9. (See previous page.)

Predictably, the DIALOG search service was used by all ten respondents. Table 10 illustrates database vendor usage by the libraries in this group.

Table 10.

Database vendor usage
(Tertiary education libraries)

Name of service	No. of users
DIALOG	10
NLM	4
DATA-STAR BRS InfoLine	3
ORBIT DATASOLVE	2
WILSONLINE ALANET	1

Approximate (no uniformity in the keeping of statistics exists, and respondents were only asked for approximate figures) search numbers for this group of libraries are given in Table 11, as well as estimated figures for the growth of their respective services over the past two/five years.

Table 11.

Search statistics (approximate)
(Tertiary education libraries)

	CTek	Natal	Potch	RAU	UCT	Unisa	UOFS	UP(M)	UP(VS)	UWL
No. of user searches										
. Per month	4	4	10	9	5	67	47	40	18	30
. Per year	48	48	120	108	60	804	564	480	216	360
Estimated growth										
. Over 2 years	N/A	30%	20%	293%	20%	50%	100%	123%	266%	1%
. Over 5 years	-	50%	-	-	-	400%	-	148%	556%	-

7.2.2 Online information retrieval in medical libraries

Most of the twelve-odd medical libraries in this country make use of the various computerised information retrieval services offered by the IBC. Some, however, use the services of libraries near them who do access the medical databases, such as the libraries of the NCOH, the NIV and the SAIMR, which all use the WML service when they need MEDLINE or related searches done. (9) There are nevertheless four medical libraries in this country which do run their own search services. They, and the IBC itself, constitute the group of LIS whose responses to the questionnaire are analysed in the following pages.

7.2.2.1 Service history

The earliest of this group to begin online searching, was, of course, the IBC (then known as the IML), which began doing searches for end-users in August 1976. WML and UOFS(M) began using these services at that time, but in June 1977, an agreement between IML and WML was reached, according to the terms of which WML could begin accessing MEDLINE directly, without IML intervention. (7, p.61) UOFS(M) also began doing its own searches

in 1977 in accordance with a similar agreement. UP(Med.) followed this precedent in 1982, as did Madunsa in April 1985.

Table 12.

Year of start of online search service (Medical libraries)

1976	1977	1982	1985
IML	UOFS(M.) WML	UP(Med.)	Madunsa

7.2.2.2 Hardware and software

The trend towards the use of microcomputers for online searching is also to be found amongst this group. Of those who use terminals, the IBC terminal has been upgraded to make it "intelligent", and the other two respondents indicated that a switch to microcomputers was imminent. The only minicomputer in use is the ONTEL at UOFS(M), who indicated that it was intended to purchase a microcomputer for online searching in the near future.

Database access software is used by only two library/information services in this group, namely IBC, which uses the front end Sci-Mate and various inhouse versions of it, and the UOFS(M), which uses an in-house developed gateway package. (cf. 7.2.1.2) (See Table 14)

7.2.2.3 Intermediaries

Most of these library/information services use the term "information" in connection with their online search services. With some, it is in the name of the department or section in which the service functions; with others, the title of the intermediary contains the word. Examples of the former are Medical Information Dissemination Service, Information Section ("Inligtingsafdeling"), and Information provision (rather a loose translation of "Inligtingsvoorsiening"!) One such service (UP(Med.))

forms part of the library/information service's subject reference librarian system, and the other has no particular name, simply forming part of the library service as a whole (WML).

Table 13.

Hardware
(Medical libraries)

Type and make	User(s)
A. Terminals	
ADDS Consul + MFE500 ("dumb terminal + added intelligence")	IML
HP 2621B	UP(Med.)
B. Microcomputers	
IBM PC	WML, UOFS(M)
IBM PC/XT	Medunsa
Wang PC	IBC
Apple IIe	IBC
C. Minicomputers	
ONTEL	UOFS(M)

Two institutions term intermediaries "Librarians" (Medunsa, WML), two call them "Information officers" (IBC,UOFS(M)), and the last, UP(Med.), calls its intermediaries "subject reference librarians" ("vakreferente").

None of the searchers at IBC have qualifications in librarianship, but posses biomedical qualifications instead, whereas all those doing searches at the other four institutions are qualified librarians.

Table 14.

Database access software used by medical libraries

Type and make	User(s)
A. Gateway	
Other (including self-developed)	IBC, UOFS(M)
B. Front end	
Sci-Mate	IBC

Numbers of searchers at each institution vary, with the highest (six) being found at the IBC and UP(Med.), then five at WML, followed by thee at Medunsa and two at UOFS(M).

The IBC has actively encouraged end-user searching, and is one of the only known organisations, if not the only one, in South Africa to have done so to date. The CSTI trained researchers on the CSIR staff very early on (in 1977 - cf. 6 3.1.3) but Steyn (11, p.26) reported that they nevertheless appeared to prefer intermediary intervention. Developments in the online industry have helped to change this trend somewhat, and the introduction of services geared towards end-user searching (cf.4.2.1.1.2, p.x) is growing. Since the latter part of 1985, the IBC has offered seven end-user searching courses to groups of six participants each, thereby training forty-two people to do their own searches. The courses intersperse theory and practice equally, starting with manual searches of **Index medicus**, followed by the corresponding online search done on one of the NLM databases. To date (June 1986), eight users have received NLM ID numbers from the IBC, under the same agreement that exists between it and other institutions for searching the NLM databases. (5)

Another attempt at end-user training on the part of the IBC was the introduction of a group of doctors to a menu-driven gateway service, PAPERCHASE. The system was designed for end-user access to their database(s) by the Beth Israel Hospital in Boston, Massachusetts. (A similar system, GRATEFUL MATE, has been developed by the NLM.) (5)

Table 15.

Sources of online expertise (Medical libraries)

	IBC	Medunsa	UOFS(M)	UP(Med.)	WML
CSTI courses				X	X
IML/IBC courses	X	X	X	X	X
SAOUG courses	X	X		X	X
Library school					
In-service training	X			X	
Self-taught		X	X		
Overseas training	X				

Intermediary training in this group of library/information services is well illustrated by Tables 15 and 16. Attendance at the various CSTI and SAOUG database producer courses is predictably high, with twenty-two searchers from these five library/information services attending them. Attendance of training courses held overseas is also higher than that among other groups of LIS among the respondents.

7.2.2.4 Administration

All five libraries keep records of the numbers of database and user searches done, as well as connect time usage of the search service accessed, e.g. MEDLINE. The precedent for charging users for searches was originally set by the IBC, which charged users fixed fees per search,

instead of the exact costs, or a percentage thereof, incurred. Three of the respondent libraries (Medunsa, IBC, WML) follow this method of recovering costs, doing so with all users or only from specific groups of users, and this is reflected in the type of statistics kept by them. Such libraries, for instance, have no need to keep meticulous note of telecommunications costs or the numbers of "prints" (references) retrieved - neither WML nor Medunsa keep telecommunications statistics, and none of the three keeps "print" statistics. If a search takes longer than anticipated, or retrieved a large amount of information, the search charge is simply increased to that of the next category. Table 17 (next page) illustrates the extent to which records are kept of search statistics by this group of libraries.

Table 16.

Attendance at database producer/vendor courses (Medical libraries)

		IBC	Medunsa	UOFS(M)	UP(Med.)	WML
Producer course(s)	BIOSIS	X				X
	Excerpta Medica	X	X		X	X
	CAB	X				
Vendor course(s)	DIALOG	X			X	X

All these library/information services, with the exception of Medunsa, cumulate their search statistics, if not monthly, then annually.

7.2.2.5 Financial aspects

Funding of online search services in medical libraries varies from a more or less completely subsidised service to a situation in which all costs are recovered from users - much the same situation as exists in tertiary education libraries. The UP(Med.) service is wholly funded by specific monies from the library budget earmarked for external computerised services, and, as such, is unique in this group. UOFS(M) recovers its costs from user departments, while IBC and Medunsa each have their own budget for their search services. WML recovers all its costs from users.

Table 17.

Statistical record-keeping (Medical libraries)

Type of statistic	IBC	Medunsa	UOFS(M)	UP(Med.)	
No. of database searches	X	X	X	X	X
No. of user searches	X	X		X	X
No. of "prints" (total)	X				
Separate "print" statistics - online "prints" (including downloaded "prints") - offline "prints"			X X	X X	
Connect time costs	X	X	X	X	X
Telecommunications costs	X		X	X	
Cost of information ("prints") retrieved			X	X	

Users of medical libraries do not always form a homogeneous group. Frequently, such libraries are attached to a medical school, which means

that they serve not only academic staff, under- and postgraduate students, and researchers, but often the local medical community as well.

Table 18.

Funding of online search service (Medical libraries)

Source	IBC	Medunsa	UOFS(M)	UP(Med.)	WML
Library budget	X	X	X		
Separate fund				X	
User (total) (incl. fixed fees)	X	X	X		X
User (partial - subsidised					

The same type of problem arises with a service which must support the activities of a research organisation, such as the MRC, whose IBC users include staff from the MRC's other institutes, as well as outside researchers doing MRC-funded research, the local medical community, and the biomedical community in South Africa as a whole. Consequently, there can be no single charging policy for the users of such services. Table 19 attempts to summarise this diversity.

7.2.2.6 Publicity and marketing

All the libraries in this group engaged in some form of publicity for their online search services, but on the whole, as is usually the case, the services seem to sell themselves after a while. Most commonly, any publicity efforts tend to form part of user education programmes, particularly when the library is attached to a teaching institution. Demonstrations and talks appear to be the most popular methods, but all the respondents mentioned some form of written publicity material - Medunsa distributes leaflets at its main desk, and the IBC also has

Table 19.

Cost recovery for searches
(Medical libraries)

Method	Staff including funded researchers	Students	"outsiders"
Fixed fee (user or user's dept.)	WML	Medunsa WML	IBC, WML
Actual costs (user or user's dept.)	UOFS(M)	UOFS(M)	UOFS(M)
Actual costs + %			UP(Med.)
Free (library/own budget; special fund)	UP(Med), IBC, Medunsa	UP(Med.)	

printed material describing its service. The university medical libraries all mentioned the service in their published guides to their libraries. Two of these are supplemented with publicity material in other media, viz. a tape/slide presentation at WML and a video recording at Medunsa.

Three libraries reported undertaking marketing and publicity at regular intervals, namely the IBC (monthly), Medunsa (bi-annually) and UP(Med.) (annually). The remaining two indicated that when the need for information regarding the service arose it was met, but that this did not take place according to any regular schedule.

7.2.2.7 Pre- and post search procedures

All these respondents reported intermediary interviewing of end users, with search request forms being completed by the intermediaries in three cases (Medunsa, UOFS(M), and UP(Med.)), and by the end-user in one (WML). The IBC uses a very simple request form on which user details are noted,

but the interviewer makes personal notes on the substance of the interview itself.

Table 20.

Marketing/publicity of search service
(Medical libraries)

Method	IBC	Medunsa	UOFS(H)	UP(Med.)	WML
Demonstrations	X	X	X	X	X
Talks	X	X	X	X	
Posters/flyers	X	X			

User presence at the time of the search was preferred by three libraries - the IBC (when this is physically possible, as some users are ographically remote), Medunsa, and UP(Med.), who mentioned that this deemed particularly desirable in the event of a search on Chemical racts. WML actively discouraged the practice as being too me-consuming, whereas, in principle, UP(Med.) and UOFS(M) would agree to the user being present if this was specifically requested.

Getting feedback from users appears to be a common problem. Both WML and UP(Med.) reported the use of evaluation forms, but noted that they were rarely returned. The IBC sends out an evaluation card with the references retrieved by the search, but did not comment on its return rate. The most effective method of obtaining feedback seems to be verbal, this method being followed by Medunsa, UP(Med.) and UOFS(M). Human nature being what it is, the chances of irate end-users reporting poor search results are quite high!

None of the libraries in this group keeps a copy of the searches done, but, with the exception of the IBC, each keeps a record of search topics. The most formal of these is a register of titles and subjects of searches kept by Medunsa, while the rest keep either the search strategy itself, with an assigned title (WML), or preserve the search request form, which contains such details (UOFS(M), UP(Med.)).

7.2.2.7 Database and database vendor usage

The most commonly used database among medical libraries is, of course, MEDLARS, with the most a commonly used vendor being, correspondingly, NLM's MEDLINE. DIALOG is used by 80% of these libraries, presumably for searching databases such as EmBase (Excerpta Medica), PschInfo, SciSearch, BIOSIS and CASearch.

The most phenomenal growth rate with regard to online searching amongst this group of library/information services is shown by UP(Med.), whose librarian commented that the number of reference requests in the library, as well as the number of users, had grown enormously during the past few years, and that online searching had become an essential tool in the efforts of her staff to meet the needs of their users.

Table 21.

