ABSTRACT
              A survey of public library users was conducted
regarding retrieval results of unassisted user searches in general
periodical indexes. The data were analyzed to evaluate the impact or
lack of impact of searching a CD-ROM index with loosely-controlled
vocabulary and expanded-search capabilities (i.e., InfoTrac-General
Periodicals Index) versus a print index with a more highly-controlled
vocabulary (i.e., Readers' Guide to Periodical Literature).
Statistics include the age of the searcher, the experience with
searching indexes, the experience with computers, recall and
precision retrieval results, and user satisfaction with retrieval
results. Problem areas considered in InfoTrac were variant headings
assigned for one individual and one heading assigned to two different
people. The results of the study indicate higher user satisfaction
with the electronic index even when recall and precision rates are
lower than when using the print index. Overall results indicate
users' precision scores are lower when multiple variant headings are
used with no cross-references and that users are not aware of the
inaccuracies of their searches. The user questionnaire is included in
the appendix. (Contains 24 references.) (Author/JLB)

RETRIEVAL RESULTS OF UNASSISTED SEARCHES
OF TWO GENERAL PERIODICAL INDEXES

A Master's Research Paper submitted to the
Kent State University School of Library and Information Science
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by

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Retrieval Results of Unassisted Searches of Two General Periodical Indexes

A survey was conducted regarding retrieval results of unassisted-user searches in general periodical indexes. The data was analyzed to evaluate the impact or lack of impact of searching a CD-ROM index with a loosely-controlled vocabulary versus a print index with a highly-controlled vocabulary. Statistics include the age of the searcher, the experience with searching indexes, the experience with computers, recall and precision retrieval results, and user satisfaction with retrieval results.

Problem areas considered in InfoTrac were variant headings assigned for information about the one individual and one heading assigned to two different people. The results of the study indicate higher user satisfaction with the electronic index, InfoTrac, even when recall and precision rates are lower than when using the print index, Readers' Guide to Periodical Literature. This could be a result of the perception that the database was probably larger and that the user missed relevant articles. Overall results seem to indicate users' precision scores are lower when multiple variant headings are used with no cross-references, and that users' are not aware of the inaccuracies of their searches.

Master's Research Paper by

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M.L.S., Kent State University, 1992

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1. Introduction

Authority control has been a basic principle of librarianship for decades. Whether in the card catalog or as a part of an index, authority control used in conjunction with a system of cross-references has provided the means for gathering together information on like subjects and providing access to that information through various access points. In the practice of indexing the term authority control may not be commonly used but the term consistency is. Consistency itself is at the core of authority control.

As we move into the future with capabilities for boolean or keyword searching in electronic databases, the value of maintaining established subject headings and strict authority control has been discussed. Along with this trend is the rapid move from print indexes to electronic indexes. Computer-aided indexing provides an opportunity for improvement in consistency of access to information for these users. The resulting product of computer-aided indexing has been seen to fall anywhere along a continuum; some are better than print indexes and some are worse.

Reference librarians, though squeezed between the budget cuts resulting from an economic recession and the difficulty of keeping up with the increasing use of libraries, still voice concern over the lack of quality in indexes and databases. It is, in most cases, considered the responsibility of the information staff to determine policies and to determine which tools are appropriate for individual searches (Booth and South 1982). There has been an increase in interest in streamlining services in public as well as academic libraries so that more unassisted research can take place. In a public library the researcher may be a student, businessman, consumer, or job seeker. The indexes used are usually general periodical indexes.

1.1 The Problem

The problem addressed by this study was to examine the impact or lack of impact of maintaining traditional authority control over subject headings in a general periodical index. To reach this end, the study examined the impact on an unassisted, untrained user's search when searching a CD-ROM index with loosely-controlled vocabulary and expanded-search capabilities versus a print index with a more traditionally-structured vocabulary (access points). Specifically, the study examined the results of the user's search for records in InfoTrac-General Periodicals Index containing perceived problem headings versus the results of the same search in the print index <u>Readers' Guide to Periodical Literature</u>.

1.2 Definitions of Terms

<u>Authority control</u> in this study is defined as "the process of maintaining consistency in the verbal form used to represent an access point and the further process of showing the relationships among names, works, and subjects" (Taylor 1992).

<u>IAC</u> is an acronym for Information Access Company of California.

<u>InfoTrac</u> is a trademark of the Information Access Company of California. The label InfoTrac refers to several CD-ROM indexing and abstracting databases offered by IAC. Some of these are LegalTrac, Health Reference Center, and General Periodicals Index. The term <u>InfoTrac</u> in this study refers only to the General Periodicals Index, available since 1985.

<u>Precision</u> is the proportion of retrieved items that are relevant and <u>recall</u> is the proportion of relevant items retrieved as a result of a search (Salton 1992). According to Losee (1991), when R and N represent the number of relevant and non-relevant documents in the database and R_{ret} and N_{ret} represent the number of relevant and non-relevant documents already retrieved, these measures may be computed as follows:

$$\text{Recall} = \frac{R_{ret}}{R} \quad \text{and} \quad \text{Precision} = \frac{R_{ret}}{(R_{ret} + N_{ret})} .$$

Rowley (1982) states these formulas as:

$$\text{Recall ratio} = \frac{\text{Number of relevant documents retrieved}}{\text{Number of relevant documents in the system}} \times 100\%$$

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

<u>Readers' Guide to Periodical Literature</u> is a general periodicals print index produced by H. W. Wilson Company and available since 1900.

<u>Unassisted research</u> refers to patrons receiving no assistance or training from library staff to use the bibliographic databases on CD-ROM (Allen 1989). Hall, Talan, and Pease (1987) mention "naive students' using InfoTrac with little instruction or guidance; Reese (1988) mentions that InfoTrac is a "self-explanatory index for beginners" and that many users have no previous library research experience. In this study, the phrase <u>unassisted research</u> or <u>user</u> will refer to the user receiving no instructions in the use of the index other than those provided by the index itself. In addition, the user will be provided with no instruction from the library staff or the researcher in developing search techniques.

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1.3 Limitations of the Study

Since the monthly InfoTrac CD-ROM spans the years 1986 to the previous month of the current year, the years searched in this study included 1986 to the month currently included in the InfoTrac database. The data collection was conducted over no longer that two consecutive weeks for InfoTrac as InfoTrac is updated monthly. Because the number of records included in a database that spans eight years is considerable, three sample searches with a limited number of possible retrievals were chosen to test the success of the users' searches. The study was limited to two months for data collection, compilation and evaluation of the results. The numbers of individuals willing to participate was small and the rejection rate was high; therefore, the total sample size was 44.

2. Literature Review

2.1 Overview of Indexing Quality

In the field of indexing and abstracting there are many elements to consider when looking at quality. The elements of quality in an index may not be easily enumerated as defining them would involve subjective processes and because indexes are designed for different purposes and for different users.

Jennifer Rowley believes that "An index, whatever theory it reflects, must be comprehensible to its users". She gives a synopsis of features that a good index would exhibit, the major points being that the subject and the relationships between subjects are labeled effectively so that search strategies can be developed by the user. Other researchers have mentioned elements of quality in an online database record that could also be measured in a CD-ROM database. These are mechanical accuracy, appropriateness of headings, level of detail and intellectual accuracy (Zeng 1993).

As a facet of information retrieval and storage, the quality of indexes and indexing has been measured by various tests. Some consider Armand V. Feigenbaum's <u>Total Quality Control</u> to be the standard in determining quality in indexes (Buchan 1992). Though the tests for quality in indexes have not been officially standardized the most widely used and known tests are recall and precision (Losee 1992; Salton 1992), which are frequently connected to user satisfaction (Chu and Ajiferuke 1989).

Chu and Ajiferuke (1989) indicate that relevance and user-satisfaction judgments create problems because of subjectivity. The relevance formulas are based on the concept of exhaustivity in which it is assumed that the searcher wants to find all records related to the focus of the search. Some researchers believe that this is rarely the case (Salton 1992), though it is really up to the searcher to decide which items are relevant. If not all documents are indexed with appropriate cross-linking so that the

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records <u>can</u> be found, then the searcher's option to determine relevance is lost before he even begins.

