

Reading Library Catalogues and Indexes

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This paper gives a brief description of some of the work undertaken by the Centre for Catalogue Research at the University of Bath. Some of the Centre's research is concerned with visual factors affecting the design and performance of library catalogues and indexes. The involvement of computers in the generation of catalogues has enabled people's performance to be studied with alternative catalogue displays. One of the critical factors is the number of entries which can be scanned per page, the more entries the shorter the search time. Another critical factor is the way keywords in a title are displayed in relation to the context both of the other words in the title and the other entries in the catalogue. It is shown that major improvements are possible to the visual display of the information on some of the catalogue systems currently in use.

It was due to the influence of my father that I chose to be a librarian. A bookseller by trade, well read and with catholic interests, he always managed to produce some surprises. I well remember him telling me that he liked to read *Bradshaw*. He was not a railway enthusiast, but the mental activity of tracing routes and the delights of reaching destinations in the imagination gave him particular pleasure. For me, as a young boy, *Bradshaw* was an insurmountable obstacle to the prospect of ever getting anywhere by rail! Indeed, I still have my problems with British Rail timetables! The typography, the form of tabulation, the abbreviations and arbitrary signs and symbols used, were more likely to obfuscate than to enlighten me. Similar difficulties have faced the users of library catalogues and indexes for years. In his article "The crisis in cataloguing" Andrew Osborn wrote, "The card catalogue is at best a barrier between the reader and the book" (Osborn, 1941).

Computers effect changes in physical form

For many users the most significant development in the catalogue and index in recent time has been the change in its physical form stemming from the use of computers. First came the use of Computer Output Microfilm (COM) and latterly the emergence of the on-line public access catalogue.

COM resulted in a return to the page form for presenting catalogue data. This was previously exemplified by the guard-book and printed book cata-

logues which predated the ubiquitous card catalogue and the less common sheaf catalogue. The card catalogue had been introduced in libraries to allow the facility of easy updating through the interfiling of new entries. Cards also offered the prospect of providing a centralised service, such as that inaugurated in 1901 by the Library of Congress, so that the same item did not need to be catalogued independently by scores of different libraries. Such services, however, placed great emphasis on the need for standardisation. There were two consequences for the user therefore: firstly the loss of the scannable array of entries provided by the page format, and secondly the development of more complex rules governing forms of heading and description which developed to cope with filing problems and standardisation requirements. An additional difficulty facing the compilers and users of catalogues which include subject headings, is the establishment of a satisfactory syndetic structure. Many users of card catalogues will vouch for the frustration which they have experienced when being directed through the catalogue by a system of “see” and “see also” references only to find that they reached a dead-end, or that they appeared to be back where they started! The same problem also applies to book and COM catalogues, but at least pages, or volumes of entries, allow the eye to alight on neighbouring entries. Serendipitous discovery of relevant items is made more possible: a point to which I will return later.

On-line access, in its earlier forms, reverted to the presentation of details relating to one title at a time and was more reminiscent of the card catalogue. Indeed, most existing on-line catalogues still do not provide pages of entries which can easily be compared to those provided by the book or COM forms of catalogue. The most significant advance for the user so far provided by the on-line catalogue has been the power made available for *searching* the file. Searching by separate data elements such as the publisher’s name, searching for individual keywords within titles or subject headings, the implementation of Boolean logic using “and” “or” “not”, the ability to use sequential searching to identify particular strings of alpha-numeric characters, have all opened up completely new vistas for file interrogation. Nevertheless, the data still have to be presented to the user in a comprehensible form. We may ask whether some of the undoubted plusses of enhanced searching power, are being offset at present by losses in the manner of the data presentation.

Centre for Catalogue Research

What factors have to be borne in mind when designing the new systems in order to ensure that users can more easily search for and identify items and then interpret the details presented to them more speedily and more accurately? This question is one of a whole series which the Centre for Catalogue Research has been, and is still, investigating on behalf of the UK library and information community and which also attracts a good deal of interest from overseas.

The Centre was set up by the British Library Research and Development Department in September 1977 and operates on behalf of all types of libraries in the United Kingdom as the national focal point for research, information, and instruction in the field of catalogue research and development. The catalogue has been the most costly tool produced by librarians. Given recent economic pressures, the growth in expenditure on computing, the opportunities for developing multi-functional files, and the new technology, the level of investment now requires justification. It is important to stress that the word "catalogue" in the Centre's title covers the use of bibliographic records for acquisitions, book issue systems, resource sharing schemes, and the study of methods of providing subject access, as well as for the traditional cataloguing function.

