

# University Scientists as Seekers of Information: sources of references to periodical literature

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*This article studies the pattern of users' interaction with information sources in science, technology and social sciences at the Antwerp State University Centre. The results showed, first, that the main sources of references to periodical literature were citations at the ends of articles in journals and books, second, the increasing role of the current awareness type of publication in assisting in the selection of relevant articles and, third, decreased use of conventional abstract journals. Computerized information services scored very low, but greater usage of machine-readable data bases is expected upon introduction of interactive on-line systems.*

## INTRODUCTION

There is little doubt now that librarians will have to rationalize their purchasing policy because of the increasing cost of scientific journals. First, a study was made to discover the most consulted scientific serials in the library, as described in a previous publication.<sup>1</sup> Next, it was decided to carry out a survey of the use of bibliographical information media as sources of references for literature provided. For library management, the survey would serve as a guide in their abstract acquisition policy. Therefore a study has been made by the library into the information gathering habits of its readers among faculty and doctoral students. Antwerp State University Centre Library subscribes to about 1500 current periodicals and 150 abstract, index or other secondary journals dealing with such disciplines as mathematics, physics, chemistry, geology, biology, anatomy-embryology-cytology-histology, biochemistry-biophysics-physiology, geography, economics, sociology and technology.

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## METHODOLOGY

The method adopted was that of a questionnaire. Over a period of one year, from 15 May 1975 to 15 May 1976, all researchers in the faculties of sciences and applied economics and some in non-faculty departments provided with periodical literature from library borrowings and interlibrary loans were offered a list of sources and asked to indicate from which the reference to the periodical article was obtained. If necessary, they could mention other sources where or other ways how they found out about the article.

During the survey period 4082 questionnaires were handed out and filled in, either immediately when borrowing the issue or receiving a photocopy of the article, or when returning it to the library afterwards. A total of 3545 replies were received; 3458 or 97.5% of them were valid answers. The survey took no account of unsatisfied requests which amount to 30% for interlibrary loans.

## RESULTS

An analysis of the answers to the question "How did you become aware of the existence of the article which the library has provided for you?" is presented in Table 1. These data show a difference between pure scientists plus technologists and social scientists in their habits as seekers of information.

The sources are grouped in three categories; first, those pertaining to primary information sources; second, those relating to abstracting and indexing journals including the machine-readable data bases and, third, those originating from various other sources. The main sources of references to periodical literature were citations at the end of articles in periodicals and books (54.3%), lists of paper titles such as *Current Contents* and the library-operated SDI service (21.1%) and the abstracting and indexing journals (15.3%). The remaining 9.3% were obtained from personal recommendations, computerized information services, library browsing, theses, catalogues, etc.

Among the first category of publications, the percentage distributions between periodicals and books were in favour of books for social scientists, while pure scientists and technologists relied much more on periodical articles as a source of potentially useful references; for the latter group, one reference was found in a book compared with three of them in a periodical publication. As was already demonstrated by Hakulinen,<sup>2</sup> it was found that abstracting and indexing journals are astonishingly unimportant. They seem to serve the needs of information scientists rather than those of researchers.

In Table 2, a more detailed distribution of the 1018 references traced in abstracting and indexing journals is given. The frequency of use is highest for *Current Contents*, *Physical & Chemical Sciences* and *Life Sciences*, which were quoted 490 times accounting for nearly 50% of the total, while at the other end of the

TABLE I—SOURCES OF BIBLIOGRAPHICAL INFORMATION

Source	No. of times used			% of total uses		
	Social scientists	Pure scientists/technologists	Total users	Social scientists	Pure scientists/technologists	Total users
Primary sources						
Periodical article	160	1062	1265	27.0	39.0	36.6
Book	189	388	613	31.9	14.2	17.7
Personal verbal and written communication	9	45	61	1.5	1.6	1.8
Secondary sources						
Library SDI service	110	128	239	18.5	4.7	6.9
Current Contents	0	490	490	0	18.0	14.2
Other abstracting and indexing journals	86	422	528	14.5	15.5	15.3
Machine-readable data bases	1	44	46	0.2	1.6	1.3
Other sources						
Library browsing	31	118	172	5.2	4.3	5.0
Library union catalogue of current periodicals (Antilope)	1	3	11	0.2	0.1	0.3
Other	6	26	33	1.0	1.0	0.9
All sources	593	2726	3458	100.0	100.0	100.0