Most frequently accessed databases
(Medical libraries)

Position	Database	No. of users
1	MEDLARS	5
2	Excerpta Medica PsycInfo	4
3	BIOSIS	3
4	Toxline SciSearch CASearch	2
5	Chemline Cancerlit ERIC CAB	1

Table 22.

Database vendor usage
(Medical libraries)

Position	Name of service	No. of users
1	NLM (MEDLINE)	5
2	DIALOG	4
3	BRS	2
4	DATA-STAR SDC DIMDI	1

Table 23.

Search statistics (approximate)
(Medical libraries)

	IBC	Medunsa	UOFS(M)	UP(Med.)	WSL
No. of user searches					
. Per month	100	18	30	41	45
. Per year	1200	216	360	492	540
Estimated growth					
. Over 2 years	10%	0%	50%	148%	64%
. Over 5 years	200%	0%	-	517%	27%

References

1. DIPPENAAR, A. Personal communication, 23rd June 1986.

2. DIPPENAAR, A.M., Fokker, D.W. & de Bruin, H. Online information retrieval systems in Southern Africa: current situation, problems and development trends. 8th International Online Information Meeting, London, 4-6 December 1984. [*Proceedings*.] Oxford: Learned Information, [1984], p.105-113.

3. DUFFY, Neil. International on-line group go into action. *Systems/Stelsels*, 10(7), July 1980, p.63-65.

4. HAWKINS, Donald T & Levy, Louise R. Front-end software for online database searching. Part 1: definitions, system features and evaluation. *Online*, 9(6), November 1985, p.30-37)

5. MILLIGAN, George. Personal communication, 27th June 1986.

6. PEARSON, Annette. Education and training for online bibliographic information retrieval in South Africa. 7th International Online Information Meeting, London 6-8 December 1983. [*Proceedings*.] Oxford: Learned Information, [1983], p.341-352.

7. PEARSON, Annette. Online information retrieval services at the University of the Witwatersrand, Johannesburg *Wits journal of librarianship and information science*, 1, December 1982, p.58-77.

8. PEARSON, Annette. Online information retrieval in some African university libraries. 6th International Online Information Meeting, London, 7-9 December 1982. [*Proceedings*.] Oxford: Learned Information, [1982], p.443-453.

9. ROBERTSON, Elizabeth. Personal communication, 17th June 1986.

10. ROSSOUW, S.F. Choosing an online vendor. *South African journal of librarianship and information science*, 52(2), July, 1984, p.62-69.

11. STEYN, Daniel Pieter. Factors influencing the use of computerized scientific and technical information services in South Africa. M.A. Dissertation, University of the Witwatersrand, Johannesburg, 1984.

TABLE CODES - CHAPTER 7

CTek	Cape Technikon Library Service
IBC	Institute for Biomedical Communication
Medunsa	Medical University of South Africa
Potch	Potchefstroom University for CHE
RAU	Rand Afrikaans University
Unisa	University of South Africa
UOFS	University of the Orange Free State
UOFS (M)	Frik Scott Medical Library, UOFS
UP (M)	University of Pretoria, Merensky Library
UP (Med.)	University of Pretoria, Medical Library
UP (VS)	University of Pretoria, Veterinary Science Library
UWL	University of the Witwatersrand, Wartenweiler Library
WML	University of the Witwatersrand Medical Library

CHAPTER 8

Online bibliographic information retrieval in South Africa
Current situation (continued)

8.1 Online information retrieval in statutory bodies

This section examines online information retrieval as it takes place in various institutes and departments in four statutory bodies, viz. the CSIR, the HSRC, MINTEK and NUKOR. The CSIR's CSTI runs a centralised retrospective information retrieval service from its Pretoria headquarters, the SARIS service, which also operates from each of the four regional CSIR offices in Johannesburg, Durban, Port Elizabeth and Cape Town. These have been treated as one service, as together they do form one national service. They have, however, been counted as separate services when the total number of such services operating in South Africa was calculated.

The IBC is an institute of the Medical Research Council, and as such, should have been included in this group. However, because it is the South African MEDLINE centre, it has been included in the medical libraries group, which is discussed in section 7.2.2 and its sub-sections.

8.1.1 Service history

The CSTI's SARIS service is, of course, the oldest computerised retrospective search service in the country, having started as the experimental SARIS1 in 1976. By July 1977, SARIS1's successor, SARIS, was already operational.(cf.6.3.1.2) MINTEK was fortunate enough to secure the services of a librarian with extensive experience of computers and automated library systems, with the result that its online search service was operational by 1978. NUKOR started purchasing INIS tapes in 1972, running SDI profiles on them monthly in batch mode. However, although they obtained a password to search INIS online in Vienna in 1978, they only started actually doing so in 1980. The HSRC used the SARIS service until it instituted its own service in 1983.

Table 24.

Year of institution of online search service
(Statutory body LIS)

1977	1978	1980	1983
CSTI	MINTEK	NUKOR	HSRC

8.1.2 Hardware and software used

The number of microcomputers (five) used for online searching in this group exceeds that of terminals. (The CSTI did not disclose specific makes and models of hardware used for online searching, but indicated that both microcomputers and terminals are used.)

Table 25.

Hardware used in statutory body
LIS

Type and make	User(s)
A. Terminals	
TI Silent 700	MINTEK
Other	CSTI
B. Microcomputers	
AOC	MINTEK
IBM PC	HSRC
IBM PC/XT	NUKOR
Other	CSTI

Two libraries (NUKOR and the HSRC) in this group use some form of database access software.

Table 26.

Database access software used by statutory body LIS

Type and make	User(s)
A. Gateway	
Self-developed DIALOGLINK (Bus. Manager SEARCH	MINTEK HSRC NUKOR
B. Front end	
-	-

All library/information services in this group use SAPONET-P, but NUKOR is still forced to use direct-dial to access INIS, as it is not possible through SAPONET at present. The possibility of accessing INIS by means of SAPONET-P via West Germany or Italy is being investigated.

8.1.3 Intermediaries

Departments from which online search intermediaries in this group of respondents work are mainly termed "library and information centres/services", with the exception of the CSTI, which distinguishes between its library services and its information services, each forming a separate section.

As far as the qualifications of its "information officers" are concerned, the CSTI first and foremost demands a degree in the pure or applied sciences or technology, regarding a library and/or information science qualification as secondary. Intermediaries at the other three organisations all have library and information science qualifications. The library/information service at NUKOR is the only one which still terms

its online searchers "librarians"; the HSRC refers to them as "information officers", while at MINTEK they are called "information scientists".

The CSTI has the largest number of searchers, citing it as approximately twenty; MINTEk has two, the HSRC three, with more currently undergoing training, and NUKOR has six. The CSTI response also indicated that three end-users regularly use their facilities to search overseas databases for their own purposes. One of these was trained at a CSTI course, another received DIALOG training overseas, and the third also learned online searching overseas. The response also indicated that an unknown number of scientists working at the various CSIR institutes search overseas systems themselves without intermediary intervention.

On analysis, sources of expertise reveal themselves to be mostly the CSTI courses or in-service training.

Table 27.

Sources of online training
(Statutory body LIS

	CSTI	HSRC	MINTEK	NUKOR
CSTI courses	X	X	X	
IML/IBC courses				
SAOUG courses	X	X	X	
Library school	X			
In-service training	X	X		X
Self-taught			X	
Overseas training				

The database producer courses were well-attended by CSTI staff; they were held in Pretoria, two of them under the auspices of the CSTI, and certainly fell within the range of disciplines in which research is carried out at the CSIR. The DIALOG courses were attended by representatives from three respondents (CSTI, HSRC and MINTEK), while the NUKOR response indicated that the further education course on online

searching offered by the University of Pretoria's Department of Library and Information Science in June 1986 had been attended by one of its librarians.

Table 28.

Attendance at database producer/vendor courses (Statutory body LIS)

		CSTI	HSRC	MINTEK	NUKOR
Producer course(s)	BIOSIS	X			
	Excerpta Medica	X			
	CAB	X			
Vendor course(s)	DIALOG	X	X	X	

8.1.4 Administration

Statistics of various aspects of the searches done are kept by all four respondents. MINTEK and the CSTI combine the costs of the information retrieved and database usage costs. NUKOR currently only searches one database (INIS Atomindex) and consequently does not record how many databases have been accessed during a single search as this does not apply. The NUKOR respondent indicated that the service is to start using the DIALOG service within the next few weeks, so that the need for such a statistic may well arise then.

The HSRC is the only organisation which does not cumulate its search statistics. NUKOR does so annually, as does MINTEK, while the CSTI keeps monthly statistics, no doubt to cumulate annually if needed

Table 29.

Statistical record-keeping
(Statutory body LIS)

	CSTI	HSRC	MINTEK	NUKOR
No. of database searches	X	X	X	
No. of user searches	X	X	X	X
No. of "prints" (total)		X	X	
Separate "print" statistics - online "prints" (including downloaded "prints") - offline "prints"				
Connect time costs (database use)	X	X	X	X
Telecommunications costs	X	X	X	X
Cost of information ("prints") retrieved	X	X	X	X

8.1.5 Financial aspects

Of the four respondents in this group, all four are funded with monies received as part of the budget of the section within which they fall, e.g., the library, and recover costs from end-users. Outsiders (not staff) having searches done at the CSTI, MINTEK or the HSRC, must pay the full costs, as do CSIR institutes or departments, who must therefore budget for these as part of their annual expenses. Staff at the HSRC, MINTEK and NUKOR do not pay for searches - not even via their departmental budgets.

Table 30.

Funding and cost-recovery for online search services (statutory body LIS)

Source	CSTI	HSRC	MINTEK	NUKOR
Library/dept. budget	X	X	X	X
Separate fund				
User (total)	X	X	X	
User (partial-subsidised)				

8.1.6 Publicity and marketing

All the respondents in this group undertake some form of publicity for their services, while two (the CSTI and the HSRC) actively market their services to end-users. Of the four, the CSTI's efforts are the most noteworthy, as befits a national retrospective search service. Demonstrations are given on a regular (monthly) basis to groups which include interested potential clients, university students visiting the CSTI, other visitors, and new CSIR staff. Talks are also delivered to such groups. At MINTEK, the HSRC and NUKOR, talks and demonstrations take place as and when the need arises, mostly for new staff, but also for the benefit of visitors.

The CSTI have brochures about the SARIS service and a display, set up in the CSIR's conference centre. It can be set up at conferences and meetings in other locations as well when the need arises. The brochures are also sent out with SASDI outputs. The HSRC also presents an exhibit at relevant conferences, and distributes brochures to interested parties.

Table 31.

Marketing/publicity of search service
(Statutory body LIS)

Method	CSTI	HSRC	MINTEK	NUKOR
Demonstrations	X	X	X	X
Talks	X	X	X	X
Posters/flyers	X	X		

8.1.7 Pre- and post-search procedures

Whenever possible, the searcher tries to conduct the pre-search interview with the end-users of these services. Sometimes a third party does it, as in the case of the HSRC, where a subject reference librarian may have requested the search or the CSTI, where a librarian from another library may have requested the search on behalf of an end-user.

The HSRC is more in favour of end-user presence at the time of search than the other respondents are. The general attitude is that this does not happen as a matter of course, but only at the discretion of the searcher; the CSTI's respondent mentioned specifically that it had been found to have increased the cost of the search.

All but MINTEK expected formal evaluation of search results by end-users. The CSTI distributes a quality control card with the search results, the HSRC gives users a form to complete, and NUKOR gives them a card; however, none indicated how often or what percentage of these were ever returned, if at all.

Request forms were mostly completed by the intermediaries themselves, although the CSTI expects the user to do this if a face-to-face (not telephonic) interview takes place, where NUKOR sees the whole process as a joint effort on the part of the end-user and the intermediary.

The CSTI keeps the original copy of each search, while the HSRC only preserves the search strategy itself. Neither MINTEK nor NUKOR keep either. No search topics are recorded by the CSTI or NUKOR, while MINTEK keeps a record of the topic with the relevant search statistics, and if it is felt that the search was one which could possibly be of use again, the HSRC preserves the references retrieved, and indexes them under the topic.

8.1.8 Database and database vendor usage

It is difficult to establish a clear picture regarding database and database vendor usage for this group. Firstly, it is a very small one, with only four respondents, and, secondly, they are equally divided as far as subject areas are concerned into two with very specific subject areas (MINTEK and NUKOR) and two with very broad subject areas (CSTI and HSRC). Database usage consequently reflects this diversity, with any databases mentioned (fifteen out of twenty) being used by only one respondent. However, Compendex (**Engineering index** in machine-readable form) and CASearch (the online version of **Chemical abstracts**) emerge as the most popular, with three users each.

Table 32.