User Needs

It has been all too easy for librarians to engage in cataloguing as an arcane pursuit in its own right. Intellectually it can be surprisingly stimulating and possess considerable academic content, but what has often been lacking is any reasonably objective consideration of the impact of this effort on the service to the *user*: not only through the catalogue itself, but also through the possible imbalance in the allocation of resources within the library.

The principal emphasis of the Centre's work is on users and their needs and a particular feature of our work is that, as far as possible, experimental methods should be used. Many studies of catalogue use have been undertaken in the United States and UK over the past fifty years, but almost all of them have been questionnaire or interview studies of how readers used existing catalogues and indexes. Some of these studies also invited users to hypothesise about what they might like to have provided by the catalogue if it was possible, but very few indeed have created alternative files the performance of which could be measured against use. This has been due mainly to the unacceptably high costs of producing alternative parallel files (i.e. files for exactly the same titles but with variant forms of presentation) by manual means. The introduction of computerised production of catalogues and indexes in the mid to late '60s altered the situation significantly.

Bath University Comparative Catalogue Study

Between 1969 and 1971 I was responsible with Gillian Venner for the retrospective conversion of Bath University Library's card catalogue to machine-readable form (Bryant, Venner, and Line, 1972). The conversion was initiated by Maurice Line, the then University Librarian and now Director General of the British Library Lending Division. The decision was made to use catalogue records containing much less data than was usually included in a university library's catalogue. A proposal was submitted to the Office of Scientific and

Technical Information (now incorporated in the British Library Research and Development Department) pointing out that Bath University Library had complete card and complete machine-readable files of its catalogue, together with the programs able to produce a variety of output options. A grant was awarded to fund the Bath University Comparative Catalogue Study (BUCCS) from 1973 to 1975 (see reference note 1). The study compared four physical forms: card, computer printout bound into volumes, 16mm cassetted COM roll-film (indexed and unindexed, motorised and manual), and 42x reduced COM microfiches; and four different sequences, with entries being sequenced by author, title, classified (UDC) and KeyWord Out of Context (KWOC). Figure 1 illustrates a KWOC display.

It is not my purpose to give detailed results here, but fiche proved to be the preferred form, and the reaction to the KWOC sequence was enthusiastically positive. The importance of the BUCCS project lay in the fact that, although it took place in a small university (2,815 students in the academic year 1972/3), it had been a real-life experimental project and had studied the performance of the four physical forms and sequences of catalogue in relation to potential as well as regular catalogue users.

The success of this project, together with the rapid technological developments influencing the library world, led to the establishment of a more comprehensive programme of research in 1977. Two of the projects were especially relevant to those interested in the visual acceptability of data. These were: (i) A study of the performance of full and short entry catalogues, and (ii) A study of a variety of output options for keyword catalogues (i.e. catalogues using the free language of the words in the title, contents page, etc.).

Figure 1. Illustration of catalogue entries displayed with keyword out of context.

