

End User Search Systems: Access to Library and Information Science Literature

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Introduction

TWO DATABASE VENDORS, BRS and DIALOG, now offer simplified search systems with a variety of databases for the end user searcher. BRS/After Dark and DIALOG's Knowledge Index are expanding the librarian's role from that of search intermediary to that of instructor in the use of online systems. Such a change will have an impact on library services and should influence library and information science education.

This article reviews the literature on end user searching and, since there has been no comparable study in the area, provides a preliminary investigation on the usefulness of the end user systems to the library and information science student.* This study looks at costs, vendor choice, searching precision, and also at databases that students choose when given the opportunity to become end user searchers.

Literature Review

"User-friendly" end user system—BRS/After Dark and Knowledge Index—have been reviewed by Tenopir, Mader, Janke, Ojala, and

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Kaplan.¹ Since the inception of these simplified systems, end user searching has generated much discussion and more than a little controversy.² Studies on other services like The Source and CompuServe; front-end and gateway systems like Sci-Mate, InSearch, or EasyNet; and also the greater availability and enhanced capabilities of microcomputers, have added to the literature. To illustrate, two articles by Janke³ list bibliographies on end user searching that total 181 references.

Numerous case studies document medical and allied health personnel,⁴ scientists,⁵ lawyers,⁶ engineers,⁷ university faculty,⁸ journalists,⁹ and the general public¹⁰ as end users. College students, as one might expect, have been studied most often.¹¹

But in particular the use of BRS/After Dark and Knowledge Index has generated the most study. Janke at the University of Ottawa has been the most enthusiastic about the use of BRS/After Dark.¹² Trzebiatowski, in a study at the University of Wisconsin, chose participants from appropriate reference desk transactions and then surveyed these end users' reactions to BRS's menu-driven system.¹³ Mader and Park at Memphis State University conducted a study in 1984 and concluded that there was an "overwhelmingly positive response" to its use.¹⁴ Halperin and Pagell at the Wharton School of the University of Pennsylvania offered the innovation of free end user searching to all business students.¹⁵ Friend at Pennsylvania State University conducted a study of end user searching by graduate students in educational psychology as part of course-related library instruction.¹⁶ At Texas A&M University, Jaros, et al. reported on the costs of an experiment in subsidized end user searching for a large student population,¹⁷ while most recently, Branch at Johns Hopkins University discussed developing a conceptual approach to teaching end users as part of its library instruction program.¹⁸

Among this research, however, we could find no studies dealing specifically with library and information science students as searchers of these end user systems. Some earlier work looking at the use of online databases by librarians and library and information science students is pertinent to this study. In 1981 LaBorie and Halperin used beginning library and information science students' searches to compare the online databases *Library & Information Science Abstracts (LISA)* and *ERIC* for precision and recall. Librarians did the searches on DIALOG for students in that study.¹⁹ In another study, LaBorie compared six databases for the information professional for their coverage of materials of interest to those in the information field.²⁰

Methodology

For our study on library and information science students as end users, volunteer students (n=17) from Drexel University's College of Information Studies were offered free database searching on the two end user systems. They were provided with lists of available databases and guides to searching each system. The students were allowed to search any of the databases and use either or both search systems. A librarian/monitor was available to answer questions and log students onto the system.

Only two of the students had previous experience on an end user system although all but four had some database searching experience. Most students had used OCLC or the full BRS or DIALOG systems either through their coursework or some job-related activity. The documentation we provided to them included a copy of DIALOG's brief system guide to Knowledge Index and a two-page guide to BRS/After Dark searching which had been developed at the Drexel University library.

We did not recommend one system over another but if asked would explain, for example, that BRS/After Dark was a menu-driven system and Knowledge Index was command-driven. Most students chose a specific system because of the databases that were available. Six students searched both systems.

Most students selected the databases they wished to search by reading the database lists and descriptions. If asked, the monitor would recommend databases that were relevant to the subject area of the search. All but one student asked for assistance in formulating his/her search strategy. Six asked for a thesaurus to help them select terms for their search.