Other methods of measurement of quality of online systems have been developed for the National Library of Medicine (White and Griffith 1987) and proposed for use by White and Griffith (1987). In this method, three dimensions of an indexing system are identified for measurement. These are "(a) linking related documents, (b) discriminating broadly among these linked subsets within the entire file, and (c) discriminating finely among individual documents."

Whichever method is used, there are recurring variables being studied with each of the methodologies--exhaustivity through linking of documents and discrimination through specificity. With the increasing use of computers in the Information Age, the possibility of providing true consistency in indexes is very real. Early on some information specialists felt that automatic indexing, in which the indexing was done entirely by the computer, would be the wave of the future. In reality it seems that the most current viable use of computers in indexing is computer-aided indexing, in which the computer is used to manipulate text and to maintain consistency and standards through lexicographical interaction (Buchan 1992).

A good index should provide precision, consistency and cross-linking in order to provide access to information. In this way the phrase "A mis-shelved book is a lost book" applies to poor indexing. Without quality indexing, the information is lost.

The opportunity for lost information is especially noticeable especially when related to the indexing of forms of names. Texts on indexing or information filing agree that it is extremely important to link related documents (White and Griffith 1987) when associated with variant forms of personal names (Wellisch 1991; Booth and South 1982). One of the most useful methods of assuring comprehension of an index to a user is to link documents indexed under variant names of the same person with the traditional 'see also' reference. In addition to this, a descriptor added to a name entry will facilitate continued consistency in the name headings by eliminating ambiguity of identity and the resulting confusion on the part of the searcher and the indexer.

2.2 InfoTrac and
<u>Readers' Guide to Periodical Literature</u>

Since authority control and accessibility are intertwined, the opportunity for error in identifying relevant entries is considered to be especially high for the untrained information seeker (i.e. one without much practice). The untrained information seeker is most likely to use a general periodical index since it is multi-disciplinary, and this user is likely to come from all walks of life, seeking various kinds of information. The two most commonly found general periodical indexes found in academic and public libraries are InfoTrac and <u>Readers' Guide to Periodical Literature</u>.

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InfoTrac - General Periodicals Index is a periodical index on
CD-ROM produced by Information Access Company (IAC) of California.
IAC also produces related products such as Health Reference Center.
From this point, all references to InfoTrac will refer only to the
General Periodicals Index. Readers' Guide to Periodical Literature
is a well-known print index published by H.W. Wilson. Both indexes
are commonly found in public and academic libraries, are used by
students and the general public, and use Library of Congress
subject headings.

Since the introduction of InfoTrac in 1985, most literature
about it has related to user acceptance and satisfaction. Almost
over-whelmingly positive, feedback from users has been visual as
well as verbal. Though extremely popular (Van Arsdale and Ostrye
1986; Beltran 1987; Momenee 1987; Hall, Talan and Pease 1987; Jaffe
1988; Reese 1988; Ernest and Lange 1989; and Forrest, Chapman and
Wright 1989), InfoTrac has raised concerns from librarians who
question the value of the searches performed by unassisted users.
In some cases, the concerns about quality are over the apparent
lack of awareness of the inappropriateness of the database for
their particular subject search. In other cases, though users seem
satisfied, librarians have not been convinced that the quality of
the authority control in the indexing has allowed the user to
retrieve appropriate citations. Librarians have a professional
responsibility to provide quality resources and popularity is not
necessarily a bottom-line criteria for providing a particular
resource (Van Arsdale and Ostrye 1989).

In a 1986 article in Database, Richard D. Carney, a Vice
President of Information Access Company, described InfoTrac as a
"self-contained periodical reference system designed for in-library
use by library patrons". In the same article, he focuses on the
evaluation of reference tools and the effect the tool will have on
information specialists who face increasing demands on their time.
All over the country library staff are coping with fall-out from
the economic recession: budgets are cut but use of libraries is up.
Therefore the tool that Mr. Carney describes is particularly
appealing, especially when he emphasizes, " The key is to employ
the new technology to facilitate more unassisted research by
patrons". Since InfoTrac is promoted as a database for beginners
and users appear to be abandoning print indexes, succumbing to the
lure of the definitiveness of a computer system, the inaccuracies
and inadequacies in the authority files of this widely-used index
should be of concern.

Past studies indicate that patrons/users do participate in
unassisted research and feel satisfied with their search results
(Momenee 1987; Jaffe 1988; Forrest, Chapman and Wright 1989). The
majority of the studies were done in academic settings where it was
found that InfoTrac was a tool most appropriately and
enthusiastically used by undergraduates (Beltran 1987). Jaffe at
Sweet Briar College in Virginia found that students preferred the
controlled-index search method of InfoTrac rather than the boolean
free-text searching of WILSONDISC. Both Jaffe and Beltran found
that the multi-disciplinary approach of InfoTrac was an advantage

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when used by undergraduates because the students tended to believe that the results of their searches were definitive even if the database they had used was not appropriate for the subject searched. This finding makes Carney's offering that the system is self-contained and facilitates more unassisted research by patrons worrisome, since the purpose of the information specialist is to assist in locating the most accurate, reliable and comprehensive information available within the constraints of the available resources. Reese conducted a study comparing Readers' Guide to Periodical Literature with InfoTrac but the controls fell short of those needed to validate the results (Reese 1988).

InfoTrac is indexed with Library of Congress subject headings. Occasionally, additional topical subject headings are added when the new headings have not yet appeared in the Library of Congress system. According to the IAC handbook, those new headings created by IAC are linked to the nearest LC subject heading by a cross-reference. Headings in the alphabetically-arranged subject index may be topics; personal, product or company names; and titles of books, movies, plays, etc. All variant forms of an individual's name will appear in the subject listing in the alphabetic position where it would naturally fall. In the case of names this researcher searched, there were no cross references to variant forms of the name. The heading takes the form of the name as it appeared in the entry.

This approach is directly opposite the findings in the literature concerning features of a good index in that there is a lack of consistency in the vocabulary, a lack of 'linking related documents', and a lack of discriminating finely among individual documents. In theory this should produce a high failure rate when untrained searchers use the system. Some entries may be found with 'boolean' searching. In 1986, Carney felt that boolean searching was not effective for "a reference product designed to serve large numbers of untrained users". Since then, the capability for an 'expanded search' has been added creating system-driven 'and' searches. Some information specialists feel that boolean capabilities replace the need for a controlled vocabulary with authority control. This study is to examine the results of searches performed by untrained InfoTrac users when the searches are based upon records with perceived problem headings.

3. Methodology

A survey was conducted involving public library users in a suburban metropolitan area. Groups of users performed pre-selected search queries in two general periodical indexes. A random sample of forty-four public library users were asked to participate through accidental sampling of those who asked the reference staff for assistance with an information query. It was assumed that the majority of those who asked for assistance in the public library

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would be untrained users since trained users (i.e. those who do research frequently in information databases and understand the structure of those databases) typically do not request assistance. It was assumed that the general periodical indexes being studied are designed for use by a wide range of people with a diversity of interests, therefore anyone approaching the reference staff with a reference query may have justification for use of those indexes.

The data collected were the numbers of relevant citations identified by untrained, unassisted users from a pre-selected set perceived to contain problem access points or headings. The questionnaire and data collection form used was a variation of the form used by Reese in 1987 at the Brookdale Community College Learning Resources Center. At that time, her sample included a final total of 17 students which was insufficient to draw any serious conclusions.

3.1 Procedures and Design

Two groups of results are compared in the study concerning the usability and quality of two separate general periodical indexes when used by untrained, unassisted searchers. Voluntary participation was asked of patrons who approached the reference staff with information questions. The study was conducted by the researcher who asked the first patron to do a search in InfoTrac-General Periodicals Index 1986-current. The next patron was asked to do the identical search in the volumes of Wilson's Readers' Guide to Periodical Literature that covered the same time period. The only assistance given in the search was an explanation of what subject headings look like in each of the indexes and how to identify the citations following headings that meet the specifications of the search.