CENTRE FOR CATALOGUE RESEARCH: FULL MARC CATALOGUE 23/08/80

- Warner, Thomas Everett
An annotated bibliography of woodwind instruction books.
1600-1830 / by Thomas E. Warner - Detroit: Information
Coordinators, 1967
xv1.138p - (Detroit studies in music bibliography i.11) 0-
911 772-31-6
Shelved at: M 128 W5 WAR
Book No: 10 0234884 1
- Warnock, G. J
Sense and sensibilib / (by) J. L. Austin / reconstructed from
the manuscript notes by G. J. Warnock - London: Oxford
University Press, 1972
2x 144p: 21 cm: Pbk Index - 0-19-500307-1
Shelved at: BF 311 AUS
Book no: 10 0017442 9: 10 0017440 0: 10 0249509 6
- Warnock, Mary
Education: a way ahead / [by] Mary Warnock - Oxford:
Blackwell, 1979
146p - (Mainstream series) 0-631-11281-2
Shelved at: IA632 WAR
Book no: 10 0255658 9
- Warnock, Mary
Ethics since 1900 / [by] Mary Warnock - 3rd ed - Oxford:
Oxford University Press 1978
1x150p: 20 cm: Pbk - (Opus) Previous ed: 1960 - Bibl:
p.145-147 - Index - 0-19-289108-1
Shelved at: BJ 319 WAR
Book no: 10 0235584 2
- Warr, Peter B
The perception of people and events / by Peter B. Warr (and)
Christopher Knapper - London: Wiley, 1968
445p: ill - 24 cm 0-471-92109-2
Shelved at: MM 132 WAR
Book no: 10 0060168 5: 10 00663637 0: 10 0252547 4
- Warr, Peter B
Psychology at work / edited by Peter B. Warr -
Harmondsworth: Penguin, 1971
460p: illos: 18 cm: Pbk. (Penguin education) bibl p403
444 - 0-14-080284-3
Shelved at: H 5548-8 PSY
Book no: 10 0236945 8
- The Warrant chiefs
: indirect rule in Southeastern Nigeria, 1891-1929 / [by]
A.F. Afigbe - New York: Humanities Press, 1972
338p. (Ibadan history series) 0-391-00215-5
Shelved at: JQ 3099-E23 API
Book no: 10 0251368 1
- Warrants and convertibles data book
: an index of warrants and convertible loan stocks available
in the U.K. / [by] Peter Welham - Cambridge: Woodhead
Paulkner, 1975
(1) vii. 109p: 21 cm: 5p 0-85941-022-6
Shelved at: HG 5441 WEL
Book no: 10 0235699 1

Content of catalogue entries

There has been heated debate regarding the amount of detail which should be included in catalogue entries since the days of the great Panizzi. On the one hand there have been those who believe that the local library catalogue should only be a finding list, and on the other there have been many committed to the bibliographic catalogue based on full records adhering closely to the highest standards. As my colleague Alan Seal (formerly research fellow at the Centre for Catalogue Research) has pointed out: "The recent growth of bibliographic networks, the escalating cost of output as files increase in size, the use of less-than-full . . . records in CIP (Cataloguing in Publication) programmes, the rapid growth of on-line information retrieval databases, and several other developments have all highlighted the need for more information on the relative merits of full and short entry catalogues" (Seal, 1983).

The use of a short entry catalogue affects a library system and library users in three main areas: system costs, user needs, and usability. The Centre's report on the project (Seal, Bryant, and Hall, 1982) commented on the latter two areas as follows:

User needs . . . How often does the omission of data mean that a user would fail to find a title which he otherwise would have found? How often would a user be put to some inconvenience by having to check a source other than the library catalogue?

Usability . . . It refers to speed of use, accuracy of searching, and preference . . . Usability interacts with both needs and cost. It is possible to have a catalogue which can cater for any need but this might only be achieved at greater cost and possibly be more difficult to use.

As with the BUCCS project a number of the constituent studies carried out by the Centre involved controlled experiments using parallel catalogue files. Two of these experiments were specifically concerned with usability. The bigger of them was undertaken at the library of the University of Bristol where parallel author/title sequences were produced, each of which contained 55,075 entries. (Figures 2 and 3 show sample frames from both the full and short entry files.) The second experiment was carried out using the library files catalogue of the City University.

Before the experimental COM catalogues were produced, I approached Herbert Spencer and Linda Reynolds at the Royal College of Art for advice on establishing a form of layout for the entries which would be neutral in its effect. We did not want the layouts selected for the tests benefiting the performance of one file at the expense of the other. As a result of this request Reynolds carried out a survey of a range of existing catalogues which demonstrated beyond question the scanty attention paid by librarians and COM producers to the importance of layout both in terms of cost, and, more importantly, usability (Reynolds, 1979a). Figure 4 shows a typical example of a