As monitors, we maintained a detached but helpful attitude during the search sessions. After logging students on we stayed at the terminal to answer any questions. We found a wide range of ability among the students; some were able to work quite independently while others required continual assistance. We placed no time limit on the search sessions. On the average, an hour was spent with each student; search sessions ranged from thirty minutes to ninety-five minutes.

The students were required to complete a presearch worksheet to help them prepare the search and a postsearch questionnaire (see appendix A) on which their experience was evaluated. Finally, the students were required to provide a copy of their completed papers so that their bibliographies and footnotes could be matched with citations used from their searches.

Findings

Search Sessions

The more adventuresome students tried between six and seven databases but most searched only two databases (mode); the average number accessed was 3.15. Data on the seventeen search sessions is summarized in table 1; complete data can be found in appendix B. Two students searched for over an hour; the average time online was thirty-six minutes, and the average cost for all sessions was \$9.84.

For comparison, students studied by Friend used an average of 1.86 databases per session and spent an average of thirty minutes online.²¹ The average cost (\$4.80) was much lower than in our study. We think the lower cost can be attributed to the high percentage of use of the inexpensive ERIC database—46 percent in the Friend study and 18 percent in our study.

Halperin and Pagell reported an average of \$4 per search for business graduate and undergraduate students who were allowed fifteen minutes free search time on BRS/After Dark.²² This cost rate is very close to that in our study.

Cost and Time Online by Vendor

In addition to looking at the cost and time online for each search session, use of individual databases on the two vendor systems was also examined. (This data is summarized in table 2; a detailed list by database accessed is presented in appendix C.)

TABLE 1
SEARCH SESSION SUMMARY

Number of Databases Used by a Student:	
Range:	1-7
Mode:	2
Average:	3.15
Online Time in Hours:	
Range:	.234-1.231 (14-74 minutes)
Average:	.604 (36 minutes)
Cost:	
Range:	\$1.93-\$23.80
Average:	\$9.84

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TABLE 2
COST AND TIME ONLINE BY VENDOR
(60 searches on 24 databases)

<i>Vendor</i>	<i>No. of Searches</i>	<i>Hours Online</i>	<i>Average Hours</i>	<i>Total Cost</i>	<i>Average Cost Per Search</i>
BRS	44	8.623	.196	\$127.82	\$2.91
DIALOG	16	1.649	.103	\$39.49	\$2.47
TOTAL	60	10.272	.171	\$167.31	\$2.79

BRS/After Dark was found to be the most heavily used system. Nine students used BRS only, two used Knowledge Index only, and six used both systems. Nine out of seventeen (53 percent) student questionnaires indicated that the databases available on the system were the reason for the choice. Of the databases searched, 73 percent were on BRS. Our sample size is much too small to make a definitive evaluation of the desirability of the two systems, but the trend toward favoring BRS when cost is no object is difficult to ignore.

Of the total online time, 84 percent was spent on BRS; however, students spent almost twice as much average time online on BRS. We believe this is due to use of the menu-driven system, which is more time consuming, rather than a difference in the volume of citations printed. The average number of citations per search on each system was nearly identical—BRS/After Dark, 17.5; Knowledge Index, 17.6.

Similarly, the average BRS search cost was forty-four cents more. But costing database access on the two systems is not a simple matter because the charging systems are different. Knowledge Index charges a flat rate (\$24 per hour) while BRS/After Dark charges variable rates in addition to per citation print charges on certain databases.

Although on a per search basis BRS was more costly, on an hourly basis it was less expensive. BRS's hourly cost was \$14.82 and DIALOG was \$23.95. For comparison, Mader reported an average search cost on BRS/After Dark as \$11 per hour.²³ Jaros reported the average search session as twenty-three minutes costing \$5.67 which calculates to \$14.79 per hour.²⁴

Search Subject

The student's choice of databases was influenced by the courses offered in the College of Information Studies. For example, the number

of searches on business databases was no doubt influenced by the "Resources in Business" course which was taught during the term when this study was conducted. If a science reference course had been taught, the databases chosen would certainly have been different.