Each searcher was given a data collection form which included a user profile section. No names were recorded. The user profile included age, past index use, past computer use, and frequency of use of any indexes, databases, or computers.

Each searcher was asked to search one question so that each question was to be searched by eight to 23 people on InfoTrac and eight to 23 people in Readers' Guide. The final range of participants was five to nine people for each search. The purpose of the study was to see how well the untrained searcher handles the problem of variant forms of names, the problem of an absence of descriptors for individuals sharing the same headings and an absence of cross-references in these cases. Attached to each data collection form was a photocopy of a title page of a book related to the search question. The searcher was asked to record each subject heading or search method used, even if no heading or entries were found, and to record the citations found that fit the requirements of the search. Recording the citations on InfoTrac may be done by pressing the letter 'p' or by pressing the 'print'

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key.   Recording the citations in Readers' Guide required hand
writing the subject heading used, the author of the article, the
journal name and date, and the volume and page number of the index.
If no entries were found, that was to be noted. Also, the searcher
was asked if he received any outside assistance and from whom.

This study was designed to examine the retrieval success of
users of two general periodical indexes when the sample population
is unassisted by trained individuals. Comparison of the results
when using InfoTrac, an electronic database, and when using
READERS' GUIDE TO PERIODICAL LITERATURE, a traditionally-designed
print index, is made to indicate the impact or lack of impact of
searching an index constructed with a loosely-controlled vocabulary
and which uses no descriptors.

In a preliminary search by the researcher, it was found that
there were 6 variations of the name W. EDWARDS DEMING in the
InfoTrac (1986-August 1993) database. All of these entries applied
to the same individual, founder of TQM management principles and
author of OUT OF THE CRISIS. No cross-references or qualifiers
were given for any of the variations. The variations were:
>   Deming, Edwards
>   Deming, Edwards W.
>   Deming, W.Edward
>   Deming, W.Edwards
>   Demming, Edward
>   Demming, Edwards.

For the name of Robert Waller, there were at least four variant
headings. The entries applied to at least two and possible three
different individuals.   No qualifiers, descriptors or cross
references were given.   One entry, WALLER, ROBERT, combined
articles about two different individuals: 1. the author of THE
BRIDGES OF MADISON COUNTY, and 2. a British writer on industrial
and political relations. The variations in the name entries were:
>   Waller, Robert
>   Waller, Robert A.
>   Waller, Robert J.
>   Waller, Robert James.

When searching for information on Kate Smith, singer and author of
UPON MY LIPS A SONG, the researcher found one heading for the name
SMITH, KATE. There were 10 entries under this one heading. The
first two applied to an author/writer of current information. The
latest article by this Kate Smith appeared in January 1990. The
other eight articles applied to the singer Kate Smith, who died in
1986. There, again, were no descriptors or cross-references as all
Kate Smiths were listed under the same heading.

When looking through a comparable range of years in READERS'
GUIDE TO PERIODICAL LITERATURE 1986-current, the researcher found
one variation of the name SMITH, KATE. All articles listed under
this heading were about the singer who died in 1986. There was
one variation of Deming's name from 1986 to current:
>   DEMING, W. EDWARDS.

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There were two variations of the author Robert Waller's name as well as a heading for a second Robert Waller. The 1990 volume listed:

WALLER, ROBERT, 1913- .

The 1991 and 1992 volumes listed:

WALLER, ROBERT J.

In 1993 there was a qualification added to WALLER, ROBERT J. to expand it to:

WALLER, ROBERT JAMES, 1939- .

The articles and headings found by the researcher in READERS' GUIDE are included in Appendix C.

4. IMPLEMENTATION

Six variations of questionnaire packets were created and distributed by the researcher in the reference area of a medium-sized public library. The searches were for information about three authors: Kate Smith, Robert Waller, and Edwards Deming. Each search was paired to have been searched in InfoTrac and in READERS' GUIDE TO PERIODICAL LITERATURE in order to compare recall and precision results. Volunteers were solicited from individuals who approached the reference area. Library users were told that the study was to determine the effectiveness and 'user-friendliness' of two magazine indexes in the library.

The survey began the last of August 1993. The researcher proceeded with the survey during various times of the day and week in order to survey a range of people in different lifestyles. The proposed period of time for the completion of the survey was a two-week period. At the end of this time and after eighteen hours of requesting participation from volunteers, the researcher had obtained 24 usable InfoTrac surveys and 12 usable READERS' GUIDE surveys. In an attempt to balance the number of InfoTrac surveys with READERS' GUIDE surveys, the researcher extended the time for surveying to another eight hours over approximately a one week period.

Each month when the InfoTrac database is updated with a new CD-ROM, there is the possibility of records being dropped or added. By restricting the gathering of surveys from InfoTrac users to a designated two-week period, all 24 searchers searched the same database. The database range searched in the print indexes was easily framed by pointing out the volumes to be searched. Print indexes remain constant in records contained in each volume. Each volunteer searcher was asked to search for information on the author of a particular book, not the book itself, in order to limit the scope of the search.

As seen by the extension of time for distributing READERS' GUIDE surveys, people were much more willing to search using InfoTrac. Indeed, the observation that individuals will wait for some time in order to use electronic databases rather than use print indexes created an interest in this research and was informally supported by the difficulty of getting volunteers. In

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addition to this, though there was only one InfoTrac-General Periodicals Index workstation available and one set of READERS' GUIDE, the number of searches being completed during the same time frame was greater for InfoTrac than for the print index. Refusals for volunteering to do any of the searches were high--about one out of four agreed to do the search. Most indicated that time was the crucial factor.

The total number of surveys completed were 24 for InfoTrac and 20 for READERS' GUIDE. Almost all volunteers were somewhat reluctant, expressing lack of experience or knowledge in using either index.

The first part of the survey gathered profile information from the volunteer searchers--characteristics which might affect the outcome of their search. These sought to determine
1. if the searcher had prior experience in searching electronic or print indexes,
2. if the searcher had experience with computers, and
3. what the age of the searcher was.
The total sample population was 44. The sample population by age broke down in this way, with public school age comprising about 23%:

```
8-12...................4.5%
13-18.................18.2%
19-25.................16.0%
26-35..................9.1%
36-45.................27.2%
46+...................25.0%.
```

After completing the search, the survey was completed by filling in responses to five questions meant to determine the searchers attitudes about the results. Questions #1 and #2 were open-ended. The searchers were asked if they felt they had found enough information and if they felt that they needed more help. To verify the responses to question #2 the searchers were asked to check a YES or NO response as to whether they were satisfied with the results of their research. Finally, a survey of the time taken for each search was taken. Searchers were asked to check a range of minutes appropriate for their search. A representation of the questionnaire is found in Appendix A.

4.1 Data Analysis

The total number of relevant records retrieved for each of the six searches was tabulated. In some cases, non-relevant records were retrieved. These were not included in computing the mean, median and mode scores. Table 1 illustrates these numbers in relationship to the number retrieved by the researcher. On first glance, it seems that most searchers did well as the scores are clustered closely together. Only the nine people searching for information on Kate Smith through the use of InfoTrac seem to have had difficulty.

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TABLE 1

RETRIEVAL RESULTS BY INDIVIDUAL SEARCH TOPICS

READERS' GUIDE TO PERIODICAL LITERATURE

	Kate Smith (n=7)	Robert Waller (n=8)	Edwards Deming (n=5)
Mean	2.86	4	9.8
Median	3	4	9
Mode	3	4	8 & 12
Possible	3	6	12

INFOTRAC

	Kate Smith (n=9)	Robert Waller (n=8)*	Edwards Deming (n=7)
Mean	3.11	14.66	60
Median	1	14.75	79
Mode	0 & 8	14.00	90
Possible	8	16	90

* two surveys not completed or used in computations

Using answers given in part 1 of the questionnaire, the respondents were divided into groups of those with experience and those without experience in searching the respective indexes. The researcher set the qualification for experience in searching InfoTrac as having used InfoTrac more than 0-1 times. If the respondent indicated on the survey that he had previously used READERS' GUIDE, he was considered experienced. The bar graphs in Figures 1 & 2 display the mean and median scores achieved by searchers who were perceived to have had experience and those without experience.