- Warner I R
 An anthology of modern Portuguese and Brazilian prose.
 Shelves at: PG 9173 AMT
 Book no: 10 0242593 4
- Warner, Malcolm
 Comparative union democracy: organisation and opposition in
 British and American unions. (by) J. Edelman - 1975
 Shelves at: HQ 664 EDE
 Book no: 10 0234241 9
- Warner, Marina
 Alone of all her sex: the myth and cult of the Virgin
 Mary - 1978
 Shelves at: BT 645 WAR
 Book no: 20 0242710 2
- Warner, Robin
 See
 Warner, I R
- Warner, Sam Bass
 Measurements for social history - 1977
 Shelves at: HT 123 WAR
 Book no: 10 0230982 x
- Warner, Thomas Everett
 An annotated bibliography of woodwind instruction books.
 1600-1630 - 1967
 Shelves at: M 128 WS WAR
 Book no: 10 0234884 1
- Warnock, G. J.
 Sense and sensibility. (by) J. Austin - 1972
 Shelves at: BF 311 AUS
 Book no: 10 0017442 9: 100017440 0: 10 0249509 6
- (Warnung an hartherzige Frauenn).
 Des armen Schoeffthors "Warnung an hartherzige Frauen":
 (Andrens Capellanus: "De Amore". Dialogus De deutsch). (by)
 Schoeffthor - 1979
 Shelves at: PT 1651.534
 Book no: 10 0250350 3
- Warr, Peter B
 The perception of people and events - 1968
 Shelves at: HM 132 WAR
 Book no: 10 0060168 5: 10 0063637 0: 10 0252547 4
- Warr, Peter B
 Psychology at work - 1971
 Shelves at: HF 5549-8 PSY
 Book no: 10 0236945 8
- The Warrant chiefs
 : indirect rule in Southeastern Nigeria. 1891-1929. (by) A.
 Afigbo - 1972
 Shelves at: JQ 3099.E23 LFI
 Book no: 10 0251368 1
- Warrants and convertibles data book
 : an index of warrants and convertible loan stocks available in
 the U.K. (by) P. Welham - 1975
 Shelves at: JQ 5441 WEL
 Book no: 10 0235699 1
- Warre, Michael
 Designing and making stage scenery - 1966
 Shelves at: PN 2091.SB WAR
 Book no: 10 0251308 2

Figure 2. Traditional full catalogue entry.

Figure 3. Illustration of short entry in catalogue. Note increase in number of entries visible simultaneously.

AUTHOR	SHROPSHIRE COUNTY LIBRARY TITLE & CLASS	PAGINATION & COLLATION	SUPPLEMENT		YEAR	PRICE	EDITION	PAGE		44
			PUBLISHER & LOCATIONS	PLACE OF PUBLICATION				ISBN	ISBN	
BALCHIN, NIGEL	FATAL FASCINATION - A CHOICE OF CRIME	364.152	200P	HUTCHINSON	LONDON	1964	1.05	S0000003431	0	
	IN THE ABSENCE OF MRS PETERSEN	F		04 HA/02 AU/04 QN/71						
	THE ANATOMY OF VILLAINY	301.151	256P I	COLLINS	LONDON	1950	0.63	S070010904	0	
	A WAY THROUGH THE WOOD	F		02 HS/02						
BALDER, ALTON PARKER	THE COMPLETE MANUAL OF SKIN DIVING	797.23	302P BIK	COLLINS	LONDON	1970	1.25	0 00 221937	9	
				01 DA/01 WN/71						
BALDICK, ROBERT	THE SIEGE OF PARIS	944.08	248P BIK	COLLIER-MACMILLAN	LONDON	1968		S0700053823	0	
				04 ALP04						
BALDWIN, FRANK ARNOLD	SIMPLE SHORT WAVE RECEIVERS	621.384151	140P ID	BATSFORD	LONDON	1964	1.75	S0700152418	0	
				00 05/66						
BALDWIN, JAMES	THE FIRE NEXT TIME	323.173	112P	DATA PUBLICATIONS	LONDON	1970	0.80	0 900328	06 1	
	TELL ME HOW LONG THE TRAIN'S BEEN GONE	F		07 CM/01 MS/07 MS/06 WN/02						
	NOBODY KNOWS MY NAME	323.173	196P	JOSEPH	LONDON	1963	0.67	S0700017057	0	
	THE FIRE NEXT TIME	323.173L	120P	06 HS/05 OA/06 WK/01						
	THE DEVIL FINDS WORK	791.430909352	125P	JOSEPH	LONDON	1968	1.75	S0700031417	0	
	GO TELL IT ON THE MOUNTAIN	F		08 BR/07 DO/08 HD/05 HS/06 MO/04 OA/01						
	GIOVANI'S ROOM	F		JOSEPH	LONDON	1964	1.05	S0700062477	0	
BALDWIN, MICHAEL	THE GREAT CHAM	F		WATTS	NEW YORK	1963	2.20	NEW. 0 531 00312	4	
				03 BR/01 MD/03 MS/02						
				CORGI	LONDON	1978	0.75	NEW. 0 552 10663	1	
BALDWIN, NICK	FARM TRACTORS	629.225	64P IK	01 MD/01						
				JOSEPH	LONDON	1954	2.50	0 7181 0161	8	
				01 BH/52 BH/52 HS/03 SR/02 WR/01						
				JOSEPH	LONDON	1957	2.00	0 7181 0475	7	
				19 BR/13 BY/03 FR/15 HL/17 HS/18 HY/14						
				SECKER & WARBURG	1967	1.38	0 436 03202	3		
				08 BR/08 HL/07 SP/04 SR/06						
				WARNE	LONDON	1977	3.95	0 7232 2060	3	
				12 BY/11 HL/05 HY/01 LU/10 OS/04 OS/06 OS/09						
				WH/07 WK/02						