In appendix D the databases used by the students are broken down into five subject categories that correspond to those used by BRS in its database listing. Business and science databases were the most heavily used, followed closely by social science and education.

ERIC, an educational database which indexes many key library and information science journals, was used nearly twice as much as any other database. The general social science database, *Social Sciences Citation Index* (SSCI) and the two business databases, *Trade and Industry Index* (BIZZ) and *ABI/Inform* (INFO), were just as heavily used. The *INSPEC* file which LaBorie found very useful for library and information science topics, was little used, either because students were not familiar with it or because the database's primary focus on engineering appeared to be irrelevant to the subject area of most searches.²⁵

Precision

We found that students did not use many of the citations found in their searches. In fact, on the average, only one citation was used for each database accessed or 3.5 per paper.

In the postsearch questionnaire, students were asked to rate how they felt about the results of their search. Twelve indicated "satisfied," four indicated "somewhat satisfied," and only one student indicated that his search session was "disappointing." If this is a true assessment, then the students must have gotten something from their searches besides usable citations. One student did note that: "It was interesting what was not online about this subject."

"Precision" in database searching is a standardized measure of the ratio of relevant citations retrieved to total citations retrieved. We followed a strict measure of relevance—i.e., a citation was considered relevant if it was used in a student's bibliography. We used the following formula for computing the precision ratio:²⁶

$$\text{Precision} = \frac{\text{Number of relevant documents retrieved}}{\text{Total number of documents retrieved}} \times 100$$

Appendix E shows the average precision ratio for all searches was 5.7 percent. Nine of twenty-three databases had a precision ratio above 0.00 and are shown in table 3.

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TABLE 3
DATABASES WITH PRECISION RATIO ABOVE 0.00*

	Database	No. of Uses	Cites Printed	Cites Used	Precision Ratio
NOOZ	National Newspaper Index	1	12	2	16.6
NRIC	National Rehabilitation Information Center	1	12	1	8.3
ERIC	ERIC	11	294	23	7.8
INFO	ABI/Inform	6	219	17	7.7
COMP3	Microcomputer Index	4	136	7	5.1
BIZZ	Trade & Industry Index	6	83	3	3.6
COMP4	Computer Database	4	97	3	3.1
INSP	INSPEC	3	66	2	3.0
SSCI	Social Science Citation Index	6	70	2	2.9

*See appendix D for a complete list of all databases searched.

The ERIC database, with a precision ratio of 7.8 percent, was one of the most relevant databases. The precision compares closely with a 1981 study in which librarians performed searches for library and information science students on the ERIC and LISA databases. Precision for ERIC in that study was 8 percent.²⁷

The ABI/Inform database also showed high relevance (7.7 percent). NRIC, the National Rehabilitation Information Center's database, and NOOZ, the *National Newspaper Index*, also had high precision but represent a low sample size. Table 3 presents the databases which had searches with a precision ratio higher than zero; appendix E presents more detailed data.

Discussion

Certainly most library and information science degree programs today have programmed database searching into their curriculum. Since many of these students will soon be in the position of teaching library patrons to use the end user systems it is also essential that they have exposure to the systems. Also, end user search facilities should be available to students so that they can continue to exercise and refine their searching skills at the inexpensive rates offered by the end user systems.

Although the primary databases for library and information science information (*LISA* and *Information Science Abstracts*) are not on the end user systems, students do not hesitate to try a variety of databases in different subject areas, and this limited study has shown that there are many databases available on the end user systems that are useful to library and information science research.

Precision appears to be low but, as Lancaster notes, users have different requirements for precision at different times.²⁸ Our student searchers, rather than using carefully developed search strategies aimed at high precision, frequently approached their search as a preliminary test of their topic—i.e., to see how much and what kind of research is available. Some students searched more than one topic which would also account for an individual and overall lower precision.