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FIGURE 1
Experience and Readers' Guide

relevant items retrieved

Article Retrieval Rates

■ no-Smith ▦ yes-Smith ▢ no-Waller ▨ yes-Waller
▦ no-Deming ▢ yes-Deming

yes=prior experience with index
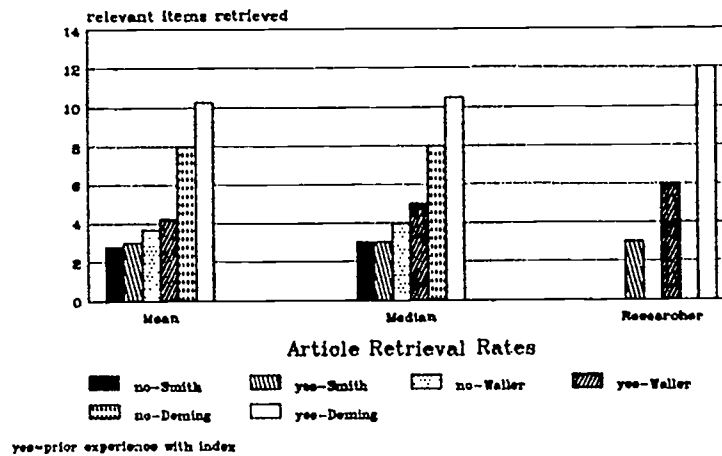
FIGURE 2
Experience and InfoTrac

relevant items retrieved

Article Retrieval Rates

■ no-Smith ▦ yes-Smith ▢ no-Waller ▨ yes-Waller
▦ no-Deming ▢ yes-Deming

yes=prior experience with index

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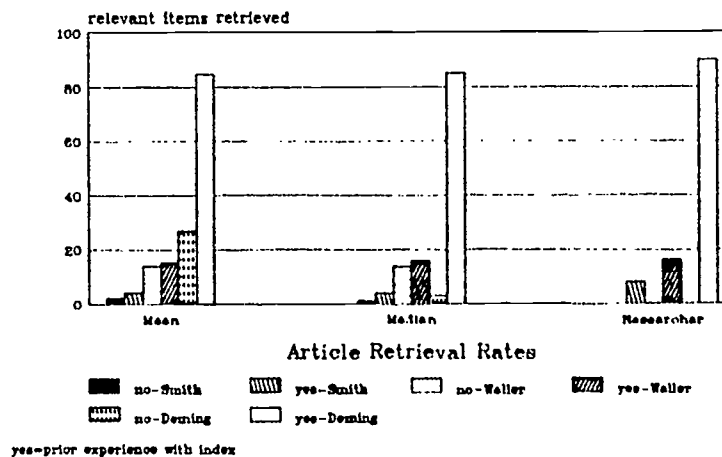
The scores for both groups are similar though there is a slight increase in the number of records retrieved by those perceived to be experienced in searching those indexes. The largest difference in the scores within the groups shows up with the Deming search using InfoTrac though there is a slight difference in the Smith search as well. Table 1 in Appendix B displays the mean, median and mode scores for each group.

Question #4 in Part 1 of the questionnaire seeks to determine if past computer use had impact on the success of the searcher. While computation of mean, median and mode scores are useful, precision rates compute scores by including 'wrong' answers as well as 'right' answers. Because the consistency of subject headings used in the indexes searched is important, the researcher used recall and precision rates for analysis of computer experience and success of retrieval. The formula for recall rate is:

$$\frac{\text{number of relevant articles retrieved}}{\text{number of relevant articles in the database}}.$$

The formula for precision rate is:

$$\frac{\text{number of relevant + non-relevant articles retrieved}}{\text{number of relevant articles in the database}}.$$

Figures 3 and 4 show computer experience in comparison with retrieval rates.

FIGURE 3

Computer Use & InfoTrac

number of searchers

Article Recall Rate

0-8 times   8-10 times   11-20 times   20+ times

frequency of computer use per month

13
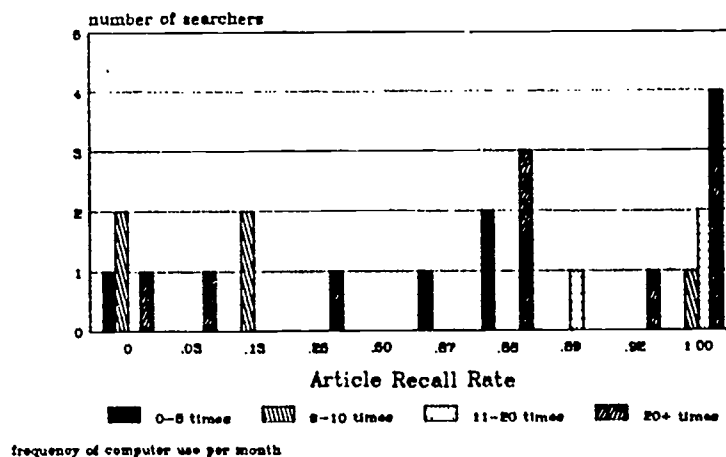
FIGURE 4
Computer Use & InfoTrac

number of searchers

Article Precision Rate

■ 0-5   ▨ 6-10   ▢ 11-20   ▨ 21+

frequency of computer use per month
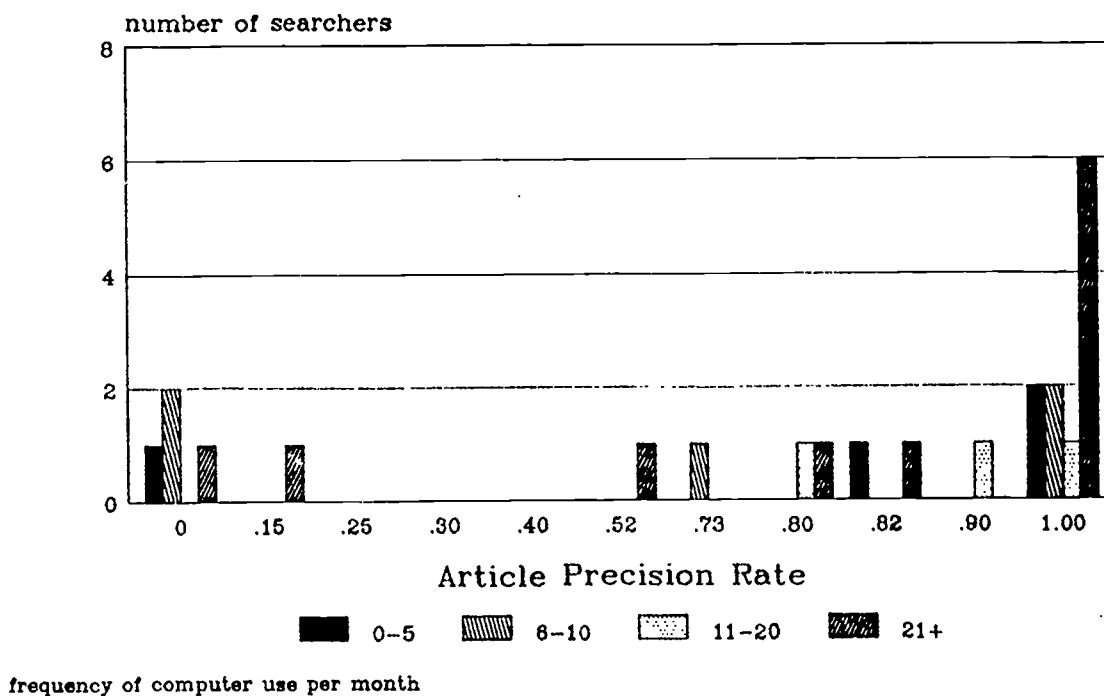
Recall rates and precision rates are expressed as decimals. The closer the number is to 1.00, the better the score is. The two scores(recall and precision) are not dependent upon one another. Searcher A may have retrieved only 80% (or recall rate=0.80) of relevant documents but all of the documents retrieved were relevant so that the precision rate is 1.00. Searcher B may have retrieved 100% of the relevant documents to obtain a recall rate of 1.00, but may also have retrieved several non-relevant articles which lowered the precision rate to something less than 1.00.