STAFFIN, H. K. HENLEY, E. J. Stagewise process design; by Ernest J. Henley & H. Kenneth Staffin. Wiley, 1963	STAFFORD, E. M. ELLISON, A. P. The dynamics of the civil aviation industry; by A. P. Ellison & E. M. Stafford. Saxon House. 1974
xxx Shelved at 660.281 HEN in Loan Collection (7305132) (01/01) (c801403260)	xxx Shelved at 387.7334 ELL in Loan Collection (7501238) (01/01) (c270127790)
STAFFING & TRAINING FOR EDUCATIONAL CLOSED-CIRCUIT TELEVISION NATIONAL EDUCATIONAL CLOSED-CIRCUIT TELEVISION ASSOCIATION Staffing & training for educational closed-circuit television: the report of a joint Working Party of the NECCTA ACTT. NCET, 1971	STAFFORD, J. E. SMITH, Samuel V. Readings in marketing information systems: a new area in marketing research: by Samuel V. Smith, Richard M. Brien & James E. Stafford. Houghton Mifflin, 1968
xxx Shelved at 371.3358 NCET in Loan Collection (7500726) (01/01) (c270432320)	xx Shelved at 658.83 SMI in Business School Collection (7106531/7105632) (04/02) (c280681530)
STAFFORD, D. C. CORNER, Desmond Carteret Open-ended investment funds in the EEC and Switzerland; (by) D. C. Corner and D. C. Stafford. Macmillian, 1977 x. 254p. 11l. 23 cm.	STAFFORD, Joseph Hover DE NEUFVILLE, Richard Systems analysis for engineers and managers; (by) Richard de Neufville, Joseph H. Stafford. McGraw-Hill, 1971 xiii. 353p. ill. 24 cm. Title page imprint: London
xxx Shelved at 332.6327 COR in Loan Collection (7611759 7613427) (01/01) (o333154266)	xxx Shelved at 001.424 DEN in Loan Collection (7016443) (01/01) (0070163707)

Figure 4. Illustration of confusing display of catalogue information.

catalogue where the coherence of data relating to any one item is almost impossible to see. Line length, columnar spacing, and levels of indentation obscure and confuse.

Reynolds, in an excellent review article, has summarised some of the legibility research which has been undertaken relevant to modern documentation methods. She writes: "Legibility should be the concern of all those involved in the production of scientific and technical information It has been shown beyond doubt in numerous experiments that design variables can significantly affect the speed and accuracy with which reading tasks are performed. It has also been demonstrated that readers' subjective assessment of *the complexity of the content of a display of information* [my italics] are influenced by the design of the display in terms of typography and layout This is perhaps particularly true of complex printed information such as timetables and instructions, and of information presented in . . . media such as microforms and cathode ray tube displays" (Reynolds, 1979b).

The results of the Centre's usability studies of content showed that it is probable that the degree of fullness of catalogue entries in a COM catalogue does affect the speed and accuracy with which users and library staff can search for items. However, the difference is only small unless the difference between the catalogues is substantial in terms of the number of entries which can be viewed at a time, as was the case in the second experiment (see Figures 5 and 6). Although the single line entry catalogue (Figure 5) looks unattractive

compared with the full version (Figure 6), it was reliably faster (26% quicker) when searching for correctly cited items and even faster (36% quicker) for items which were slightly mis-cited.