TABLE 2—USE OF ABSTRACTING AND INDEXING JOURNALS

Rank	No. of times used	% of total uses	Title
1	490	48.1	Current Contents, Physical & Chemical Sciences/Life Sciences
2	220	21.6	Science Citation Index
3	119	11.7	Chemical Abstracts
4	46	4.5	Social Sciences Citation Index
5	22	2.2	Excerpta Medica
6	21	2.1	Bulletin Signalétique
7	16	1.6	Economic Abstracts
8	14	1.4	Physics Abstracts
9	11	1.1	Library and Information Science Abstracts
10	10	5.7	Biological Abstracts
			Zoological Record
12	6		Helminthological Abstracts
			Library Literature
			Wildlife Review
15	5		Computer Abstracts
			Veterinary Bulletin
17	4		Social Sciences and Humanities Index
18	3		Electrical and Electronics Abstracts
			Ornithologische Schriftenschau
20	1	International Bibliography of the Social Sciences	
	1018	100.0	Total

scale 130 other titles of this class of publications produced no references at all, including *Index Medicus*, *Current Contents*, *Social & Behavioral Sciences* and *Anbar Management Abstracts*.

Most striking is the fact that bibliographical instruments published by the Institute for Scientific Information scored 74%, *Chemical Abstracts* 11% and all other sources less than 5% of total references. The dominant role of *Current Contents* as an information source among users of biomedical periodical literature and some of the reasons for this were described by Hakulinen.<sup>2</sup> However, the *Social & Behavioral Sciences* section of this handy-format weekly collection of contents pages of current periodical issues obviously did not cover the fields of interest, of our social scientists. There is every reason to believe that this failure is due to journal coverage because their work is oriented towards national or regional social and economic problems rather than international research topics. It was found that this group of scientists successfully used the library-operated SDI service as a substitute. The service provides researchers on an individual basis

with a copy of the table of contents of current issues of journals as they arrive in the library. Use of machine-readable data bases scored low with 1.3% of the references. As shown in Table 3, the major part of the references was obtained from the United Kingdom Chemical Information Service (UKCIS), while 14 references were found in computer printout obtained from the National Centre for Scientific and Technical Documentation at the Royal Library in Brussels. This Centre is processing a number of data bases to provide a highly personal SDI service to scientists in all types of organizations. None of the data bases were available for on-line searching during the period covered by this survey.

The "other sources" category in Table 1 accounted for 6.2% of total uses. It contains the Antwerp library union catalogue of current periodicals, Antilope, as a finding list and 33 miscellaneous information sources: information from industry such as product catalogues, a chemistry course, theses, a computer program manual, etc. The survey also revealed that 5% of the articles were discovered without any prior reference being involved simply as a result of library browsing.

Results of the present survey were compared in Table 4 with similar surveys carried out at the National Lending Library for Science and Technology (NLL) from 1963 to 1971<sup>3-7</sup> and the Karolinska Institutets Bibliotek (KIB) in 1973,<sup>2</sup> covering a 13-year period which saw further exponential growth of information resulting in an increased volume of primary literature, which in the present system still remains the principal information carrier for the communication of scientific research. This so-called information explosion was paralleled by the difficulty for researchers, first, to keep aware of new publications in a particular field and, second, in a literature search to trace what has been published on a particular subject and to find out what these papers have to say. This problem is

TABLE 3—USE OF MACHINE-READABLE DATA BASES

<i>Data base</i>	<i>No. of times used</i>	<i>% of total uses</i>
UKCIS	27	58.7
DIALOG	3	6.5
INSPEC	1	2.2
Ministry of Economic Affairs	1	2.2
Unidentified (through the National Centre for Scientific and Technical Documentation, Royal Library, Brussels)	14	30.4
Total	46	100.0