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It would be difficult to make an assumption with population size and with the results shown. There seems to be a significant improvement in recall and precision rates for those people who use computers 11 or more times a month. The recall rate for those using computers 0-5 times a month is slightly less than for those using them 11 or more times a month, but the precision rate for articles retrieved is good.

When examining the results of those who indicated use of computers 6-10 times a month, the results are less clear. Four our of five (80%) scored 0.13 or less on recall. This is worse than those with 0-5 times-a-month computer use of whom 75% scored 0.87 higher on recall. Three out of five (60%) of computer users who use them 6-10 times a month scored 0.73 on precision, which is poorer than the 75% of 0-5 times-a-month computer users who scored 0.82 or higher.

A problem in measuring the variable of frequency of computer use comes in defining computer use. Computers are used in many ways, and a user's understanding and manipulation of computer processes may be low. One person may feel that use of an automated teller machine is computer use (which it is) but this would provide the lowest level of computer familiarity to the end user as compared with data entry, word processing and other interactive tasks. There is no indication on the questionnaire of the type of computer experience the respondents have had, though it is likely that those who use computers 20 or more times a month use them for more than repetitive tasks.

Question #3 of the questionnaire asked for the age of the respondent. The purpose was to study the effects that age might have on success in using InfoTrac or READERS' GUIDE. Figures 5 through 8 show the results when recall and precision rates are grouped according to age. These results are grouped by database searched.

In InfoTrac the only group that scored consistently well was the 19-25 age group (n=3). For precision, 100% of this group scored 0.80 or higher and 100% scored 0.88 or higher on recall. In examination of the questionnaires, two individuals searched for information on Robert Waller and one searched for information on Kate Smith. The next best scores were achieved by the 46+ years age group (of whom 80% scored 0.87 or higher on recall and sixty percent scored 0.80 or higher on precision) and the 13-18 age group (of whom 60% scored 0.88 or higher on recall and 80% scored 0.82 or higher on precision). At least four people searching InfoTrac found nothing while all individuals searching READERS' GUIDE found at least one article. In comparing figures 5 and 6 for recall rates and figures 7 and 8 for precision rates, it would appear that there is more consistency in the recall and precision rates of those searching READERS' GUIDE than in those searching InfoTrac. In using READERS' GUIDE, the recall and precision rates appear to increase slightly with age. Table 2 of Appendix B lists the subjects searched in each age group by the index searched.

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FIGURE 5
Recall Rate and Age

number of searchers

Recall Rate

13-18   19-25   26-35   36-45   46+

Age of InfoTrac User
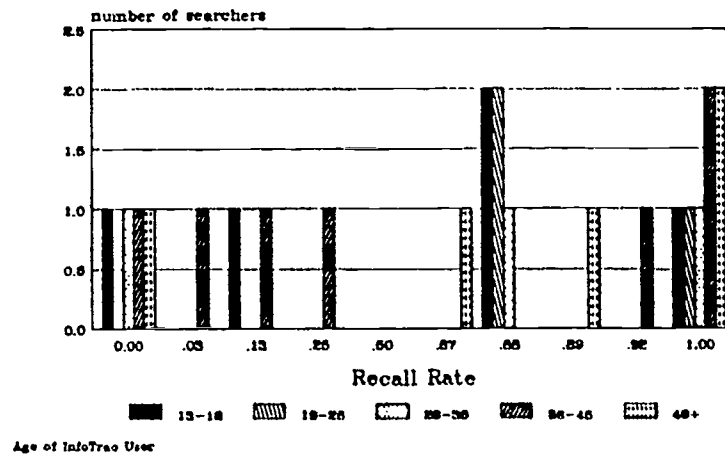
FIGURE 6
Recall Rate and Age

number of searchers

Recall Rate

6-12   13-18   19-25   26-35   36-45   46+

Age of Readers' Guide User

16
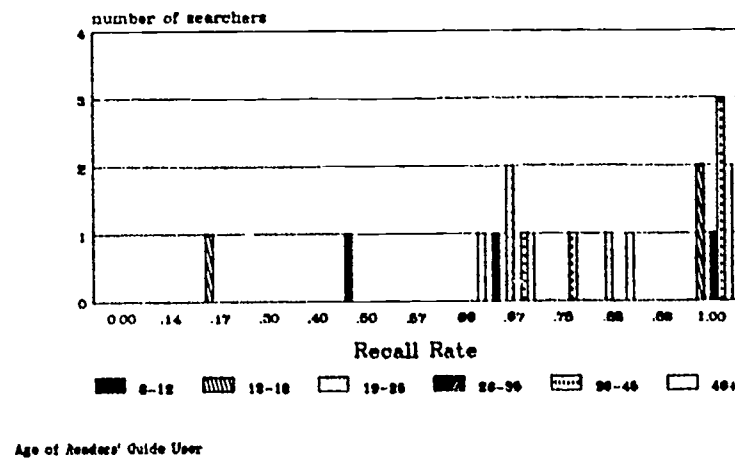
FIGURE 7
Precision Rate and Age

number of searchers

Precision Rate

█ 12-18 ▥ 19-25 ▢ 26-35 ▨ 36-45 ▦ 46+

Age of InfoTrac User
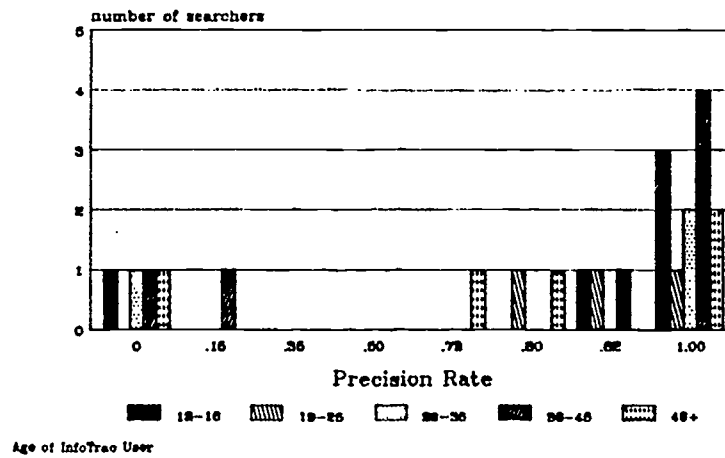
FIGURE 8
Precision Rate and Age

number of searchers

Precision Rate

█ 6-18 ▥ 16-18 ▢ 19-80 █ 26-36 ▦ 36-45 ▢ 46+

Age of Readers' Guide User

17

24
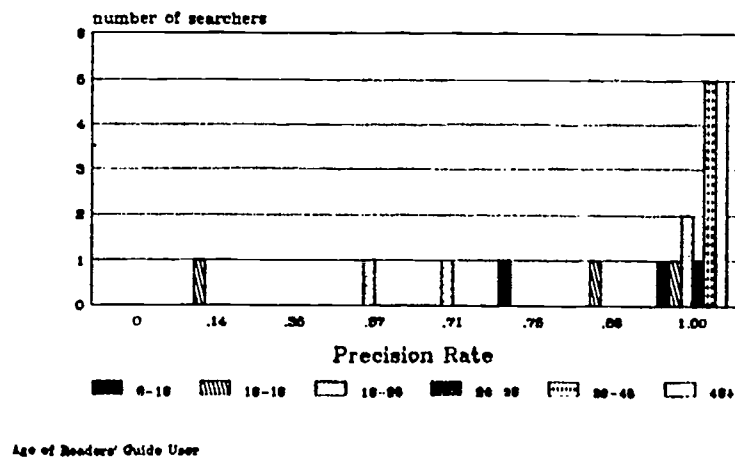
Success vs. Satisfaction

After completing the search, the participants were asked to respond to questions that expressed their feelings about the success of their search. Question #1 asked if the searcher felt that he had found enough information.