Even if the difference in performance when using brief entries is not large, the results are important when considering other factors such as user preference, the page scanning facility, lower costs, and the enhanced possibility of providing free language access through the use of keywords and phrases from title pages, contents pages, and back of book indexes. The latter method of providing additional access to the contents of books is quite uneconomic using normal controlled methods of subject access. Both at Bath and elsewhere users have responded very favourably to the provision of keyword catalogues and the introduction of on-line access makes the free language approach even more effective.

Testing a variety of keyword catalogue output options

The principal means of providing users with a method for searching library catalogues for items on particular subjects has, until recently, been by just using controlled systems. In the case of subject heading catalogues this is through the use of an authoritative list of subject headings such as the Library of Congress Subject Headings (LCSH), and, in the case of classified catalogues through reference to the schedules of a classification scheme such as the Dewey Decimal Classification. I stated earlier that subject heading catalogues can present difficulties through the attempt to maintain a satisfactory scheme of cross references, but classified catalogues, where the entries are filed in the order of the notation of the classification scheme, are hardly used by anyone other than library staff. This is due to the fact that general users of public or academic libraries cannot readily understand the notation, and because a subject index has to be provided to the classification numbers used. This means that they are faced with a two-stage searching task.

The tradition has been for North American libraries to provide catalogues which use subject headings and for British libraries to use classified catalogues. Bath University Library uses the Universal Decimal Classification (UDC), a scheme better suited to the needs of a scientific and technologically oriented stock but which uses a more complex notation than Dewey, including a range of arbitrary signs and symbols. It was clear during the BUCCS project that readers' reactions to the KeyWord Out of Context sequence were very enthusiastic. It was preferred because it provided a one-stage process for searching, and because the words used were those of the author and not those of an indexer. However, the use of the computer to derive words from titles can lead to entry under words which may have no subject content, or which may even be superfluous. Homographs may also cause problems, e.g., GROUP is used in social studies and in mathematics. In KWOC, entry is normally only under single words (Figure 1) which can result in many entries under common

STAFFORD. The dynamics of the civil aviation industry. (ELLISON) 1974. 387.7334 ELL Loan
 STAFFORD. The dynamics of the civil aviation industry. (Ellison) 1974. 387.7334 ELL Loan & Graduate Business Centre
 STAFFORD. The economics of housing policy. 1978. 338.4730154 STA Loan
 STAFFORD. The effect of investment incentive schemes on decisions of firms in the electronics & electrical engineering industries. 1973. Theses
 STAFFORD. The modern economy. 1976. 330.156 STA Loan
 STAFFORD. Open-ended investment funds in the EEC and Switzerland (Corner) 1977. 332.5327 COR Loan
 STAFFORD. Reading in marketing information systems. (SMITH) 1968. 658.83 SMI Business School
 STAFFORD. Systems analysis for engineers and managers. (De Neufville) 1971. 001.424 DEN Loan
 STAFFORD-CLARK. Psychiatry to-day. 1952.
 STAFFORD-CLARK. Psychiatry today. 2nd edition reprinted with revisions. 1973. 157.9 STA Loan
 STAFFORD-CLARK. Psychiatry today. 2nd ed. 1963. 157 STA Loan
 STAFFURTH. The problem of selling & distribution 3rd edition. 1961. 658.8 INS Business School
 STAFFURTH. Project cost control using networks. 1969. 658.1552 STA Business School
 "THE STAGE". The stage guide. 1971. 792.025 STA Loan + reference
 STAGE DESIGN THROUGHOUT THE WORLD. 1970-75. 1976. 792.025 HAI Loan
 STAGE DESIGN THROUGHOUT THE WORLD SINCE 1960. (International Theatre Institute) 1973. 792.025 HAI Loan
 STAGE FRIGHT (HAVAS) 1973. 787.20431115 HAV Loan
 THE STAGE GUIDE. 1971. 792.025 STA Loan + Reference
 THE STAGE LIGHTING HANDBOOK. (Reid) 1976. 792.025 REI Loan
 STAGE RIGHT (Matthew) 1975. 792.0222 MAT Loan
 STAGE-SETTING (Southern) 1937. 792.025 SOU Loan
 STAGE SOUND (Collison) 1976.
 THE STAGES OF ECONOMIC GROWTH. (Rostow) 2nd ed. 1971. 339.5 ROS Loan
 STAGES OF SOCIAL RESEARCH. (Porcese) 1970. 300.18 FOR Loan
 STAGEWISE PROCESS DESIGN. (HENLEY) 1963. 660.281 HEN Loan
 STAGG. Criteria and assumption for numerical analysis of dams. (International Symposium on Criteria and Assumptions for Numerical Analysis of Dams. 1975) 1976. 627.81 NAY Loan
 STAGG. A select bibliography of educational technology. (2nd ed.). 1975. 016.3713078 STA Reference
 THE STAGNANT SOCIETY. (Shanks) 1961. 330.942 SHA Business School
 STAGNER. Psychological aspects of international conflict. 1967. 327.11 STA Loan
 STAGNER. Psychology of personality. 4th edition. 1973. 155.23 STA Loan
 STAHL. Environmental policy and welfare economics. (Hjatte) 1977. Loan
 STAHL. Ethiopia. 1974. 333.00963 STA Loan