Most frequently accessed databases
(Statutory body LIS)

Position	Database	No. of users
1	CASearch Compendex	1
2	Metadex ABI/Inform INSPEC	2
3	Various	1

A large spectrum (eleven in all) of database vendors is used by this group, but once again, most use DIALOG. The large number of vendors used also reflects the wide range of subject interests of these LIS and their end-users.

Table 33.

Database vendor usage
(Statutory body LIS)

Position	Name of service	No. of users
1	DIALOG	4
2	SDC BRS InfoLine Questel STN	2
3	INIS DIMDI DATA-STAR INKA DATASOLVE	1

The CSTI, as a national scientific and technical information centre leads with the highest number of searches done by a very wide margin, as indicated in Table 34. MINTEK has expanded its online search service in the past few years to include an in-house technical reports database, and purchases the Immage tapes from the British Institute of Mining and Metallurgy for searching via CAIRS. Consequently, end-user needs are being satisfied to a much greater extent by these, rather than by overseas searches, as was the case in the past.

8.2 Online information retrieval in special libraries

8.2.1 Service history

From Table 35 it can be seen that special libraries were amongst the very earliest in South Africa to access overseas databases. (See also Table

57) One library (JCI) mentioned specifically that they had been using SARIS since May 1978, before introducing their own service in August 1983.

Table 34.

Search statistics (approximate)
(Statutory body LIS)

	CSTI	MSRC	MINTEK	NUKOR
No. of user searches				
. per month	200	26	15	15
. per year	2400	312	144	180
Estimated growth				
. over 2 years	-	300%	20%	15%
. over 5 years	130%			

Although the questionnaire did not include a specific question on SARIS usage, it may safely be assumed that, following the pattern of at least two university libraries, viz. Unisa and the Science /Engineering Library at the University of Natal in Durban, which started their own services after successfully using the SARIS service, several of the special libraries in this category must have done the same thing.

Two library/information services in this group were unable to give the exact year in which their online search services were started, and their codes are therefore followed by a question mark.

8.2.2 Hardware and software used

The majority (ten out of seventeen) of respondents in this group use microcomputers for online searching, with the IBM PC being the most popular model (six users).

Only five respondents use either gateway or database access software, with a wide variety of interface programs being used, but the SEARCH and

Sci-Mate packages once more proving popular choices in the database access category.

Table 35.

Year of institution of online search service (Special libraries)

1976	1977	1979	1980	1981	1983	1984	1985	1986
AECI AAC	ELB Sappi?	DeB	ESCOM	COM	AARL JCI VW	Ad-Ing ICC Volks?	CG IP IK	BKD

Table 36.

Hardware used in special libraries

Type and make	User(s)
A. Terminals	
TI Omni 80 820 KSR TI Silent 700 TI 765 memory Term	AECI, JK, AAC CoM, ESCOM JCI
B. Microcomputers	
ICL PC Sperry PC IBM PC/XT IBM PC	Ad-Ing AECI AARL, C-C DEB, IP, ICC, Sappi, Volkskas, VW

Surprisingly enough, one respondent (ELB) still uses direct dial access, but the other respondents all access the database vendors via SAPONET-P.

Table 37.

Database access software used by special libraries

Type and make	User(s)
A. Gateway	
DIALOGLINK Comms. Manager	IP
SEARCH	D&B
SIM PC (self-developed)	AECI
B. Front end	
Sci-Mate	IGC

8.2.3 Intermediaries

The majority of intermediaries doing online searches in special libraries are housed in sections or departments known as "information centres/services" or "library and information services". Volkskas' service is housed in its Marketing Intelligence Department.

Searcher's qualifications in this group of library/information services are mainly in the field of librarianship and information science, with eleven respondents reporting these; others have qualifications ranging from Matric to a Ph.D. in chemistry, with several engineering qualifications and an LL.B. thrown in for good measure!

The highest number of searchers in an organisation in this group is four (AAC and ESCOM); most (seven) of these LIS have two, only one (AECI) has three, and five have one.

In seven organisations the online intermediaries are called "information officers"; six still retain the title "librarian", while titles such as "Information Research Manager", "Manager, Technical Information Services" and "Information Centre Consultant/Coordinator" are used. One of the firms surveyed is a firm of patent attorneys, which has two articled clerks doing its searches.

Table 38.

Sources of online training
(Special libraries)

	Ad-Ing	AECI	AAC	AAEL	ELB	CoM	C-G	DeB	ESCOM	IP	IGC	JCI	JK	Sappi	Volks.	W
CSTI courses	X	X	X	X	X	X		X	X	X		X		X	X	X
IML/IBC courses							X									
SAOUG courses	X	X	X	X				X		X	X			X		
Library school		X													X	
In-service training		X	X		X			X						X	X	
Self-taught	X	X		X	X						X		X	X	X	X
Overseas training			X				X									

Tables 38 and 39 reflect the way in which this group of searchers has gained its online expertise. The most important source has been the courses offered by the CSTI, followed by in-house training, with one searcher passing on the knowledge to others. Many respondents acknowledge the role of hand-on experience, with nine marking the "self-taught" option on the questionnaire. The respondent for AECI mentioned specifically that their information officers were "encouraged to experiment with online techniques". Two organisations have sent searchers overseas for training, namely, the Anglo American Corporation and Ciba-Geigy. The latter company has a private database of information on its drugs and pharmaceuticals on the DATASTAR system, and sent their librarian to a company course on its use at the parent company

headquarters in Switzerland. The AAC librarian attended DIALOG training courses in the USA.

Table 39.

Attendance at database producer/vendor courses
(Special libraries)

		Ad-Ing	AECI	AAC	AARL	ELB	CoM	C-G	DeB	ESCOM	IF	IGC	JCI	JK	Bappi	Volks.	WW
Producer course(s)	BIOSIS		X													X	X
	Excerpta Medica	X						X									
	CAB		X														
Vendor course(s)	DIALOG	X	X	X	X				X		X	X			X		

Attendance at the three database producer courses presented in this country to date amongst this group of respondents appears low, but simply reflects the subject interests of those who attended. Attendance of the DIALOG courses is higher, and several respondents mentioned that, had they known about the courses, they would have attended them. (The courses were publicised in the library/information press and to all SAOUG members.)

8.2.4 Administration

Most (ten) special libraries keep statistics of at least the number of searches done. On the whole, those who offer a free service to users tend to keep less detailed search statistics, as can be seen when Table 40 is compared with Table 41. The one exception to this trend is ESCOM. In cases where telecommunications costs are not recorded, these are usually included in telephone costs for the section/department or company as a whole, e.g., ELB and DeB.

Eleven out of sixteen respondents cumulate their statistics, presumably for purposes of annual reports, with six keeping monthly cumulations as well.

Table 40.

Statistical record-keeping
(Special libraries)

	Ad-Ing	AESI	AAC	AARL	ELB	CoM	C-C	DeB	ESCOM	IP	IGC	JCI	JL	Sappi	Volks.	VW
No. of database searches	X	X	X		X	X		X		X						X
No. of user searches	X	X	X	X	X	X			X			X	X	X		
No. of "prints" (total)					X				X						X	X
Separate "print" statistics																
- online "prints" (including downloaded "prints")					X	X			X			X	X			
- offline "prints"					X	X			X			X	X	X		
Connect time costs (database use)	X	X			X	X			X	X		X	X			X
Telecommunications costs	X	X			X	X			X	X		X	X			
Cost of information ("prints") retrieved		X			X			X	X	X		X	X		X	X

8.2.5 Financial aspects

A picture of different types of funding and cost recovery for different groups of users emerges from this group of respondents. Most of them recover at least some costs from some groups of users, usually those who are not connected with the organisation in any way. Departmental or company projects which have specific budgets are having to include funding for information, as they are usually charged the full costs of an online search, although this does not always include the telecommunications costs. In one case (AECI), a number of departments and associated companies contribute to the annual running costs of their Research and Development Department, under which the library/information service falls; consequently, searches, or for that matter, any library work done for staff from these are done free of overt charges, as they have already been paid for. Other users of online services at AECI pay the full costs of the search, including the telecommunications charges and a fee for the work done by the information officer involved, based on the amount of time taken to complete the task.

Table 41.

Funding and cost recovery for online search services (Special libraries)

Source	Ad-Ins	AECI	AAC	AARL	ELB	CoM	C-G	DeB	ESCOM	IP	IGC	JC	JK	Sappi	Volks.	VW
Library/dept. budget		X	X		X	X	X	X	X	X	X	X			X	X
Separate fund																
User (total)	X	X	X	X						X		X	X	X		
User (partial - subsidised)					X			X								

In another organisation (DeB), most (and the most lengthy) searches are commissioned by the Patents Department. These are charged for total search costs, excluding telecommunications charges, while other searches

are done free of charge to users and are paid for out of the library/information service's budget. Another library (AAC) charges nothing for searches which emanate from its head office, but full rates including telecommunications costs are recovered from group companies. A novel, and extremely fair, from the end-user's point of view, way of handling cost recovery is only to charge for "successful" searches. Edward L. Bateman's Technical Information Centre follows this procedure. The company bears the telecommunications costs for all searches as well, thus providing a particularly highly subsidised service.

8.2.6 Publicity and marketing

Publicity and marketing of their search services is undertaken by most special libraries. It is mainly directed at potential users already on the staff when the service is still new, and thereafter tends to concentrate on new staff. Only two organisations mentioned specifically that no attempt had been made to bring the attention of potential end-users to the existence of the service. The one, the IGC, runs an information service for users in which an online search is sometimes done as part of the total service if needed, and, as such, users do not specifically request online searches. The second is a patent attorney's office, in which searches are also carried out if necessary as part of the total service offered to clients, in which case they are never specifically requested by them.

Demonstration searches are popular, with eleven respondents indicating that these are done on a regular basis in response to requests from specific groups and as part of orientation programmes for new staff. They are usually introduced by means of a talk given by the librarian - only two organisations (CoM and Volkskas) indicated that talks alone take place without being followed with a "live" demonstration search.

Three libraries in this group (ELB, AARL and IP) indicated that regular reminders of the existence of the service were published variously in accessions lists, a current awareness bulletin, and in the company's in-house journal. Only three respondents reported the use of posters or leaflets, viz. CoM, ESCOM and JCI.

Table 42.

Marketing/publicity of search service (Special libraries)

Method	Ad-Ing	AECI	AAC	AARL	ELB	CoN	C-G	Des	ESCOM	IP	IGC	JCI	JK	Sappi	Volks.	VW
Demonstrations	X	X	X	X	X		X		X			X				X
Talks	X	X	X	X		X	X	X	X			X			X	
Posters/fl/ers						X			X			X				

No clear-cut pattern as to the frequency of publicity or marketing efforts emerged, but the most common occurrence seems to be annually, as part of induction programmes for new staff. Several (five) respondents noted that demonstrations, talks, etc. were given whenever they were requested or when a need arose. Three organisations (AECI, IP and VW) mentioned specifically that increased publicity and/or marketing efforts were planned for the future. On the other hand, two respondents mentioned that they did not advertise at present, either for fear of being overwhelmed with requests for searches (C-G), or because of current high costs (VW).

8.2.7 Pre- and post-search procedures

In all but one organisation (the patent attorney), search interviews are carried out by the intermediary who eventually does the search.

Respondents were equally divided for and against the presence of the end-user at the time the search is carried out. The reason why this doesn't happen in some cases is that users may be geographically remote, but other respondents who were against the practice felt that there was a good chance of the costs of the search increasing because of the end-user changing his/her mind about the search strategy while online,

and cited this as a reason for not encouraging the practice. In one organisation, the searcher is a qualified engineer doing searches for engineers, and felt that therefore there was no need for the end-user to be present. (ELB) Those in favour commented that the subject expertise of the end-user was often very useful while online (Ad-Ing, AAC, AARL and DeB) and that many liked being present when their searches were done.

Only two respondents required formal (written) evaluations of searches from their end-users (AAC and COM), however, neither indicated what their rate of return was. Six (AARL, C-G, ESCOM, Sappi, Volkskas and VW) tried to obtain verbal evaluations from users, while the rest did not demand feedback, but the comment from AECI's response ("we like feedback but don't always get it") probably reflect their sentiments on the matter.

Where a library/information service uses a search request form, this is usually completed by the interviewer, whereas in a situation where the user is far away, like that of JCI, the end-user first fills in a form, on receipt of which the interview takes place by telephone. Many (eight) interviewers simply prefer to make their own notes.

The majority of respondents (ten) preserve a copy of, or the original search itself, including the "prints" or references retrieved. Of the six who do not, two (AARL and DeB) preserve the search strategy itself. Only four respondents out of sixteen (AARL, DeB, Sappi and AECI) do this, two of them doing so on floppy disks (AARL and Sappi). A record of the topics of searches is kept by twelve respondents, mostly on cards or in a logbook containing other search details.