Figures 9 and 10 show that InfoTrac users were much more likely to feel satisfied with results than READERS GUIDE users. In examining the questionnaires, it seems there is a correlation between the total number of articles retrieved and the perception of finding enough information. Even though 100% of articles may have been found, if the number of articles retrieved is small, the searcher does not appear to feel he has found enough information.

FIGURE 9
Sufficient Information Found

number of searchers

Readers' Guide Users

Smith (n=7)　Waller (n=8)　Deming (n=8)
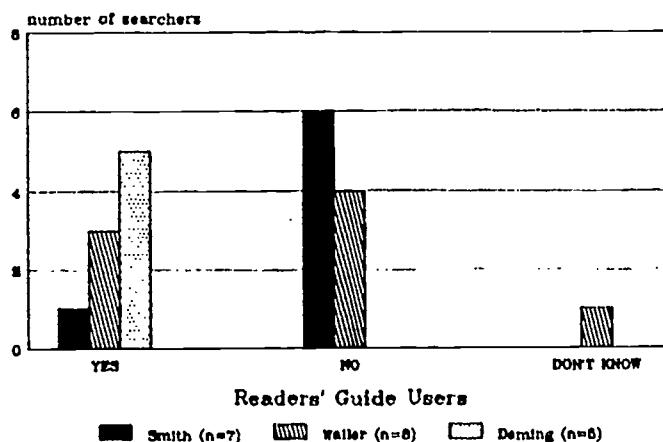
FIGURE 10
Sufficient Information Found

number of searchers

InfoTrac Users

Smith (n=9)   Waller (n=8)   Deming (n=7)
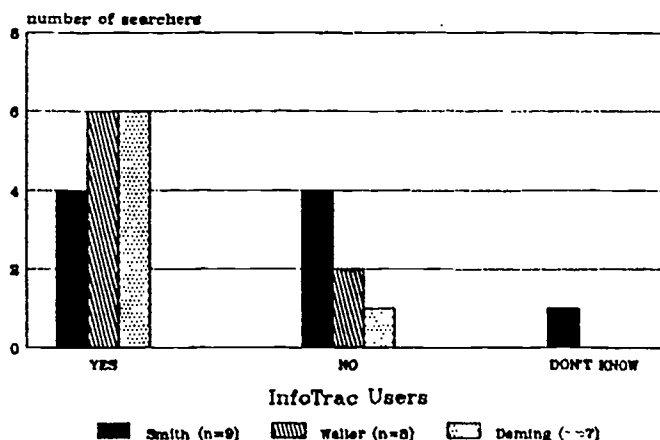
The total number of retrievable articles about KATE SMITH was small (three for READERS' GUIDE and eight for InfoTrac) and the graphs indicate that fewer people doing those searches felt enough information had been found. The reverse is true for the DEMING search where there were 12 articles in READERS' GUIDE (excluding articles listed under DEMING PRIZE, etc.) and at least ninety articles in InfoTrac.

The Waller search seems to indicate a mid-point number for the perception that enough information had been found. The majority of READERS' GUIDE searchers were not convinced that enough information had been found when only six were retrievable. The InfoTrac searchers felt enough information had been found when there were a possible 16 to be retrieved.

It's important to examine the actual recall and precision rates for each of the six searches before determining that the total number of articles retrieved is the only influencing factor in judging success. In Tables 2 and 3, recall and precision rates are higher for individuals searching InfoTrac for information on ROBERT WALLER than in searching READERS' GUIDE. It is surprising that even though individuals searching for articles on KATE SMITH had a very high rate of precision and recall, half of them were not satisfied with their results.

In looking at the headings that people listed, some of the problems of retrieval could be uncovered. When using a print index, it seems that people were able to redirect themselves to an appropriate method of searching. For some reason, those using

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TABLE 2

READERS' GUIDE SUCCESS RATE/SATISFACTION
by Individual Search Topic

	User Success		User Satisfaction	
	Recall	Precision	Yes	No
Smith	1.00	1.00		X
(n=6)	1.00	1.00		X
	1.00	1.00	X	
	1.00	1.00	X	
	1.00	1.00	X	
	0.67	1.00		X
Waller	0.17	0.14		X
(n=7)	0.50	0.75	X	
	0.67	0.57		X
	0.67	1.00		X
	0.83	0.71		X
	0.83	1.00	no answer	
	1.00	0.86	X	
Deming	0.67	1.00	X	
(n=5)	0.67	1.00	X	
	0.75	1.00	X	
	1.00	1.00	X	
	1.00	1.00	X	

TABLE 3

INFOTRAC SUCCESS RATE/SATISFACTION
by Individual Search Topics

	User Success Recall	Success Precision	User Satisfaction Yes	No
Smith	0.00	0.00		X
(n=9)	0.00	0.00		X
	0.00	0.00	X	
	0.13	1.00		X
	0.13	1.00	X	
	0.25	0.15		X
	1.00	0.73	X	
	1.00	0.80	X	
	1.00	0.80	X	
Waller	0.88	0.82	X	
(n=8)	0.88	0.82	X	
	0.88	1.00	X	
	0.88	1.00	X	
	0.92	1.00		X
	1.00	1.00	X	
	1.00	0.52	X	
Deming	1.00	1.00	X	
(n=7)	1.00	1.00	X	
	0.89	1.00	X	
	0.88	1.00	X	
	0.87	1.00	X	
	0.03	1.00	X	
	0.00	0.00	X	

InfoTrac did not do that. The most common error made, that resulted in 0.00 recall rate, was not inverting the heading. The search was entered as KATE SMITH or W. EDWARDS DEMING not SMITH, KATE or DEMING, W. EDWARDS.

Question #4 asked for a yes or no response to whether the searcher was satisfied with the results of this search. This was to verify the answers to question #1. The responses were similar to the responses given when asked if enough information had been found. Results are shown in Figures 11 and 12.
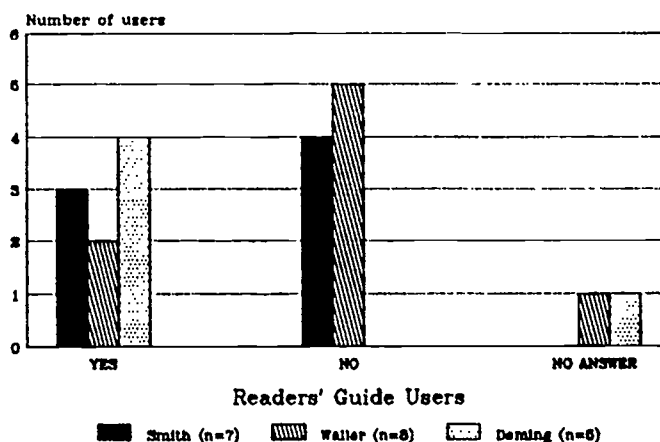
FIGURE 11
Satisfied Users

Readers' Guide Users

Smith (n=7) Waller (n=8) Deming (n=6)

FIGURE 12
Satisfied Users

InfoTrac Users

Smith (n=9) Waller (n=8) Deming (n=7)

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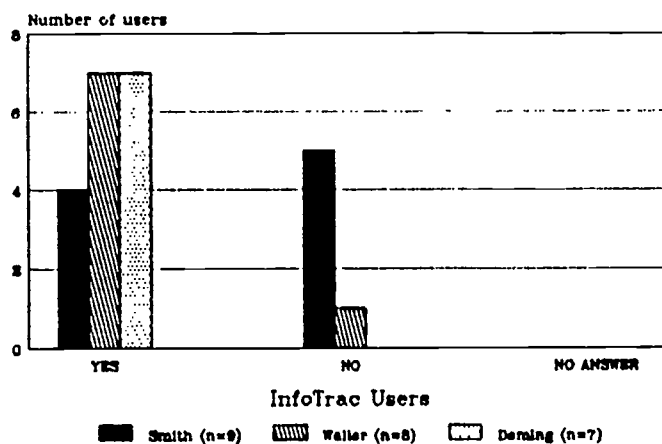
Judging from the reactions of the searchers they were more pleased with using InfoTrac than READERS' GUIDE. Table 3 of Appendix B breaks down the respondents feelings abut needing further assistance. Each index searched is broken down into age categories. Though most categories are equal in the perception of assistance needed, those people 36 years of age and older seemed to feel the need for help less no matter which index searched.