Figure 5. Single line allotted to each catalogue entry.

Figure 6. Illustration of the amount of extra space required by conventional catalogue displays, relative to the single line display of Figure 5.

EVOLUTION	Plate tectonics and crustal evolution (Condie, Kent C) 1976	LIB 0551.241 CON	2525100
"	The proofs of evolution (Lechman, J. T.) 1977	LIB 575.8 LEH	2625512
"	Pulmonates Vol.2A Systematics, evolution and ecology 1978	LIB 594.38 PUL	2663872
"	Recent advances in primatology Vol. 3 Evolution (International Primatological Society. Congress. 6th University of Cambridge. 1976) 1978	LIB 575.8:599.8 INT	2683202
"	Stellar evolution (Meadows, Arthur Jack) 2nd ed 1978	LIB 523.8 MEA	2637971 2 copies
"	A study of the evolution of concentration in the electrical appliances industry for the United Kingdom: a report (MLH Consultants Ltd) 1977	LIB 338:621.38 MLH	265633x
"	A study of the evolution of concentration in the food distribution industry for the United Kingdom (Commission of the European Communities) c19	LIB 0658.87 DEV	2654458
EVOLUTIONARY	Behavioural ecology: an evolutionary approach 1978	LIB 591.51:574 BEH	2651823
"	Biogeography: an ecological and evolutionary approach (Cox, Christopher Barry) 2nd ed 1976	LIB 574.9 COX	2679698
"	The development of behavior: comparative and evolutionary aspects 1978	LIB 591.51 DEV	2655489
"	An evolutionary application of advanced flight path prediction capability to the control of air traffic 1977	LIB PA3056	2638185
"	Evolutionary aspects of animal communication, and: Imprinting and early learning (Association for the Study of Animal Behaviour) 1962	LIB 591.51 EVO	8950822

words such as SOCIAL and PROBLEMS which, when combined as the phrase SOCIAL PROBLEMS, become quite specific. There were many other queries raised by the BUCCS project, but the unqualified success of the KWOC catalogue led to plans for further study of keyword methods for accessing library files being included in the 1977 programme of research. It was considered that, not only might lessons be learnt regarding the visual presentation of data which could be relevant in due course to VDU display, but also more knowledge could be gleaned for on-line systems about how users approach the catalogue when subject searching. One of the most interesting comments made by an interviewee during the BUCCS project relevant to this article was that KWOC was: "More likely to inspire you to keep looking." Several senior members of the academic staff commented on the ease with which the file could be scanned, and how interesting it was to be made aware of titles which the searcher had not realised previously were in the library's stock. In other words there was a tendency to actually *read* the catalogue.

Keyword indexing as used by abstracting and indexing services since the early 1960's has frequently been in the KWIC (KeyWord in Context) format. Each entry consists of a keyword together with the words which immediately precede and follow it (hence in context). Because of the single-line entry and the varying length and displacement of the phrases, both in front of and following the keyword, titles often have to be arbitrarily truncated. In addition, the rotation of words in order to align each keyword results in titles being cycled. This means the use of a slash, or asterisk, in order to indicate the first word of the title (see Figure 7).

The arbitrary truncation and cycling of titles, and the use of document numbers to refer to the complete entries for the sought items are likely to prove very discouraging for users of library catalogues. However, if a derived KWIC catalogue could be produced which would not truncate the entry, which would ensure that the entry could be read from left to right, and also be reasonably economic in its use of space, there could be great advantages. This would be because of the easier recognition of compound terms within their context and because these terms would file together and not be separated as in many KWOC sequences due to titles being filed by their first word under each keyword (Prowse, 1983).