8.2.8 Database and database vendor usage

The most frequently access databases for this group of respondents reflects the major interests of the group, namely, mining, science and engineering. Table 43 illustrates this. Table 44 demonstrates database vendor usage by these respondents.

Table 43.

Most frequently accessed databases
(Special libraries)

Position	Database	No. of users
1	CASearch Compendex	9
2	Metadex	8
3	ABI/Inform	6
4	NTIS	5
5	Management Contents MEDLARS INSPEC	4
6	Excerpta Medica HBR Claims (Patents) WPI Georef	3

Table 44.

Database vendor usage
(Special libraries)

Position	Name of service	No. of users
1	DIALOG	15
2	InfoLine	8
3	SDC	5
4	IMMAGE	4
5	DATA-STAR QUESTEL	2
6	STN BRS	1

Approximate search statistics are given in Table 45 Many of these library information services would appear to be doing an uneconomical number of searches to justify the expense of the equipment (a low average of twelve user searches each per month). Some respondents mentioned limiting the number of searches done because of the present unfavorable rand-dollar exchange rate, whereas the older, more established services (e.g., AECI, AAC) show steady, if small, annual growth rates.

Table 45.

Search statistics (approximate)
(Special libraries)

	Ad-Ing	AECI	AAC	AARL	ELB	CoH	C-G	DeB	ESCOM	IP	IGC	JCI	JK	Sappi	Volks.	VW
No. of user searches																
. Per month	8	45	12	2	25	5	3	3	40	5	2	2	7	5	3	1
. Per year	96	540	144	24	300	60	36	36	480	60	24	24	84	60	36	12
Estimated growth																
. Over 2 years	100%	6%	25%	60%	-	100%	-	-	-	-	-	-	-	2%	50%	10%
. Over 5 years	-	4%	-	-	-	-	-	-	100%	-		-	-	-	100%	-

TABLE CODES - CHAPTER 8

Ad-Ing	Adcock-Ingram Laboratories
AECI	African Explosives and Chemical Industries Limited
AAC	Anglo American Corporation of South Africa
AARL	Anglo American Research Laboratories
BKD	BankorpData
ELB	Edward L. Bateman Limited
CoM	Chamber of Mines of SA Research Organisation
CSTI	Centre for Scientific and Technical Information (CSIR)
C-G	Ciba-Geigy (Pty.) Ltd.
DeB	De Beers Diamond Research Laboratory
ESCOM	Electricity Supply Commission
HSRC	Human Sciences Research Council
IP	Impala Platinum Limited Refineries
IGC	International Gold Corporation Limited
JCI	Johannesburg Consolidated Investment Company Limited, Minerals Processing Research Laboratory
JK	John A. Kernick
MINTEK	Council for Mineral Technology
NUKOR	Nuclear Development Corporation of SA (Pty.) Ltd.
Sappi	Sappi Limited
Volks	Volkskas Limited
VW	Volkswagen of SA (Pty.) Ltd.

CHAPTER 9
Summary and conclusions

9.1 Introduction

In this last chapter, a summarising overview of the prevailing trends and practices in online bibliographic information retrieval from remote databases by South African library/information services as revealed by responses to the questionnaire, will be given. It will be followed by the conclusions to be drawn from the summary.

9.2 Summary

9.2.1 Comments on hardware and software used

The use of microcomputers for online searching is by now a firmly entrenched practice in this country, with twenty-four (60%) respondents using them. It may safely be anticipated that any hardware replacement in the future will tend towards the purchase of microcomputers.

The IBM PC is the most popular model at present, followed by the IBM PC/XT.

It is possible that the present IBM PCs will be used for many years to come. The so-called "open architecture" concept pioneered by Apple, which allows personal computers to increase their storage and processing capabilities by means of the installation of interface or expansion boards would certainly imply that there will be no need to frequently replace them, even if they are superseded by more sophisticated models.

Those library/information services which replace the terminals currently in use will undoubtedly do so with microcomputers. An important reason for doing this would be the fact that search strategies, passwords, etc., can be uploaded, and search results downloaded by means of microcomputer technology. Three software packages currently in use in this country, viz. CROSSTALK XIV, SEARCH and Sci-Mate all facilitate this. The amount

Table 46.

Hardware used for online searching in South Africa

Type and make	User(s)
A. Terminals	
IBM 3101-22	Potch
TI Silent 700	Natal, UP(VS), CoM, ESCOM, MINTEK
HP 2621B	UP(M), UP(Med.)
TI Omni 80 820 KSR	AECI, JK, AAC
TI 765 Memory Term.	JCI
ADDS Consul (+ MFE 500)	IBC
Other	CSTI
B. Microcomputers	
IBM PC	UWL, WML, RAU, UCT, UOFS(M)
	DeB, IP, IGC, Sappi, Volkskas,
	VW, HSRC
IBM PC/XT	Unisa, Medunsa, AARL, C-G,
	NUKOR
Wang PC	IBC
Apple IIe	IBC
ONTEL Amigo	CTek
ICL PC	Ad-Ing
Sperry PC	AECI
AOC	MINTEK
Other	CSTI
C. Minicomputers	
ONTEL	UOFS, UOFS(M)

of downloading which takes place in South Africa can consequently be measured by the number of users of these packages. In addition, AECI's self-developed SIM PC also allows downloading

The advantage of downloading to South African users is chiefly that of timely information. Offline "prints" from database vendors in the US typically take approximately two weeks to reach this country; downloading provides the end-user with the retrieved references immediately the search has been completed, at relatively little extra cost.

Table 47.

Database access software usage in South Africa

Type and make	User(s)
A. Gateway	
CROSSTALK XVI	UCT
DIALOGLINK Comms. Manager	IP, HSRC
SEARCH	RAU, UWL, Unisa, DeB, NUKOR
Other (including self-developed)	AECI, UOFS, IBC, UOFS(Med.), MINTEK
B. Front end	
Sci-Mate	IBC, IGC

As far as front end software is concerned, the only package of this type currently being used in South Africa is the Sci-Mate Universal Online Searcher, with two users at present, and another organisation considering its purchase. Gateway software is becoming more common, with five library/information services at present using the locally developed SEARCH package, five using self-developed packages, two using the newly developed DIALOGLINK package and one using CROSSTALK XVI, giving a total of twelve users in all.

9.2.2 Intermediaries

An unsolicited comment from a respondent concerning the recruiting of trained and experienced online searchers laconically read "Remains a problem.", and this probably sums up the situation in South Africa as far as this aspect of online usage in this country is concerned very accurately.

The survey revealed a total of 142 active online searchers in this country. This cannot be regarded as a precise figure, but only as an approximate one. It does not include figures for lecturers in Departments of Librarianship and Information Science at the various universities, several of whom have acquired a fair degree of expertise as a result of teaching or previous online experience. It does, however, include those searchers who possibly do only occasional searches, either preferring colleagues to do them, or whose work does not require many searches. Levels of expertise would thus vary considerably in a group such as this.

Table 48.

Numbers of active online searchers in South Africa

Type of organisations	T.Ed.	Med.	S.org.	Sp.Lib.	TOTAL
No. of active searchers	60	22	31	31	142

As has been mentioned previously, there are a number of researchers in various organisations who are known to be carrying out their own searches, but ascertaining their exact numbers would be very difficult. The IBC has trained forty-two medical doctors to do online searching (cf. 7.2.2.3) Of these, only eight have received NLM ID numbers which will enable them to access the databases. Steyn reported a negative response to end-user training at the CSTI. (cf. 6.3.1.3) An interesting confirmation of this trend is to be found in a study cited by Kupferberger (11, p.24), in which it was estimated that of a group of US physicians studied, 71% were

reportedly interested in doing their own searches, but only 8% were actually doing so.

Similarly establishing whether there are any users in South Africa of the end-user services now on offer from the large database vendors in the US would also present considerable difficulties. Apart from reasons such as a lack of knowledge and experience on the part of end-users, there are other reasons for the lack of end-user searching in South Africa. Private ownership of personal computers in South Africa is not as widespread as it is in the US. Furthermore, the setting up of the necessary telecommunications links for private users would be problematical, mainly for financial reasons. The number of searches done would have to justify these costs, and it is unlikely that one individual, or even a group of individuals, say, a group of people working on a research project, could do so. Also, the times at which the end-user services are available to searchers are not suitable for South African conditions, falling as they do between twelve 'o clock (midnight) and seven 'o clock in the morning in this country, which corresponds with the vendors' off-peak hours in the US. Consequently, the need for intermediary/searchers in this country is not anticipated to decrease.

The CSTI has played a major role in training South African online searchers. Mention has been made of this elsewhere (cf. 6.3.1.3), but the percentage of respondents who cited the CSTI courses as a source of training is notable (71%). So also is the number of those who responded to the categories "In-service training", by which formal training by employers was meant, and "Self-taught" (54% and 51% respectively). Many respondents marked both these responses, quite correctly noting hands-on experience as an important way to learn search skills.

The influence of the SAOUG as far as training is concerned has also made itself felt - 42% of searchers had attended some or all of the courses which it has arranged. With the decision taken by the CSTI in late 1984 to discontinue its training courses for online searchers, the responsibility for presenting and arranging more of these has devolved (partly, at any rate) upon the Group, as there is now no one body primarily responsible for training in this country. The only

organisation which approaches this status in the country is the IBC. However, two factors, possibly three, mitigate against its becoming so. Firstly, it has a very

Table 49.

Sources of online training in South Africa

	No. of responses				
	T.Ed.	Med.	S.Org.	Sp.Lib.	TOTAL
Total no. of respondents in group	10	5	4	16	35
CSTI courses	7	2	13	3	25
IML/IBC courses	7	5	1	-	13
SAOUG courses	8	4	-	3	15
Library school	1	N/A	2	1	4
In-service training	8	2	6	3	19
Self-taught	6	2	9	1	18
Overseas training	1	1	2	-	4

unambiguous and clearly defined subject field, that is, the biological and medical sciences, consequently the expertise of its staff lies in these fields and in the use of the appropriate databases and services, although this could have been said of the CSTI staff as well. Secondly, being situated in the Western Cape, it is geographically remote from the areas in which the most online searchers and potential online searchers are to be found, namely, Johannesburg, Pretoria and their environs. The third reason is partly speculative, and that is, would the IBC regard online training on a general, national scale, as part of its functions? It does train searchers, as has been mentioned, but to a certain extent, some of this work is user education in the sense of introducing potential users to its own online services.

Other parties involved in training online searchers are the various Departments of Librarianship and Information Science at the universities in this country; however, it is interesting that only four respondents (11%) gave these as sources of expertise. At present, the information profession *per se* is so small in this country, that teaching skills which are particularly germane to it (and this would include all aspects of using computer technology in library/information services) only forms a small part of the courses offered by library schools, particularly as far as practical experience is concerned. The curriculum is crowded into short periods of time, computer hardware is expensive and difficult to motivate for, and lecturers themselves may not have the expertise to teach practical courses.

The DIALOG training courses offered in this country in April 1986 fulfilled a great need for system-specific training. Table 30 shows that a total of twenty-two respondents to the survey sent representatives to the courses. (The final number of attendees was ninety-four, but some of these came from organisations which have not yet instituted online search services.)

Table 30.

Attendance at database producer/vendor courses

		No. of responses				
		T.Ed.	Med.	S.Org.	Sp.Lib.	TOTAL
	Total no. of respondents in group	10	5	4	16	35
Producer course(s)	BIOSIS	1	2	1	3	7
	Excerpta Medica	7	4	1	2	14
	CAB	4	1	1	1	7
Vendor course(s)	DIALOG	8	3	3	8	22

For a local organisation such as the SAOUG to present courses such as these, there are many obstacles to be overcome. The first problem is that of finding a venue with the hardware and telecommunications facilities which will allow multiple searcher access to a remote database from one location. The second is the costs of offering such courses, which is high. The reason for this is that an essential component of particularly the beginner's courses is practical experience, which incurs all the costs normally associated with an online search. Thirdly, course materials are expensive and time-consuming to produce, and finally, finding trainers with the necessary expertise to teach such courses is not a simple matter, particularly since such individuals are usually in normal employment, and would consequently have to participate in ventures such as these in an extra-occupational capacity.

Training of online searchers in this country therefore "remains a problem" indeed.

9.4.3 Organisation and administration of local online search services

As far as the organisation of online search services in South Africa is concerned, all the services surveyed were placed in library/information services, with the exception of the searches done at the patent attorney and those done at Volkskas. In the larger organisations, they tended to be found in the reference departments of the library/information services.

All the search services surveyed kept some record of searches done, but most of them tended to keep meticulous and detailed statistics. On the whole, database search statistics were less often recorded (only 37% did this) than user search statistics (recorded by 82%), which could thus be interpreted as a South African standard regarding the definition of an "online search". (cf. 2.2.1) Recording of statistics on information retrieved is less frequently done, but a record of costs involved is almost always kept. Sometimes this is combined with the database and system usage costs (this is not reflected in Table 51). Those library/information services which do not keep records of telecommunications costs are invariably not held resonsible for them,

with the organisation/company including these in a centralised telecommunications budget.