Along with the number of articles retrieved, another factor which may have affected satisfaction with using the index was time needed to do the search. Figures 1 and 2 in Appendix B display the outcome. Even though more articles were retrieved when searching InfoTrac, the search time is considerably shortened thus reinforcing the feeling that all the necessary and accurate information has been retrieved. Tables 4 and 5 in Appendix B give the overall precision and recall rates correlated to user satisfaction and the index searched. Only two users of InfoTrac who had justifiable reasons not to be satisfied with results (0.00 recall and 0.00 precision) expressed dissatisfaction. Sixty-five percent of InfoTrac searchers scored 0.87 or higher on recall. The rest scored 0.25 or less on recall. Six out of eight people who scored 0.25 or less on the recall rate expressed satisfaction with their results. Three of those people scored 0.15 or less on precision.

Of the people who searched READERS' GUIDE, the lowest score was 0.17 for recall and 0.14 for precision. Fifty-five percent of READERS' GUIDE searchers scored higher than 0.83 in recall; 60% scored .75 or higher; 90% scored .66 or higher and 95% scored .50 or higher on recall. Still, only half of the READERS' GUIDE users were satisfied with their results.

The average precision rate for InfoTrac searchers was 0.73 with an average recall rate of 0.64. For Readers' Guide, the average recall rate was 0.80 and average precision rate was 0.90. With these figures, it would seem that the perception of quantity and speed carry more weight in determining satisfaction than recall and precision.

SEARCH ERRORS

Close examination of the methods individuals used for their search and the actual headings found provides some valuable information for library staff who assist in reference questions. Of the seven people searching InfoTrac for information on W. Edwards Deming, only two retrieved all 90 articles. The two who accomplished this used the expanded search function. In their original search one found only one heading and the other found two. None of the headings were an accurate form of the name. The entries were DEMING, EDWARD W., DEMING, EDWARDS W., and DEMING, EDWARDS. One individual retrieved 80 article by locating two headings: the main heading DEMING. W. EDWARDS and a variant located immediately before DEMING, W. EDWARD. Two others retrieved 78 articles by finding the main heading. One of those found an additional article by searching the book title, OUT OF THE CRISIS.

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This article would have been retrieved had the individual located the heading DEMMING, EDWARDS. One individual first searched under W. EDWARDS DEMING; then under DEMING, EDWARDS and wrote down "wrong guy" to end up with no retrievals.

The concern with the headings for W. Edwards Deming was that there were too many variants and that information would be lost. The concern with the headings for Robert Waller and Kate Smith were that the headings were indiscriminate and would lead to retrieving inaccurate information.

Eight people searched for information on Robert Waller. Of those, only two retrieved information under the two headings with relevant information. The first individual searched under WALLER, R.J. then located the heading WALLER, ROBERT J. and noticed that it was not the correct one. This individual did correctly retrieve the relevant articles under WALLER, ROBERT and WALLER, ROBERT JAMES. The second individual located the two headings and retrieved the relevant articles but also retrieved 15 non-relevant articles which brought the precision rate down considerably. Three of the eight searchers located only one heading (WALLER, ROBERT JAMES) so that two of the 16 articles were missed. Reducing precision, the last two searchers retrieved one non-relevant article each and 14 of the relevant articles.

Finally, the greatest number of errors were made by the group searching for information on Kate Smith. As stated before, there was only one heading for SMITH, KATE but there were two different individuals listed under the one heading. Three of the nine individuals found no information. The poor showing was a result of entering the search incorrectly as KATE SMITH, not inverted as it should be. As a result, one of these individuals retrieved two articles under the heading KATE ON THE COAST, which is a book. In all, six of the searchers first entered the name as KATE SMITH; two of these then inverted the entry to SMITH, KATE. Not one of the searchers had a completely successful search in that even the searchers who retrieved the eight relevant articles retrieved non-relevant articles. Two retrieved the other two out of ten articles listed under SMITH, KATE and one retrieved a total of three non-relevant articles. The oldest article under the heading SMITH, KATE, and that was concerning the singer Kate Smith, was her obituary notice. Two searchers retrieved only this article. The last person first searched KATE SMITH, then SMITH, KATE and SMITH, K. This led to the retrieval of two relevant articles and five non-relevant articles.

CONCLUSION

It is still apparent that there is a great deal of satisfaction on the part of the general public about using InfoTrac, while the feelings are mixed about using READERS' GUIDE. The likelihood that electronic databases and indexes would loose their appeal seems unlikely. The perception that they are completely user-friendly and can stand alone as a reference resource should be considered an inaccurate assumption. As this

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small study indicates there is the danger of sending individuals out of the library with misinformation. Looking again at Tables 2 and 3, it can be seen that there are some differences in quality of retrieval for the unassisted searcher. If we are to face the reality of the future with more self-assist work stations, we must also assume some responsibility in providing accurate information that will not mislead. When 30% of the searchers using InfoTrac retrieve articles that are not relevant to the subject searched, and the average recall rate is 0.64, perhaps we should forewarn those individuals waiting in line to use the index. The reference interview should not be considered complete by waving the questioner in the direction of the nearest InfoTrac workstation because it is so quick to use, because we are understaffed and because we, as more experienced searchers, have forgotten what others do not know. Another aspect of this topic is 'How appropriate is this database for this search?'. In comparing the periodicals indexed in each of these databases, it appears we may be letting our patrons down by not guiding them in the direction of the best sources. Would we send someone to the MCGRAW-HILL ENCYCLOPEDIA OF SCIENCE AND TECHNOLOGY for information on religions of the West Indies? The comparison is simplified but the implications are as great.

InfoTrac/Readers' Guide to Periodical Literature
User Questionnaire

This survey will be used to analyze the use of two general periodical indexes available in this library. Your assistance in submitting accurate responses will be appreciated. There will be no further obligation on your part.

1. How many other times have you used InfoTrac on CD-ROM before?

```
        0-1 times_____
        2-5 times_____
       6-10 times_____
More than 10 times_____
```

2. Please check other indexes that you have used.

```
Readers' Guide to Periodical Literature (print)_____
Cleveland News Index (Plain Dealer) (print)_____
New York Times Index (print) _____
Wall St. Journal Index (print) _____
Compact Disclosure (CD-ROM) _____
Wilsondisc (CD-ROM) _____
InfoTrac (CD-ROM) _____
InfoTrac (online)_____
Other_____
        _____
```

3. What is your age?
```
               8-12_____
              13-18_____
              19-25_____
              26-35_____
              36-45_____
       46 or older_____
```

4. How often do you use computers?

```
                     never_____
        0-5 times a month_____
       6-10 times a month_____
      11-20 times a month_____
  21 or more times a month_____
```

InfoTrac and <u>Readers' Guide to Periodical Literature</u> are indexes that help people find articles in magazines and newspapers. They are arranged alphabetically by subject. You are being asked to find information on a specific person in one of those indexes. Please follow the instructions on the following page.

INFOTRAC USERS:

1. The next page in this packet is a photocopy of the title page of a book. Please find all periodical (magazine and newspaper) articles that are listed in InfoTrac about this <u>AUTHOR</u>.

2. Please write down each name/subject heading that you look up even if it is very similar to other searches that you tried and even if you do not find the name/subject listed.
    If there is no listing for that name/subject, write a 0 (zero) next to it.