Mancall has observed, in her studies of middle school and high school students as end users, that not many utilize citations from their searches in their final papers. In a report on her unpublished research, she suggests that few citations are used because they are either too sophisticated or too difficult to obtain.²⁹

Because of the expense of online searching, librarians acting as intermediaries have typically avoided the “let’s go exploring” approach to searching. End users, however, appear to approach searching differently. The lower cost of the end user systems allows them the freedom to use the online system as a tool to refine and narrow their topic or test out an idea for a research paper.

This type of approach by end users was noted by Kollmeier and Staudt in a project in which freshman composition students were taught to search. They concluded that “the researcher who needs to explore...will profit from the unmediated ‘hands-on’ experience of the exploring process that online searching provides.”³⁰

If end user systems continue to simplify in ease of use and expand their offerings of inexpensive databases, we will see increased use by those in the library and information science fields. The addition of a file specifically for library and information science would make these systems especially attractive to librarians and students.

Conclusions

Controlled observation of a small sample of library and information science students doing end user searching showed that they found useful databases on *BRS/After Dark* and *Knowledge Index* and relevant citations for their searches. Precision was low in the student searches,

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but this did not dampen enthusiasm for the end user systems; indeed, the searching process meant more than the discovery of citable references. Future studies in this area should include not only larger groups of students but also professional librarians.

End user search systems will have an impact on library instruction programs. Librarians, in addition to their role as search intermediaries, will also be expected to teach the use of online systems. Therefore, end user search systems should be available to library and information science students, both as an educational tool to prepare them for this new teaching role and as a practical information system to provide inexpensive access to databases that will assist them with their coursework.

Working with students during this study, we found that much assistance is required for new users of these "user-friendly" systems. Effective use of these systems requires: (1) a familiarity with microcomputer software and hardware, (2) a general knowledge of the construction and subject content of databases, (3) a sense of how to develop a search using pertinent search terms and Boolean operators, and (4) a familiarity with the search commands used by the search system. Of these four competencies, only the last—simplification of the search command system—has been addressed by the end user search systems we studied. A great deal of preparation and background knowledge is still required of the novice user.

When asked in the postsearch questionnaire how their search session could have been improved, five students remarked that more time should have been spent developing their search strategy or gaining familiarity with search commands. One astute student remarked that, "*Library Literature* and *LISA* could have been made available."

Appendix A

End-User Search System Evaluation Postsearch Questionnaire

1. Name _____ Phone (____) _____
2. Graduate Student Undergraduate Student (check one)
3. Approximate number of semester hours completed _____

PAST EXPERIENCE

4. Have you had any previous experience with database searching?
- None.
 - Have taken a course or workshop with some online practice.
 - Have taken a course or workshop with no online practice.
 - Have taken the library's End-User Training Workshop.
 - Other (explain) _____
5. If you have done some online searching, check the systems that you have had experience with:
- BRS (Full system)
 - BRS/After Dark
 - DIALOG (Full system)
 - Knowledge Index
 - SDC
 - OCLC
 - Other (list) _____

SYSTEMS USED TODAY

- 6a. Did you use **only** BRS/After Dark today? (check if yes)
Why did you choose BRS/After Dark? _____

- 6b. Did you use **only** Knowledge Index today? (check if yes)
Why did you choose Knowledge Index? _____

- 6c. Did you used **both** BRS/After Dark and Knowledge Index today?
(check one) After Dark Knowledge Index
Why? _____

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DATABASES USED TODAY

7. Why did you choose the database(s) you used today? (check any)

- Chosen from previous searching experience.
- Chosen after reading documentation.
- Suggested by another person (colleague, professor, etc.)
- Suggested by Drexel librarian.
- Other (what?) _____

8. If you searched more than one database today, list those which were the best for finding articles on your topic?

GENERAL COMMENTS

4. Do you think you will do more of your own database searching in the future? _____

5. In general, how do you feel about the results of your search?

- Satisfied
- Somewhat satisfied
- Disappointed

6. If you were not completely satisfied, how do you think the search could have been improved?

7. How much would you be willing to pay for the search you just completed? (check one):

- Would not pay.
- \$0 to \$3
- \$4 to \$7
- \$8 to \$10
- \$11 to \$15
- \$15 to \$20

THANK YOU!