Figure 7. Illustration of catalogue displaying keyword in context but having problems with truncated information.

cal metallurgy Part 1 EQUILIBRIUM and general kineti theory (Chr+
 tions of single stro/EQUILIBRIUM properties of aqueous solu+
 owel/An introduction to EQUILIBRIUM thermodynamics in petrology (P+

Figure 8 shows the first KWIC output produced by the Centre. This option was subject to testing by library users at Imperial College Library in 1983 when it was compared with five other variants of KWOC and KWIC layout. Both in terms of performance and user preference, this centre-aligned KWIC was the clear winner. A report giving the detailed results of these experiments is to be issued (Bryant and others, 1984). Of particular interest was the fact that, because the keywords were centred, the test searchers were able to see both the preceding and the following words in their peripheral vision. A final point for comment is that this was a file where the searcher's eye entered the body of the entry directly without first having to process a heading, or a classification number.

On-line public access to library files

One of the major areas of research which is currently being undertaken by my colleagues Alan Seal, Janet Kinsella, and Steven Prowse is the use and design of systems providing public access to on-line library files. The overall objectives are: (i) to compare the effectiveness of on-line access with alter-

Figure 8. Arrangement of catalogue entries displaying keyword in context which avoids truncation problems.

Plate tectonics and crustal	EVOLUTION (Cowie, Ken C) 1976	LIB 0551.241 CON	2525100
The proofs of	EVOLUTION (Learman, J. P) 1977	LIB 575.8 LEH	2625512
Recent advances in primatology Vol.3	EVOLUTION (International Primatological Society. Congress. 6th. University of Cambridge. 1976) 1978	LIB 57.4:599.8 INT	2693202 2 copies
Stellar	EVOLUTION (Meadows, Arthur Jack) 2nd ed 1978	LIB 523.8 MEA	2639971 2 copies
Stellar	EVOLUTION (Meadows, Arthur Jack) 1967	LIB 523.8 MEA	2276321 2 copies
Channels of grocery distribution: changing states in	EVOLUTION: a comparison of U.S.A. and U.K. (Padberg, D I) 1973	LIB 0658.87 PAD	2676990
Pylmonatas Vol.2Y Systematics,	EVOLUTION and ecology 1973	LIB 594.38 FUL	2663872
	EVOLUTION and the fossil record: readings from Scientific American (1978)	LIB 56 EVO	2645092
	EVOLUTION and the genetics of populations: a treatise in four volumes Vol. 4 Variability within and among natural populations (Wright, Sewell) 1978	LIB 575.17 WRI	2639572
Molecular	EVOLUTION and the origin of life (Fox, Sidney W) (1972)	LIB 573.522 FOX	2304821
Molecular	EVOLUTION and the origin of life (Fox, Sidney W) Rev. ed c1977	LIB 573.522 FOX	2620693
Cement standards	EVOLUTION and trends: a symposium, St. Louis, No., 7 Dec. 1977 c1978	LIB SHELVED AS PERIODI ****	
	EVOLUTION: concepts and consequences (Dillon, Lawrence Samuel) 2nd ed. 1978	LIB 575.8 DIL	2645099
Nonlinear	EVOLUTION equations (Symposium on Nonlinear Evolution Equations Madison 1977) 1978	LIB 517.9 SYM	266965x

native forms, (ii) to examine alternative design options for on-line systems in order to provide guidelines for systems designers, (iii) to study the effect of on-line access on users' attitudes and use of libraries, and (iv) to investigate the potential of on-line systems for providing services which have not been available before.

The Centre will be especially interested in the use of classification for the internal structuring of data for on-line catalogues. Although users will enter the files using natural language, the system will be able to display titles on related subjects even though the same keywords do not necessarily appear in the records concerned.

The work of the Centre is proving to be relevant to institutions other than libraries. More and more information systems and inventories are being accessed using on-line methods. It is vitally important that attention is paid to the adequate design of data presentation to produce more usable and understandable products. If any reader thinks we may be able to be of assistance to them, please write to us.

The details and opinions included in this article are the responsibility of the author and do not necessarily reflect those of the British Library Research and Development Department.

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