Table 51.

Statistical record-keeping

	No. of responses				
	T.Ed.	Med.	S.Org.	Sp.Lib.	TOTAL
Total no. of respondents in group	10	5	4	16	35
No. of database searches	7	5	3	8	23
No. of user searches	10	5	4	10	29
No. of "prints" (total)	2	1	2	4	9
Separate statistics					
- online "prints" (including downloaded "prints")	6	2	-	5	13
- offline "prints"	8	3*	-	6	17
Connect time costs (database use)	9	5	4	9	27
Telecommunication costs	8	3	4	8	23
Cost of information ("prints") retrieved	9	2	4	9	24

* One library keeps a record of the number of pages of prints received.

9.2.4 Funding and cost recovery

The largest percentage of respondents (60%) cited the library budget as a source of funding for their online search services. Frequently, more than one way of funding and/or cost recovery is used, as with

organisations who charge their own staff nothing for an online search, but recover all costs (sometimes plus a percentage) from end-users who are not employees. Many (48%) recovered the entire costs of searches from their end-users, either by charging them the exact costs incurred, sometimes plus a percentage, as has been mentioned, or by means of fixed fees. Only four respondents operated subsidised services. (11%)

Table 52.

Funding and cost recovery

	T.Ed.	Med.	S.Org.	Sp Lib.	TOTAL v
Total no. of respondents in group	10	5	4	16	35
Library budget	8	4	4	12	28
Separate fund	1	-	-	-	1
User (total - incl. fixed fees)	4	4	3	8	19
User (partial - subsidised)	2	-	-	2	4

Interpretation of these practices leads to the conclusion that South African library/information services are loath to charge users for services, particularly where *bona fide* research is involved. Library/information services attached to statutory bodies do not charge staff for such services, regarding them as support services for the research effort as a whole. This is also the case as far as most of the library/information services in tertiary education institutions are concerned, where only three respondents recover total costs from end-users, with two operating subsidised services. The highest percentage (42%) of respondents who recover total costs form end-users are special libraries in the private sector. This would be accounted for by the fact that most of these organisations are profit-oriented; even those who support research and development nevertheless frequently do charge library services of any kind out to departments. This generally

organisations who charge their own staff nothing for an online search, but recover all costs (sometimes plus a percentage) from end-users who are not employees. Many (48%) recovered the entire costs of searches from their end-users, either by charging them the exact costs incurred, sometimes plus a percentage, as has been mentioned, or by means of fixed fees. Only four respondents operated subsidised services. (11%)

Table 52.

Funding and cost recovery

	T.Ed.	Med.	S.Org.	Sp.Lib.	TOTAL
Total no. of respondents in group	10	5	4	16	35
Library budget	8	4	4	12	28
Separate fund	1	-	-	-	1
User (total - incl. fixed fees)	4	4	3	8	19
User (partial - subsidised)	2	-	-	2	4

Interpretation of these practices leads to the conclusion that South African library/information services are loath to charge users for services, particularly where *bona fide* research is involved. Library/information services attached to statutory bodies do not charge staff for such services, regarding them as support services for the research effort as a whole. This is also the case as far as most of the library/information services in tertiary education institutions are concerned, where only three respondents recover total costs from end-users, with two operating subsidised services. The highest percentage (42%) of respondents who recover total costs form end-users are special libraries in the private sector. This would be accounted for by the fact that most of these organisations are profit-oriented; even those who support research and development nevertheless frequently do charge library services of any kind out to departments. This generally

means that end-user departments in the organisation must budget for online searches annually in order to pay for them.

Fixed fee cost recovery is a characteristic of medical libraries - indeed, the method of cost recovery, if searches are charged for, if not the precise amounts, is laid down in the agreement with the IBC which each of these libraries must abide by. Librarians in this group of respondents are in agreement that this form of charging is sometimes to the end-user's advantage, and sometimes to that of the service itself, but that, on the whole, costs incurred are recovered with the minimum of clerical effort on the part of the library/information service staff.

9.2.5 Marketing/publicity

Despite the costs involved, most (68%) of those library/information services which did periodically publicise their online activities, did so by means of demonstrations. Talks, often in conjunction with a demonstration search, were the next most popular method (65%). Surprisingly few (31%) respondents used any form of written material to alert potential users to the service.

Table 53.

Marketing/publicity of search services

	I.Ed.	Med.	S.Org.	Sp.Lib.	TOTAL
Total no. of respondents in group	10	5	4	16	35
Demonstrations	6	5	4	9	24
Talks	5	4	4	10	23
Posters/flyers	4	2	2	3	11

9.2.6 Pre- and post-search procedures

These could be said to be fairly uniform throughout the library/information services surveyed. The search interview is invariably conducted by the intermediary who runs the search; few library/information services actually keep copies of the searches they do, or of the topics on which searches have been done. The latter is easily explained in terms of phaysical space required, and of the need for security both in industry and commerce, and as far as national security is concerned. Evaluation by end-users is seldom formally sought, with most intermediaries relying on verbal feedback.

9.2.7 Database and database vendor usage

Table 54 gives a breakdown, by respondent group, of database usage by South African online searchers. The CASearch files (Chemical abstracts) are the most used (twenty users), followed by Compendex (Engineering index) in second position, with eighteen users, and MEDLARS (Index medicus, Index to dental literature and International nursing index) and PsycInfo (Psychological abstracts) in third position with twelve users each.

Although many more databases were listed by respondents, only the ten most used have been included in this summary. Its accuracy is somewhat questionable, though, as the CSTI did not divulge this information, which would no doubt have increased numbers of users for several databases mentioned. It is to be surmised that these would be those such as CASearch, BIOSIS, SciSearch, Compendex, INSPEC, etc.

Rossouw's 1983 study (17, p.63) revealed that MEDLARS was the most used database by South African users, followed by CASearch, Compendex, INSPEC and NTIS, in that order. However, because the parameters of this survey differ from that of Rossouw, it is not possible to make a formal comparison of the findings.

Interestingly enough, only one full-text database, the Harvard Business Review, features in this summary, although three organisations claim to use DATASOLVE (see Table 55), which contains only full-text databases.

Table 54.

Most frequently accessed databases from South Africa

Position	Database	No. of users				
		T.Ed.	Med.	S.Org.	Sp.Lib.	TOTAL
1	CASearch	6	2	3	9	20
2	Compendex	6		3	9	18
3	MEDLARS	3	5		4	12
	PsycInfo	8	4			12
4	INSPEC	5		2	4	11
	ABI/ inform	3		2	6	11
5	ERIC	9	1			10
	SciSearch	8	2			10
	Metadex			2	8	10
6	NTIS	3			5	8
7	Excerpta Medica		4		3	7
8	LISA	4				4
	Man. Contents				4	4
9	MLA	3				3
	Sociological abs.	3				3
	BIOSIS		3			3
	WPI				3	3
	Claims (Patents)				3	3
	Georef				3	3
	HBR				3	3
	Soc SciSearch	3				3
10	Toxline		2			2

Table 55 summarises database vendor usage from library/information services in this country. DIALOG is the most accessed vendor by a very large margin - 94% of all South African online searchers access this service, which is an indication of the breadth of scope of the information it has

Table 55.

South African usage of overseas database vendors

Position	Name of vendor	No. of users				
		T.Ed.	Med.	S.Org	Sp.Lib.	TOTAL
1	DIALOG	10	4	4	15	33
2	InfoLine	3		2	8	13
3	SDC	2	1	2	5	10
4	NUM(MEDLINE)	4	5			9
5	BRS	3	2	2	1	8
6	DATA-STAR	3	1	1	2	7
7	Questel			2	2	4
	IMMAGE				4	4
8	DATASOLVE	2		1		3
	STN			2	1	3
9	DIMDI		1	1		2
10	WILSONLINE	1				1
	ALANET	1				1
	IMIS				1	1
	INKA				1	1

on offer. This finding also correlates with the large percentage attendance at the DIALOG training courses, both those presented by the CSTI in the past and those presented more recently by DIALOG representatives in this country. All the other major vendors are accessed, with Pergamon InfoLine being the second-most used service (37%), and the System Development Corporation's ORBIT service the third (28%). (Rossouw's previously mentioned study (17, p.62), based on total system use, placed DIALOG first, followed by NLM (MEDLINE) and then SDC.)

Table 56 gives approximate numbers of user searches executed in South Africa annually. Statistics given by respondents were approximate (many respondents are unwilling to give precise figures for security reasons) and totals were calculated on monthly averages. Comparison with Duffy's 1980 figures (7, p.63) is difficult, as he does not define what is understood by an "online search". He estimated an annual 15 C40 searches would take place in 1982, but the survey for this dissertation has revealed a total of 10 668 searches *per annum* based on 1985 statistics from respondents, whose numbers have increased from 14 in 1980 to 41 in 1986. It can therefore only be concluded that he was being overly optimistic, or that he used a single access to a database as the measure.

Table 56.

Approximate search statistics for South African LIS

No. of user searches	T.Ed.	Med.	S.Org.	Sp.Lib.	TOTAL
. Per month	234	234	253	168	889
. Per year	2808	2808	3036	2016	10668

9.3 Conclusions

9.3.1 Economic sanctions and online information retrieval

The past two months (May and June 1986) have seen increasing political pressure being applied to South Africa as a result of the government's

apparent unwillingness to bring about genuine power-sharing in the country. One of the major forms which these pressures have taken have been the countless threats of sanctions from South Africa's major trading partners, the US, the UK and the European Economic Community.

On the 16th June 1986, the tenth anniversary of the Soweto Riots, foreign ministers of the twelve Common Market countries met to discuss sanctions moves against South Africa. Among the proposals were the ending of air links, the banning of food imports, restricting new investment in South Africa and boycotting bulk commodities such as steel and coal imported from this country. (8) On the same day, and for the second time in less than a month (the preceding occasion having been on the 23rd May), the US and the UK used their veto power to override a United Nations Security Council resolution calling for mandatory sanctions against South Africa. (2)

The "Anti-apartheid Act of 1986", the so-called 'Dellums Bill", was passed in the US House of Assembly by voice vote on the 19th June 1986. (To become law, however, it must be passed by the Senate as well, after which it is passed or to the White House, where the President can use his veto if less than two-thirds of both chambers support the measure.) (1) Measures contained in the Bill are a bar on any new investments in South Africa, cutting off US imports of South African steel, uranium and coal, forcing the delisting of South African companies on US stock exchanges, and, as a last resort, if there is no lessening of apartheid, including the release of political prisoners within a year, the prohibition of all computer and communications equipment sales to South Africa. (21) Because the issue has now been raised, there is no doubt in the minds of commentators that, for reasons of political expediency, those who are against the Bill might have to support some form of sanctions against this country, possibly the withdrawal of landing rights from South African Airways, or selective bans on new bank loans and investments. (18)

Computer and communications equipment is specifically mentioned in the provisions of the Dellums Bill, and a precedent has been set by the withdrawal of the Apple Computer Company from South Africa, so it is not unreasonable to speculate on the possibility of a ban on computer

technology exports to South Africa. Hardware purchases will not be seriously affected, in that locally developed products could be substituted, but the prices may be high because of a potentially limited turnover (estimated at 15 000 to 20 000 personal computers per year (19, p.657)). The same considerations would apply to software. It could also possibly still be bought, as could hardware, at a price - as long as imports can be paid for, a way will be found to supply them. South Africa has long overcome the oil embargo imposed on it in the early seventies in this manner. Thus, there would be ways to overcome a ban on South African imports of computer technology.

But what of information itself? Would the imposition of sanction necessarily include what has come to be known as "transborder data flow", of which the use of interactive database systems is an example? The answer must be "yes", if the definition of transborder data flow is taken as "...the transference of information of any kind - technical, economical, cultural, across borders of a country." (6, p.36) "Cultural" boycotts of various kinds have been in operation against this country since the early seventies, and there is no reason to believe that this situation will change in the near future - transborder data flow would certainly be seen to fall into the category of such boycotts.

Some governments, including that of the US, feel that the content of information transmitted across its borders should be controlled, in which case the question of unrestricted access to interactive database systems becomes a major issue. (6, p.37-38) Under these circumstances, South African access to these could not be ignored.

The question as to whether a large database vendor could prevent South African access to its databases is raised by this issue. Although data in electronic form can often be transmitted without the knowledge or permission of the owner of that data, access to databases mounted on a search service is by password. It would be a simple matter to simply cancel a password, thereby effectively blocking access to all its databases.

A telecommunications blockade could be brought about in much the same fashion, by cancelling South African access to the major international networks.