TABLE 4—COMPARISON OF THE PERCENTAGES OF REFERENCES PRODUCED BY DIFFERENT SOURCES WITH COMPARABLE DATA FROM SURVEYS CONDUCTED BETWEEN 1963 AND 1973 AT THE NLL AND THE KIB

Sources	NLL 1963 <sup>3</sup> Scientific and technical periodical literature survey		NLL 1967 <sup>4</sup> Medical periodical literature survey		NLL 1968 <sup>5</sup> Social sciences periodical literature survey		NLL 1969 <sup>6</sup> Biomedical periodical literature survey		NLL 1971 <sup>7</sup> Biomedical periodical literature survey		KIB 1973 <sup>2</sup> Biomedical periodical literature survey		RUCA 1975-1976	
													Social sciences periodical literature survey	Scientific and technical periodical literature survey
Periodical publications	25	37.0	25.1	39.4	25.1	38.4	27.0	39.0	38.4	32.8	27.0	39.0	31.9	14.2
Non-periodical publications	14	10.3	22.5	16.3	22.5	12.5	31.9	14.2	12.5	32.8	31.9	14.2	18.5	4.7
Periodical and non-periodical publications	39	47.3	47.6	55.7	47.6	50.9	58.9	53.2	50.9	32.8	58.9	53.2	18.5	4.7
Library SDI service*														
Current Contents, Physical & Chemical Sciences†/Life Sciences‡/Social & Behavioral Sciences§		5.6		4.6			4.6						0	18.0
Other abstracting and indexing journals		25.9		22.2			22.2						14.5	15.5
Total abstracting and indexing journals	43	31.5	21.3	26.8	21.3	30.9	26.8	42.2	30.9	42.2	14.5	33.5	14.5	1.6
Machine-readable data bases		3.7		3.2			3.2						0.2	

\* Started in 1973. Reproduction of the contents pages of approximately 400 international journals on an individual basis for RUCA scientists

† Started in 1961. Reproduction of the contents pages of approximately 800 international journals

‡ Started in 1958. Reproduction of the contents pages of approximately 1000 international journals

§ Started in 1969. Reproduction of the contents pages of approximately 1100 international journals

called current awareness and information retrieval. Blaxter<sup>8</sup> reported that modern scientists have no trouble with the first difficulty, deriving half the awareness from a scanning of a small number of primary journals, a quarter from a scanning of review or abstract publications and the remaining quarter from a scanning of paper titles such as *Current Contents* or through personal recommendation by colleagues. His study made quite clear that the modern scientist does not read any more journals than his predecessors. This might be because, in his information-gathering habits, he is taking advantage of one of the basic bibliometric distributions known as Bradford's law of scattering<sup>9</sup> described as follows: the dispersion of articles on a particular topic among various journals is such that if one finds  $n$  articles relevant to the subject in a core of  $j$  journals, then one requires  $kj$  journals for an additional  $n$  articles,  $k^2j$  more journals for another  $n$  articles, multiplying the number of journals in a zone by a constant  $k$  to find how many additional journals are required to gain  $n$  more articles. Pope,<sup>10</sup> for instance, showed that half the 7368 articles on information science published in 1011 periodicals were to be found in 33 journals and that 10 journals were isolated as the core. As authors prefer to publish their research in the core journals for their field, a scientist working in this field would keep up with major new contributions if he systematically scanned the tables of contents of these key journals, for example as they arrive in the library or weekly in *Current Contents*. Table 4 gives some indication of the increasing impact of the current awareness type of publication in assisting in the selection of relevant articles. On the other hand, a decrease is observed in the use of conventional abstract journals whose volumes grow bulkier every year, their indexes more complex and their consultation ever more time-consuming. Usage of machine-readable data bases as an alternative to the printed form is an important development and, with total terminal population in Europe expected to grow five times by 1985, there is good reason to believe that the availability of in-house terminal equipment will considerably stimulate information retrieval by machine-searching of large and comprehensive data bases.

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