Appendix B

Time Online and Cost of Search Sessions

Searcher Number	Number of Databases Used	Hours Online	Cost
1	1	0.321	\$1.93
2	3	0.453	\$2.71
3	4	0.389	\$4.47
4	2	0.324	\$4.62
5	2	0.234	\$5.61
6	1	0.290	\$6.90
7	5	0.630	\$7.01
8	6	0.422	\$8.11
9	2	0.630	\$8.43
10	2	0.525	\$9.66
11	4	0.762	\$11.22
12	2	0.732	\$11.78
13	7	0.772	\$14.23
14	2	0.668	\$15.04
15	5	0.704	\$15.19
16	6	1.185	\$16.60
17	6	1.231	\$23.80
Total	60	10.272	\$167.310
Average		0.604	\$9.842

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Appendix C

Time Online and Cost by Database Used

BRS/After Dark Searches

FILE	HRS ON	COST	FILE	HRS ON	COST
AHCI	0.042	\$0.60	INSP	0.143	\$2.15
BEBA	0.066	\$0.40	INSP	0.207	\$3.11
BIZZ	0.034	\$0.57	IRRI	0.051	\$0.30
BIZZ	0.054	\$1.38	MESH	0.128	\$2.82
BIZZ	0.325	\$10.08	MGMT	0.059	\$0.85
BIZZ	0.134	\$2.98	MGMT	0.08	\$1.12
BIZZ	0.097	\$4.34	MGMT	0.049	\$0.69
BIZZ	0.221	\$6.82	NOOZ	0.124	\$3.18
ERIC	0.315	\$1.89	NRIC	0.087	\$0.52
ERIC	0.321	\$1.93	NTIS	0.093	\$0.74
ERIC	0.231	\$1.38	NTIS	0.113	\$0.90
ERIC	0.202	\$1.20	PREV	0.026	\$0.57
ERIC	0.405	\$2.43	PSYC	0.028	\$0.40
ERIC	0.351	\$1.11	PSYC	0.217	\$2.95
ERIC	0.417	\$2.50	RBOT	0.087	\$1.64
ERIC	0.204	\$1.22	SSCI	0.294	\$8.28
ERIC	0.327	\$1.96	SSCI	0.111	\$2.10
INFO	0.358	\$5.37	SSCI	0.225	\$6.00
INFO	0.156	\$2.20	SSCI	0.251	\$7.92
INFO	0.343	\$4.96	SSCI	0.12	\$3.40
INFO	0.598	\$8.80	SSCI	0.101	\$2.02
INFO	0.299	\$4.26	Total	8.623	\$127.82
INFO	0.529	\$7.78	Average	0.196	\$2.91

Knowledge Index Searches

FILE	HRS ON	COST	FILE	HRS ON	COST
COMP1	0.061	\$1.46	CORP1	0.093	\$2.23
COMP2	0.016	\$0.40	CORP3	0.135	\$3.24
COMP3	0.29	\$6.90	ERIC	0.126	\$3.02
COMP3	0.136	\$3.25	ERIC	0.108	\$2.59
COMP3	0.075	\$1.80	GOVE2	0.033	\$0.79
COMP3	0.094	\$2.26	LEGAL	0.056	\$1.34
COMP4	0.123	\$2.95	Total	1.649	\$39.49
COMP4	0.076	\$1.82	Average	0.103	\$2.47
COMP4	0.096	\$2.30			
COMP4	0.131	\$3.14			