Such actions, would, of course bring to a total halt all online searching of remote databases from this country. Perhaps the immediate effect would only be one of inconvenience, as recourse would have to be taken to manual sources, with all the attendant problems of the time and effort involved in doing so. However, this would not solve the problem of access to the rapidly growing number of databases which have no print equivalent. Furthermore, what if the print equivalent of a particular database was not available in this country, or was only available in a library in another centre in South Africa?

In all, prevention of South African access to remote databases would put great pressure on the research effort in this country, and represent yet another step towards the general regression of the country into Third World conditions.

9.3.2 New digital storage media and online information retrieval in South Africa

Storage formats for use with microcomputers take three basic forms: the floppy disk, which provides both direct access, and read/write capabilities and is removable; the "Winchester" fixed-medium (hard) disk, which provides extremely fast access, read/write capabilities and large storage capacity as compared with the floppy disk; and optical disks, which will be described hereunder, and which offer an improvement on virtually all the characteristics of floppy and hard disk storage. (12, p.161-162)

Optical storage media can store data in many formats, be they audio, visual, textual or graphic images, or any combination of these. The technique used to record and retrieve the data on the disk uses light beams generated by lasers. A "master" disk is created, form which copies are "pressed" in the same type of manufacturing processes used to produce gramophone records. (9, p.21) Optical disks are protected by a 1.2mm thick

transparent layer, which renders them impervious to scratching and other wear and tear. (13, p.21)

The commonest format of the optical disk at present is the CD-ROM, which stands for "compact disk read only memory". The precursor of the CD-ROM was the Sony Compact Disc, introduced in 1983, on which sound was recorded digitally for the first time. (12, p.163) At present, most optical disks are what is known as WORM (Write Once, Read Many) units. This means that their contents cannot be erased or altered. Not yet commercially available, although they are being developed, are erasable optical disk units which are known as WMRAs (Write Many, Read Always). (9, p.21)

In order to "read" the data on a CD-ROM, a CD-ROM playback unit is required, with an interface card to connect it and the microcomputer.

CD-ROMs, or optical disks, to give them their generic name, can store up to 600 megabytes of data - the equivalent of about 200 000 single-spaced A4 pages - on a 12cm. disk. They are also remarkably error-free, with promised error rates for data bits ranging from one in ten to the power 12 to one in ten to the power 16. (9, p.22) Access to data is also remarkably fast, taking 1 ms (millisecond) as opposed to 3 ms on the average hard disk and 7 ms on a high-performance magnetic disk. (23, p.180)

Optical disks should be considered not only as a storage medium, but also as a distribution medium, in which capacity they do have the potential to affect usage of the large database vendor services. They can do this because of the following characteristics:

- they allow database producers to circumvent the database vendors by enabling them to sell their products directly to consumers
- they offer the opportunity of storing and retrieving large amounts of information at a fixed cost
- they allow searchers to "browse" at leisure at the same fixed cost

It is also possible to incorporate programs other than their retrieval programs on optical disks. These could be word-processing or spreadsheet programs, which would allow users to manipulate search output in different ways. (15, p.6-7) They are also particularly suitable for data which is frequently accessed by many people. An example of this application is the Information Access Company's InfoTrac, a periodical index on optical disk, designed to provide access to four users simultaneously. (20) They are also ideal for storing "static" data, which remains valid for long periods and does not require updating, either at all or frequently.

According to Collier, despite the publicity given to the potentially large storage capabilities of the CD-ROM, actual database storage is only around 300 megabytes, with the rest being required for the inverted files and the indexes. Consequently, databases requiring larger storage capacities would have to be stored on more than one disk, each of which would have to be searched individually. They are therefore ideally suited to small, specialist files, which are frequently uneconomic propositions for the large database vendors. (3, p.246-247) They are not suitable for answering queries which need very current information. Although subscribers to databases on CD-ROM would receive regular updates, an online search of the database offered by a large vendor would probably still yield the most up-to-date information.

The question is, however, whether this technology could affect South African usage of online vendors, or, in the event of database vendors denying South African searchers access, whether optical disk technology would offer at least a partial solution to the problem. There are provisos, but, to a certain extent, it is possible that this would indeed be the case.

The overall assumption would have to be that it *would* be possible to purchase databases in this format, bearing in mind that suppliers could refuse to sell them to users in this country. The next proviso would be the price of purchasing information in this format. Oppenheim has stated that the high production costs involved, which would somehow have to be recovered from purchasers, would compare unfavorably with searching

a database online. (14) Small specialist files on hand for searching and browsing in at a fixed cost remain an attractive proposition, but they are not really affected by the larger issue. "Static" data is often available in print form, so purchasing it in optical disk format would do little more than provide the advantages of Boolean logic information retrieval at a possibly disproportionately high cost. The problem of access to very current information, and to extremely large amounts of information stored in single databases would remain.

To sum up then, the purchase of information in optical disk format by South African users does offer some solutions to the problem of sanctions which would deny their access to vendor services, but eventually local library/information workers may well find themselves entirely dependent on print sources again. Costs may prove too high, and suppliers may be difficult to find.

9.3.3 The future of online bibliographic information retrieval from South Africa

Of the thirty-one organisations in South Africa accessing remote databases, seventeen started their online search services within five years of the first online search from this country in 1976. (cf. Table 57) During this period, the country also experienced difficult economic conditions, but not nearly to the extent to which it is at present, so it is therefore not surprising that such a relatively large number of services was instituted; this despite the fact that access could only take place by means of the costly dial-up mode. The price of search service usage ("connect time") was quite low, with the rand/dollar exchange rate pegged at R1,15 to the US dollar throughout the 1976-1978 period, and even rising to R1,35 in the first quarter of 1981. (4) With the introduction of SAPONET-P in 1982, the way was paved for a period of dramatic growth in online searching activities in this country. Growth there was, but it could not be described as dramatic. One reason for this was the fact that the modem, an essential piece of hardware used for converting digital signals emanating from the terminal equipment used for searching, into analogue signals for transmission by the network, was at that time still only available from the Department of Posts and Telecommunications, at a

rental of approximately R45,00 per month. This added somewhat to the costs of searching, particularly where the volume of searches was not great. (Modems have subsequently been "deregulated" and now constitute a one-off purchase at the start of a service.)

Table 57.

Year of start of online search service

1976	1977	1978	1979	1980	1981
IML AECI AAC	UOFS(M) WML ELB Sappi? CSTI	MINTEK	Unisa DeB	UWL E3COM NUKOR	Natal Potch CoM

1982	1983	1984	1985	1986
UP(Med) UP(M) UP(VS) UOFS RAU	AARL JCI VW HSRC	UCT Ad-Ing ICC Volks.	Medunsa CTek C-G IP JK	BKD

Another reason for a less-than dramatic rise in the numbers of users of remote databases was that, from its "high" in early 1981, the rand/dollar exchange rate started a slow but steady decline to South Africa's disadvantage, culminating in its record "low" of approximately R0,35 to the US dollar towards the end of 1985. This has meant that information which has to be paid for in US dollars has steadily increased in price. In addition, practices such as downloading, and normal increases in costs have caused database vendors to increase their prices. The effect of large decreases in telecommunications costs has therefore been offset to

a considerable extent by the increase in the cost of search service usage and information retrieved.

A third reason for the slow growth rate of online searching in this country lies in its dual First World/Third World character. Third World economies are characterised by a primary concern with the basic necessities of life: food, clothing and shelter. First World economies are aimed at marketing and profit-making, and are characterised by industries which manufacture goods for local consumption and for export, and the existence of large corporations, which, in turn, bring about the existence of trade unions. (10, p.20-21) It is only in the First World economy that information technology and its many applications are to be found, but in South Africa this economy, although it generates the country's wealth, is dominated by Whites, who are numerically the smallest population group in the country.

The major occupational groups, consisting mainly of White workers, served by library/information services in this country are the professional, technical and related occupations, and the administrative and managerial occupations, excluding the wholesale and retail trade. This group, taken as a whole, formed 9% or some 765 000 people) of the economically active population of South Africa (34% of the total population) in 1980. (22, p.130-131) The number of library/information services (excluding school and public libraries) in the country in 1981 was 494, with a total of 1 106 qualified librarians working in them. (5, p.3)

As has been mentioned, workers in this occupational sector, taken as a whole are all active in the First World economy, as are most special, national and tertiary education libraries, there being a considerable backlog in the provision of such services for the indigenous population groups of the country. Consequently, although in relation to the total population of the country (23,5 million people (16, p.23)), the library network appears to be very small, the needs of those active in research and development, education and business, who again constitute only a percentage of professional, technical, administrative and managerial workers. would appear to be adequately met.

Growth in online information retrieval depends largely on end-user demand, and in the case of South Africa, this comes from a relatively small group of potential end-users. Furthermore, this demand stems to a large extent from a need generated by pure and applied research. In times of economic crisis, research projects form easy targets for financial cutbacks, as do library/information services, because neither can demonstrate tangible monetary profits, which is the prevailing situation in South Africa, with prospects of worse to come.

The inevitability of economic sanctions being applied against South Africa, with the likelihood of their being extended to include computer technology and products, poor socio-political conditions and concomitantly regressive economic conditions in this country do not bode well for the future growth and development of online searching here. The reduction in telecommunications costs brought about by the introduction of SAPONET-P has been offset by the increase in database usage costs caused by the poor foreign exchange rates currently prevailing. The economic climate does not encourage research and development effort, so that the need for information to be purchased online could decline. The "brain drain" of scientists, professionals and technologists from this country at present could also contribute to a decrease in demand. It is to be anticipated that, while some of the smaller services in the private sector may be discontinued, the better-established services, particularly those in tertiary education libraries and in statutory bodies, will survive, sanctions permitting, bringing about a greater degree of centralisation of online search services in the country.

It would be a great loss to the future development of this country if South African research workers and scholars were to be deprived of the right to the timeous provision of sufficient and relevant information.

References

1. ANTI-SA Bill faces defeat - analysis. *The Star*, Thursday June 19 1986, p.17.

2. BRITAIN, US head off new sanctions bid. *The Star*, Thursday June 19 1986, p.1.

3. COLLIER, Harry. Optical publishing: a who-is-doing-what appraisal. *Electronic publishing review*, 5(4), December 1985, p.245-256.

4. The COST of hanging on. *Financial mail*, 100(11), 13 June 1986, p.36.

5. *DIRECTORY of Southern African libraries. 1983*. Pretoria: State Library, 1984.

6. DONAGHUE, Hugh P. Implications of transborder data flows to library networks. *IFLA journal*, 9(1), January 1983, p.34-38.

7. DUFFY, Neil. International on-line group go into action. *Systems/Stelsels*, 10(7), July 1980, p.63-65.

8. EEC to discuss sanctions today. *The Star*, Monday June 16 1986, p.9.

9. FALK, Howard. Hardware corner: Optical disk storage. *The electronic library*, 4(1), February 1986, p.20-23).

10. GALBRAITH, John Kenneth & Salinger, Nicole. *Almost everyone's guide to economics*. Harmondsworth, Middlesex: Penguin Books, 1982.

11. KUPFERBERGER, Natalie. End-users: how are they doing? A librarian interviews six "do-it-yourself" searchers. *Online*, 10(2), March 1986, p.24-28.

12. LAUB, Leonard. The evolution of mass storage. *Byte*, 11(5), May 1986, p.161-172.

13. MURPHY, Brower. CD-ROM and libraries. *Library hi tech*, 3(2), 1985, p.21-26.

14. OPPENHEIM, Charles. CD-ROM - panacea or hype? *Aslib information*, 14(3), March 1986, p.50.

2. BRITAIN, US head off new sanctions bid. *The Star*, Thursday June 19 1986, p.1.

3. COLLIER, Harry. Optical publishing: a who-is-doing-what appraisal. *Electronic publishing review*, 5(4), December 1985, p.245-256.

4. The COST of hanging on. *Financial mail*, 100(11), 13 June 1986, p.36.

5. *DIRECTORY of Southern African libraries. 1983*. Pretoria: State Library, 1984.

6. DONAGHUE, Hugh P. Implications of transborder data flows to library networks. *IFLA journal*, 9(1), January 1983, p.34-38.

7. DUFFY, Neil. International on-line group go into action. *Systems/Stelsels*, 10(7), July 1980, p.63-65.

8. EEC to discuss sanctions today. *The Star*, Monday June 16 1986, p.9.

9. FALK, Howard. Hardware corner: Optical disk storage. *The electronic library*, 4(1), February 1986, p.20-23).

10. GALBRAITH, John Kenneth & Salinger, Nicole. *Almost everyone's guide to economics*. Harmondsworth, Middlesex: Penguin Books, 1982.

11. KUPFERBERGER, Natalie. End-users: how are they doing? A librarian interviews six "do-it-yourself" searchers. *Online*, 10(2), March 1986, p.24-28.

12. LAUB, Leonard. The evolution of mass storage. *Byte*, 11(5), May 1986, p.161-172.

13. MURPHY, Brewer. CD-ROM and libraries. *Library hi tech*, 3(2), 1985, p.21-26.

14. OPPENHEIM, Charles. CD-ROM - panacea or hype? *Aslib information*, 14(3), March 1986, p 50.

15. PEMBERTON, Jeff. The linear file: Laserdisks ... tidal wave or ripple? *Database*, 9(1), February 1986, p.6-7.

16. POPULATION census: 6 March 1985. *Statistical news release*. Pretoria: Central Statistical Services, 2 August 1985.

17. ROSSOUW, S.F. Choosing an online vendor. *South African journal of librarianship and information science*, 52(2), July 1984, p.62-69.

18. S.A. foreign relations: Western pressure mounts. *Financial mail*, 100(13), June 27 1986, p.47.

19. STAFFORD, Linda. FW focus: Computer captives. *Finance week*, 29(11), June 12-18 1986, p.657-658.

20. STEPHENS, Kent. InfoTrac: laserdisc technology enters mainstream: easy-to-use periodical index gets heavy use at California university. *American libraries*, 17(4), April 1986, p.252.

21. US-SA sanctions: no narr[illegible] focus. *Financial mail*, 100(12), June 20 1986, p. 74.

22. ZAAIMAN, R.B. The information society in South Africa - an exploratory study. *South African journal of librarianship and information science*, 53(3), September 1985, p.129-138.

23. ZOELLICK, Bill. CD-ROM software development. *Byte*, 11(5), May 1986, p.177-188.

LIST OF WORKS CITED

ADVERTISEMENT in *Online*, 9(1), January 1985, p.1.

ANTI-SA Bill faces defeat - analysis. *The Star*, Thursday June 19 1986, p.17.

ARTHUR, Adrian. Report on the 1984 Information Technology and Electronic Publishing Exhibition. *Program*, 19(2), April 1985, p.185-188.

ASCHENBORN, H.J. Mechanisation of the SANB. *South African libraries*, 36(3), January 1969, p.112 -120.

BARWISE, T.P. The cost of literature search in 1985. *Journal of information science*, 1(4), October 1979, p.195-201.

BECKER, Joseph. A brief history of online bibliographic systems, *in* Sherrod, John, *ed*. Information systems and networks: eleventh annual symposium, March 27-29, 1974. *Proceedings*. Westport, Conn.: Greenwood, 1975, p.3-13.

BELL, Daniel. *The coming of the post-industrial society: a venture in social forecasting*. New York: Basic Books, 1976.

BORGMAN, Christine L., Moghdam, Dineh & Corbett, Patti K. *Effective online searching: a basic text*. New York: Dekker, 1984.

BOSHOFF, M.C. Die gerekenariseerde uitleenstelsel van die Randse Afrikaanse Universiteitsbiblioteek. *South African libraries*, 40(5), April 1973, p.274-283.

BOSHOFF, M.C. Die rekenaarmatige katalogus van die Randse Afrikaanse Universiteit. *South African libraries*, 36(3), January 1969, p.94-101.

BOURNE, Charles P. On-line systems: history, technology, and economics. *Journal of the American Society for Information Science*, 31(3), May 1980, p.155-160

BRITAIN, US head off new sanctions bid. *The Star*, Thursday June 19 1986, p.1.

BRS introduces pay-as-you-go retrieval service. *Online review*, 9(4), August 1985, p.272.

BRUNT, A.G. Ontwikkeling van 'n SDI-diens in Suidelike Afrika. Deel 1. *South African libraries*, 41(4), January 1974, p.173-178.

BURKETT, Jack. *Library and information networks in Western Europe*. London: Aslib, 1983.

BUSH, Vannevar. As we may think. *Atlantic monthly*, 162, July 1945, p.101-108.

CAMP, Joyce Hoskinson. Developments at DIALOG. *Online review*, 9(5), October 1985, p.377-383.

CAREL, Peter. Die rekenaar in die biblioteek. *South African libraries*, 32(1), July 1964, p.8-10.

CLAYTON, Audrey & Nisenoff, N. Changes in information delivery systems over the next two decades. 1st International Online Information Meeting, London, 13-15 December 1977. [*Proceedings.*] Oxford: Learned Information, [1977], p.17-25.

COGSWELL, James A. On-line search services: implications for libraries and library users. *College and research libraries*, 39(4), July 1978, p.275-280.

COLLIER, H.R. Long-term economics of on-line services and their relationship to conventional publishers seen from the data base producers' viewpoint. *Aslib proceedings*, 30(1), January 1978, p. 16-24.

COLLIER, H.R. The on-line terminal: a revolution, or an additional information tool? 1st International On-line Information Meeting, London,

13-15 December 1977. [*Proceedings*]. Oxford: Learned Information, [1977], p.33-38.

COLLIER, Harry. Optical publishing: a who-is-doing-what appraisal. *Electronic publishing review*, 5(4), December 1985, p.245-256.

CONGER, Lucinda D. The Friendly User: Review of the year online : 1983. *Database*, 7(2), June 1984, p.89-92.

CORNELISSEN, A. Outomatisasie in 'n provinsiale biblioteekdiens. *South African libraries*, 39(1), July 1971, p.10-17.

The COST of hanging on. *Financial mail*, 100(11), 13 June 1986, p 36.

CRONIN, Blaise. Databanks. *Aslib proceedings*, 33(6), June 1981, p.243-250.

CUADRA, C. Spreading the word on non-bibliographic databases. *The information manager*, 2(2), May/June 1979, p.28-31.

DE BRUIN, H. Library computerisation in South Africa: the current scene. *South African libraries*, 47(4), April 1980, p.125-130.

DE BRUIN, Henk. 1 - Biblioteekrekenarisering in die Wes-Transvaal en Vrystaat. *South African journal for librarianship and information science*, 49(4), April 1982, p.191-193.

DE BRUIN, Henk. Techological developments in Southern Africa: an overview. Paper prepared for the Symposium on the National and International Availability of Publications, CSIR, Pretoria, 29-30 August, 1984.

DEWEY, Patrick R. A professional librarian looks at the consumer online services ... The Source, CompuServe, Apple Bulletin Board, et al. *Online*, 7(5), September 1983, p.36-41.

DIPPENAAR, A.M., Fokker, D.W. & de Bruin, H. Online information retrieval systems in Southern Africa: current situation, problems and development trends. 8th International Online Information Meeting, London, 4-6 December 1984. [*Proceedings*]. Oxford: Learned Information, [1984], p.105-113.

DIRECTORY of Southern African libraries. 1983. Pretoria: State Library, 1984.

DONAGHUE, Hugh P. Implications of transborder data flows to library networks. *IFLA journal*, 9(1), January 1983, p.34-38.

DOWNLOADING - is it really the answer? *Outlook on research libraries*, 6(9), September 1984, p.9-11.

DUFFY, Neil. International on-line group go into action. *Systems/stelsels*, 10(7), July 1980, p.63-65.

EEC to discuss sanctions today. *The Star*, Monday June 16 1986, p.9.

FALK, Howard. Hardware corner: Optical disk storage. *The electronic library*, 4(1), February 1986, p.20-23.

FALK, Howard. The Source v. CompuServe. *Online review*, 8(3), June 1984, p.214-224.

FENICHEL, Carol Hansen. Databases and database producers and vendors. *in* Maloney, James J., *ed. Online searching technique and management*. Chicago: American Library Association, 1983, p.26-34.

FENICHEL, Carol H. & Hogan, Thomas H. *Online searching: a primer*. Marlton, N.J.: Learned Information, 1981.

FLYNN, T., Holohan, P.A., Magson, M.S. & Munro, J.D. Cost effectiveness comparison of online and manual bibliographic information retrieval. *Journal of information science*, 1(2), 1979, p.77-84.

FOSKETT, A.C. *The subject approach to information*. 4th edition. London: Bingley 1982.

FOURIE, Johan. 3 - Biblioteekrekenarisering in die Noord-Transvaal. *South African journal for librarianship and information science*, 49(4), April 1982, p.196-198.

FRY, T.F. *Computer appreciation*. 2nd edition. London: Newnes-Butterworths, 197[illegible]

FRY, T.F. *Computer appreciation*. 3rd edition. London: Butterworths, 1981.

GALBRAITH, John Kenneth & Salinger, Nicole. *Almost everyone's guide to economics*. Harmondsworth, Middlesex: Penguin Books, 1982.

GARDNER, Jeffrey J. & Wax, David M. Online bibliographic services. *Library journal*, 101(16), Sept. 15 1976, p.1827-1832.

GREGURAS, Fred M. Legal research, *in* Hoover, Ryan E., *ed. Online search strategies*. White Plains, N.Y.: Knowledge Industry, 1982, p.213-239.

HALL, James N. & Brown, Marjorie J. *Online bibliographic databases: a directory and source-book*. 3rd edition. London: Aslib, 1983.

HAWKINS, Donald T. & Brown, Carolyn P. What is an online search? *Online*, 4(1), January 1980, p.12-18.

HAWKINS, Donald T. & Levy, Louise R. Front-end software for online database searching. Part 1: definitions, system features and evaluation. *Online*, 9(6), November 1985, p.30-37.

HENRY, W.M., Leigh, J.A., Tedd, L.A. & Williams, P.W. *Online searching: an introduction*. London: Butterworths, 1980.

HOLMES, P.L. The British Library Automated Information Service (BLAISE). *Online review*, 3(3), June 1979, p.265-274.

HOOVER, Ryan E. Overview of online information retrieval, *in* Hoover, Ryan E., *ed. The library and information manager's guide to online services.* White Plains, N.Y.: Knowledge Industry, 1980, p.1-29.

HOUGHTON, Bernard & Convey, John. *Online information retrieval systems: an introductory manual to principles and practice.* 2nd edition. London: Bingley, 1984.

IAC announces the creation of the "electronic journal". *Online*, 9(1), January 1985, p.9-10, 83-93.

JANKE, Richard V. Online after six: end user searching comes of age. *Online*, 8(6), November 1984, p.15-29.

KEENAN, Stella. Videotex and information retrieval in British public libraries. *South African journal for librarianship and information science*, 50(4), April 1983, p 153-157.

KESSELMAN, Martin. Online update BRS/After Dark. *Wilson library bulletin*, 58(9), May 1984, p.652, 653, 687.

KESSELMAN, Martin. Online update. *Wilson library bulletin*, 58(10), June 1984, p.732-733, 767.

KESSELMAN, Martin. Online update. *Wilson library bulletin*, 59(2), October 1984, p.118-119.

KESSELMAN, Martin. Online update. *Wilson library bulletin*, 59(4), December 1984, p.272-273, 302.

KESTING, J.G. Gesigspunt: Meganisering: dringende behoefte aan koordinasie. *South African libraries*, 39(1), July 1971, p.9.

KINGWILL, D.G. Mechanization of library procedures: some possibilities. *South African libraries*, 32(3), January 1965, p.111-116.

KINGWILL, D.G. National functions of the S.A. Council for Scientific and Industrial Research. *South African libraries*, 34(4), April 1967, p.135-146.

KINGWILL, D.G. Scientific and technical information: an outline of past developments and present trends. *South African libraries*, 31(4), April 1964, p.125-128.

KINGWILL, D.G. & Van Houten, R. Bibliographic and information services: progress in the 1960's and 1970's. *South African libraries*, 44(2), October 1976, p.53-57.

KIPI and Cuadra surveys show strong growth for online services. *Online*, 9(2), March 1985, p.11-12, 101-110.

KNAPP, Sara D. Online searching: past, present, and future, *in* Maloney, James J., *ed. Online searching technique and management*. Chicago: American Library Association, 1983, p.3-15.

KUPFERBERGER, Natalie. End-users: how are they doing? A librarian interviews six "do-it-yourself" searchers. *Online*, 10(2), March 1986, p.24-28.

LANCASTER, F.W. Interaction between requesters and a large mechanized information retrieval system. *Information storage and retrieval*, 4(2), June 1968, p.239-252.

LANCASTER, F.W. & Fayen, E.G. *Information retrieval online*. Los Angeles: Melville, 1973.

LAUB, Leonard. The evolution of mass storage. *Byte*, 11(5), May 1986, p.161-172.

LEGGATE, Peter & Dyer, Hilary. The microcomputer in the library: III. Information retrieval from external and internal databases. *The electronic library*, 4(1), February 1986, p.38-49.

LEVY, Louise R. Gateway software: is it for you? *Online*, 8(6), November 1984, p.67-79.

LEWIS, Dennis A. Today's challenge - tomorrow's choice: change or be changed *or* The Doomsday Scenario Mk 2. *Journal of information science*, 2(2), September 1980, p.59-74.