Appendix D

Time Online and Cost by Subject

Database	No. of Uses	Time Online (Hours)	Cost	
<i>Business</i>				
BIZZ	Trade & Industry Index	6	0.865	\$26.17
CORP1	Standard & Poor's News	1	0.093	\$2.23
CORP3	S & P's Corp. Descriptions	1	0.135	\$3.24
INFO	ABI/Inform	6	2.283	\$33.37
MGMT	Management Contents	3	0.188	\$2.66
<i>Education</i>				
BEBA	Bilingual Education Abstracts	1	0.066	\$0.40
ERIC	ERIC	11	3.007	\$21.23
<i>Science and Medicine</i>				
COMP2	Int'l Software Database	1	0.016	\$0.40
COMP3	Microcomputer Index	4	0.595	\$14.21
COMP4	Computer Database	4	0.426	\$10.21
INSP	INSPEC	3	0.411	\$6.72
MESH	Medlars	1	0.128	\$2.82
NTIS	Nat'l Technical Info. Service	2	0.206	\$1.64
RBOT	Robotics Information	1	0.087	\$1.64
PREV	Medicine & Psychology Previews	1	0.026	\$0.57
<i>Social Science and Humanities</i>				
AHCI	Arts & Humanities Citation Index	1	0.042	\$0.60
IRRI	Rehabilitation Research Information	1	0.051	\$0.30
LEGA1	Legal Resource Index	1	0.056	\$1.34
NRIC	National Rehabilitation Information Center	1	0.087	\$0.52
PSYC	Psychological Abstracts	2	0.245	\$3.35
SSCI	Social Science Citation Index	6	1.102	\$29.72

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	Database	No. of Uses	Time Online (Hours)	Cost
GOVE1	GPO Publications Reference	1	0.033	\$0.79
<i>Reference Databases</i>				
NOOZ	National Newspaper Index	1	0.124	\$3.18
Total		60	10.272	\$167.31

Appendix E

Precision Ratio

<i>Database</i>	<i>No. of Uses</i>	<i>Cites Printed</i>	<i>Cites Used</i>	<i>Precision Ratio (%)</i>	
<i>Business</i>					
BIZZ	Trade & Industry Index	6	83	3	3.6
CORP1	Standard & Poor's News	1	2	0	0.0
CORP3	S & P's Corp. Descriptions	1	1	0	0.0
INFO	ABI/Inform	6	219	17	7.7
MGMT	Management Contents	3	8	0	0.0
<i>Education</i>					
BEBA	Bilingual Education Abstracts	1	3	0	0.0
ERIC	ERIC	11	294	23	7.8
<i>Science and Medicine</i>					
COMP2	International Software Database	1	0	0	0.0
COMP3	Microcomputer Index	4	136	7	5.1
COMP4	Computer Database	4	97	3	3.1
INSP	INSPEC	3	66	2	3.0
MESH	Medlars	1	20	0	0.0
NTIS	Nat'l Technical Info. Service	2	10	0	0.0
RBOT	Robotics Information	1	6	0	0.0
PREV	Medicine & Psychology Previews	1	0	0	0.0
<i>Social Science and Humanities</i>					
AHCI	Arts & Humanities Citation Index	1	0	0	0.0
IRRI	Rehabilitation Research Information	1	2	0	0.0
LEGA1	Legal Resource Index	1	2	0	0.0
NRIC	National Rehabilitation Information Center	1	12	1	8.3
PSYC	Psychological Abstracts	2	5	0	0.0
SSCI	Social Science Citation Index	6	70	2	2.9
GOVE1	GPO Publications Reference	1	1	0	0.0

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<i>Database</i>	<i>No. of Uses</i>	<i>Cites Printed</i>	<i>Cites Used</i>	<i>Precision Ratio (%)</i>
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Reference Databases

NOOZ	National Newspaper Index	1	12	2	16.6
Total		60	1049	60	

AVERAGE PRECISION RATIO = CITES USED/DOCS RETRIEVED =
60/1049 = 5.7%

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