LODDER, N.M. Computers and information retrieval. *South African libraries*, 39(3), December 1971, p.240-245.

LODDER, N.M. Preliminary survey of mechanized library and information services in South Africa. *South African libraries*, 39(2), October 1971, p.106-117.

LODDER, N.M. Short state-of-the-art report on computerization in South African libraries: September 1981. *South African journal for librarianship and information science*, 49(4), April 1982, p.191.

LONGLEY, Dennis & Shain, Michael. *Dictionary of information technology*. London: Macmillan, 1982.

MICROHINTS: Downloading. *The Electronic library*, 4(1), February 1986, p.30-33.

MULLER, P.H. Part 11: Online pricing in practice, *in* Muller, Peter H. & Wilson Roy. *Pricing policies for parallel publishing*. Oxford: Elsevier, 1985, p.59-67.

MULLER, Peter H. & Wilson, Roy. *Pricing policies for parallel publishing*. Oxford: Elsevier, 1985.

MURPHY, Brower. CD-ROM and libraries. *Library hi tech*, 3(2), 1985, p.21-26.

MUSIKER, Reuben. 4 - Library computerization in the Southern Transvaal. *South African journal for librarianship and information science*, 49(4), April 1982, p.198-199.

MUSIKER, R. The new technology in South African libraries - an update to 1984. *South African journal of librarianship and information science*, 53(2), June 1985, p.68-71.

NAISBITT, John. *Megatrends: ten new directions transforming our lives*. Futura edition. London: Macdonald, 1984.

NATIONAL Library Advisory Council. MARC Working Group. Die aanvaarbaarheid van MARC vir Suid-Afrikaanse biblioteke en die ontwikkeling van 'n raamwerk vir gerekenaariseerde biblioteekdienste in Suid-Afrika; opgestel deur M.L. van As o.l.v. die S.A. MARC-Werkgroep. Pretoria: National Library Advisory Council, 1977.

NATIONAL Library of Medicine offers subsets of MEDLINE. *Online review*, 8(6), December 1984, p.517-518.

NEW Associate Member Class. *SABINET bulletin*, 1(1), November 1985, p. 1 - 2 .

OJALA, Marydee. Knowledge Ind x: a review. *Online*, 7(5), September 1983, p.31-34.

O'LEARY, Mick. WILSONLINE: online power for every library. *Database*, 9(2), April 1986, p.102-107.

OPPENHEIM, Charles. CD-ROM - panacea or hype? *Aslib information*, 14(3), March 1986, p.50.

PEARSON, Annette. Education and training for online bibliographic information retrieval in South Africa. 7th International Online Information Meeting, London, 6-8 December 1983. [*Proceedings*]. Oxford: Learned Information, [1983], p.341-352.

PEARSON, Annette. Online information retrieval services at the University of the Witwatersrand, Johannesburg. *Wits journal of librarianship and information science*, 1, December 1982, p.58-77.

PEARSON, Annette. Online information retrieval in some African university libraries. 6th International Online Information Meeting, London, 7-9 December 1982. *[Proceedings]*. Oxford: Learned Information, [1982], p.443-453.

PEMBERTON, Jeff. The linear file: Laserdisks ... tidal wave or ripple? *Database*, 9(1), February 1986, p.6-7.

PEMBERTON, Jeffery K. & Emard, Jean-Paul. Dialog in 1984: an interview with Roger K. Summit. *Online*, 8(2), March 1984, p.13-20.

POPULATION census: 6 March 1985. *Statistical news release*. Pretoria: Central statistical services, 2 August 1985.

PSYCH Abstracts price boost stirs protest. *Library journal*, 103(6), September 15, 1978, p.1681-1682.

ROGERS, Frank B. Computerized bibliographic retrieval services. *Library trends*, 23(1), July 1974, p.73-88.

ROSENBERG, Jerry M. *Dictionary of computers, data processing and telecommunications*. New York: Wiley, 1984.

ROSSOUW, S.F. Choosing an online vendor. *South African journal of librarianship and information science*, 52(2), July 1984, p.62-69.

ROSSOUW, S.F. Hello from ELLHILL 3. *South African libraries*, 44(3), January 1977, p.109-112.

ROSSOUW, S.F. On-line training in Africa. Paper presented at the National Online Information Meeting. New York, N.Y., March 25-27, 1980.

ROSSOUW, S.F. An online vendor in South Africa: Possibility or pipe dream? *South African journal for librarianship and information science*, 49(4), April 1982, p.183-189.

ROWLEY, J.E. & Turner, C.M.D. *The dissemination of information*. London: Deutsch, 1978.

ROYAL SOCIETY. Scientific information conference, 1948. *Reports and papers submitted*. London: Royal Society, 1948.

S.A. foreign relations: Western pressure mounts. *Financial mail*, 100(13), June 27, 1986, p.47.

SABINET: Official opening. *SABINET bulletin*, 1(1), [n.d], p. [1].

SALOMON, Kristine & Burgers, Curt. Patron presence during the online search: attitudes of university librarians. *Online review*, 8(6), December 1984, p.549-558.

SCHRADER, D.B. & Portoghese, C. In-Search: bringing DIALOG to the end user. *Information today*, 1(7), July/August 1984, p. 17, [illegible].

SHEPHERD, Michael A. & Watters, Carolyn. PSI: a portable self-contained intermediary for access to bibliographic database systems. *Online review*, 8(5), October 1984, p.451-463.

SMITH, Bev. DIALOG - patriarch of the online generation holds industry lead. *Information today*, 2(5), May 1984, p.11-13.

SOUTH African libraries, 40(1), July 1972.

SOUTH African Online User Group. *Online user news*, issue 2, April 1980, p. [1].

SOUTH African Online User Group. Annual report on activities and progress, presented at the Annual General Meeting, 2 May 1985, by the Chairman, N. Spicer.

SOUTH African Online User Group. *Constitution*. 6 March 1983.

SOUTH African Online User Group. Western Cape Branch. Annual report, 1985-1986, presented at the Annual General Meeting, May 1986, by the Chairman, Paul Meyer.

SPICER, N. Development of a SDI service in Southern Africa. Part 2. *South African libraries*, 41(4), January 1974, p.179-190.

SPIEGEL, Murray R. *Statistics*. New York: McGraw-Hill, 1961.

SPIGAI, F. Gateway software: a path to the end-user market? *Information today*, 1(2), February 1984, p.6-7.

STAFFORD, Linda. IW focus: Computer captives. *Finance week*, 29(11), June 12-18 1986, p.657-658.

STEPHENS, Kent. InfoTrac: laserdisc technology enters mainstream: easy-to-use periodical index gets heavy use at California university. *American libraries*, 17(4), April 1986, p.252.

STEYN, Daniel Pieter. Factors influencing the use of computerized scientific and technical information services in South Africa. M.A. Dissertation, University of the Witwatersrand, Johannesburg, 1984.

SUMMIT, Roger K. & Meadow, Charles T. Emerging trends in the online industry. *Special libraries*, 76(2), Spring 1985, p. 88-92.

TAYLOR, Robert S. Question negotiation and information seeking in libraries. *College and research libraries*, 29(3), May 1968, p.178-194.

TEDD, L. Computer-based information retrieval services, *in* Anthony, L.J., *ed. Handbook of special librarianship and information work*. London: Aslib, 1982, p.325-354.

TENOPIR, Carol. Online databases : Database access software. *Library journal*, 109(16), October 1, 1984, p. 1828-1829.

TENOPIR, Carol. Online databases: Full-text, downloading and other issues. *Library journal*, 108(1), June 1, 1983, p.1111-1113.

TENOPIR, Carol. Online databases: "Other" bibliographic systems. *Library journal*, 109(18), November 1, 1984, p.2008-2009.

TENOPIR, Carol. Online databases: Pricing policies. *Library journal*, 109(12), July 1984, p.1300-1301.

THESING, Jane I. Online searching in perspective : advantages and limitations, *in* Maloney, James J., *ed*. *Online searching technique and management*. Chicago: American Library Association, 1983, p.16-21.

TRUBKIN, L. Economics of database enhancement. *Electronic publishing review*, 1(2), June 1981. p.103-112.

UNIVERSITY OF PRETORIA. Merensky Library. *Research project: The university library as an information service. Subproject 1*. Researcher: s E. Weyers. December 1984.

...sactions: No narrow focus. *Financial mail*, 100(12), June 20 1986, p.74.

VAN BRAKEL, P.A. Kriteria vir die evaluering van toegangsprogrammatuur vir gekoppelde inligtingsoektogte. *South African journal of librarianship and information science*, 54(2), June 1986, p.69-79.

VAN DEVENTER, M.H. The East London Municipal Library mechanization project. *South African libraries*, 39(1), July 1971, p.18-25.

VENTER, R.H. Rekenaars en die Suid-Afrikaanse reg. *South African libraries*, 40(4), January 1973, p.230-235.

VIETZEN, Colleen. 2 - Library computerisation in the Cape and Natal. *South African journal for librarianship and information science*, 49(4), April 1982, p.193-195.

VIEWPOINT, *South African libraries*, 42(2), October 1974, p.41.

WILLEMSE, J. Planning and development of a national library system in South Africa. *South African libraries*, 46(4), April 1979, p.125-129.

WILLEMSE, J. Die Universiteit van Suid-Afrika se gemeganiseerde uitleenstelsel. *South African libraries*, 36(3), January 1969, p.102-111.

WILLEMSE, John. Van samewerking tot netwerk: indrukke oor die ontwikkeling van biblioteekstelsels i. die V.S.A. *South African libraries*, 38(1), July 1970, p.26-31.

WILLIAMS, Martha E. Electronic databases. *Science*, 228(4698), 26 April 1985, p.445-450, 455-456.

WILLIAMS, Martha E. Highlights of the online database field - statistics, downloading and microprocessors. National Online Meeting, New york, April 12-14, 1983. *Proceedings*. Medford, N.J.: Learned Information, 1983, p.1-3.

WILLIAMS, Martha E. Highlights of the online database field - statistics, pricing and new delivery mechanisms. National Online Meeting, New York, April 10-12, 1984. *Proceedings*. Medford, N.J.: Learned Information, 1984, p.1-4.

ZAAIMAN, R.B. The information society in South Africa - an exploratory study. *South African journal of librarianship and information science*, 53(3), September 1985, p.129-138.

ZOELLICK, Bill. CD-ROM software development. *Byte*, 11(5), May 1986, p.172-188.

APPENDIX A

QUESTIONNAIRE - ORGANIZATIONS ACCESSING OVERSEAS ONLINE SYSTEMS

Name of organization:

_____

Questionnaire completed by: _____

Telephone: _____

A. General

1. When did your organization start providing an online search service for your users?

_____

2. How did you (or your organization) first become aware of the existence of overseas online systems and the possibility of accessing them from South Africa?

Read about it ☐

Heard about it ☐

SAOUG ☐

Other (e.g. saw a demonstration) ☐

_____

_____

_____

B. Hardware, software and telecommunications

3. Which type of computer hardware is used for your online searches?

Microcomputer ☐

Stand-alone ☐

Linked to mainframe ☐

Make: _____

Terminal via mainframe ☐

Make: _____

Other (please specify type and make) _____

_____

4. Is any form of search software (gateway software, front-end software) used for searching, e.g. SEARCH, Sci-Mate, IN-MAGIC, etc.?

No ☐

Yes ☐

If "yes", please specify which package is currently in use.

_____

5. Which telecommunication mode do you use?

SAPONET-P ☐

Direct dial ☐

C. Intermediaries

6. In which department/section of your organization is the online search service situated?

_____

7. By whom are the online searches in your organization carried out?

Individuals with qualifications in Librarianship and Information Science, e.g. B.Bibl., H.Dip.Lib., etc. ☐

Individuals with other qualifications ☐

(Please specify _____

_____)

End-users ☐

8. If the answer to 7 is "End-users", how have they acquired the necessary search skills?

Self-taught ☐

In-house training ☐

(Please specify further _____

_____)

9. How many people currently perform online searches?

_____

Author Herholdt A de V
Name of thesis Online Bibliographic information retrieval in South Africa 1987

PUBLISHER:
University of the Witwatersrand, Johannesburg
©2013

LEGAL NOTICES:

Copyright Notice: All materials on the University of the Witwatersrand, Johannesburg Library website are protected by South African copyright law and may not be distributed, transmitted, displayed, or otherwise published in any format, without the prior written permission of the copyright owner.

Disclaimer and Terms of Use: Provided that you maintain all copyright and other notices contained therein, you may download material (one machine readable copy and one print copy per page) for your personal and/or educational non-commercial use only.

The University of the Witwatersrand, Johannesburg, is not responsible for any errors or omissions and excludes any and all liability for any errors in or omissions from the information on the Library website.