3. When you find a name/subject heading that you think will give you the information you need, make a print-out of <u>every article</u> listed under it that you feel <u>applies to the author</u>.
    You may make a print-out by pressing the letter 'p' on the keyboard or the key 'F3' on the keyboard.

4. When you have finished, attach all of the print-outs to the questionnaire and return it to the reference desk.

Please list name/subjects searched here.
          SUBJECT   EXPANDED SEARCH (optional)

1. Do you feel that you found enough information?_____

_____

2. Do you feel that you needed more help?_____

_____

3. Did you receive any help today in doing this search?

        no_____
        yes_____ from: friend_____ family_____ staff_____ other_____

4. Were you satisfied with the results? no_____   yes_____

5. How long did the search take?   0-5 minutes_____.
                                   6-10 minutes_____
                                   11-15 minutes_____
                                   16-20 minutes_____
                                   over 20 minutes_____

READERS' GUIDE TO PERIODICAL LITERATURE USERS:

1. In the back of this packet is a photocopy of the title page of a book. Please find all periodical (magazine and newspaper) articles that are listed in READERS'GUIDE about this <u>AUTHOR</u>.

2. Please write down each name/subject heading that you look up even if it is very similar to other searches that you have tried and even if you do not find the name/subject listed.
    If there is no listing for that name/subject, write a 0 (zero) next to it.

3. Begin with volume 46 for the year 1986. Write down each name/subject you try. When you find a name/subject heading that lists articles you feel are about this <u>AUTHOR</u>, write down:
    (1) the last name of the person who wrote the article
    (2) the name of the periodical that the article appears in
    (3) the date of the periodical
    (4) the page number in the READERS' GUIDE volume you are
        using.

4. After you have finished looking through this volume, go on to the next volume - Number 47.

5. Continue this process until you have searched through all volumes from 1986- to the most current volume.

Volume 46

Subject	Author	Magazine	Date	Page #

Volume 47

Subject	Author	Magazine	Date	Page #

Volume 48

Subject	Author	Magazine	Date	Page #

28

Volume 49 (1989)

Subject	Author	Magazine	Date	Page #

Volume 50 (1990)

Subject	Author	Magazine	Date	Page #

Volume 51 (1991)

Subject	Author	Magazine	Date	Page #

Volume 52 (1992)

Subject	Author	Magazine	Date	Page #

Volume 93 (1993)

Subject	Author	Magazine	Date	Page #

1. Do you feel that you found enough information?_____

_____

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2. Do you feel that you needed more help?_____

_____

3. Did you receive any help today in doing this search?

no_____
yes_____ from: friend_____ family_____ staff_____ other_____

4. Were you satisfied with the results? no_____ yes_____

5. How long did the search take?
                        0-5 minutes_____
                     6-10 minutes_____
                    11-15 minutes_____
                    16-20 minutes_____
                over 20 minutes_____

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Kate Smith

Upon My Lips

A Song

Funk & Wagnalls   New York

The Bridges of Madison County

ROBERT JAMES WALLER
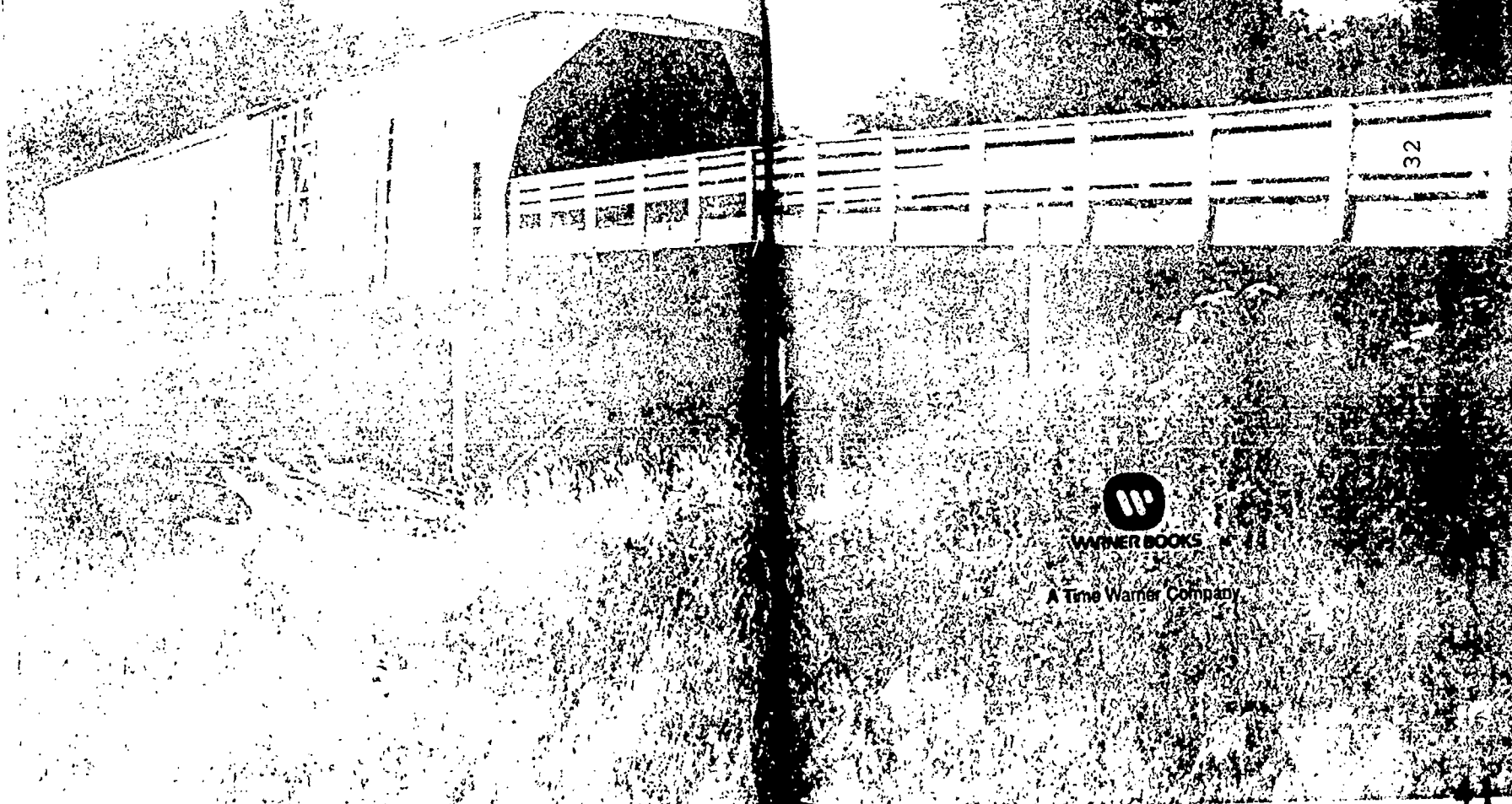
WARNER BOOKS

A Time Warner Company

OUT OF THE CRISIS

W. Edwards Deming

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TABLE 1

PRIOR EXPERIENCE AND RETRIEVAL RESULTS

READERS' GUIDE

	No Experience			Experienced		
	Smith (n=5)	Waller (n=3)	Deming (n=1)	Smith (n=2)	Waller (n=5)	Deming (n=4)
mean	2.8	3.66	8	3	4.2	10.25
median	3	4	8	3	5	10.5
mode	3	4	8	3	5	12
possible	3	6	12	3	6	12

INFOTRAC

	No Experience			Experienced		
	Smith (n=5)	Waller (n=4)*	Deming (n=3)	Smith (n=4)	Waller (n=4)*	Deming (n=4)
mean	2.4	14	27	4	15.3	84.75
median	1	14	3	4	16	85
mode	1	14	0,3,78	0 & 8	16	90
possible	8	16	90	8	16	90

* one survey not complete or used in survey

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TABLE 2

SUBJECT/NAMES SEARCHED BY AGE AND DATABASE

Readers' Guide

Age			
8-12	1 Smith	1 Waller	
13-18	1 Smith	2 Waller	
19-25	1 Smith	2 Waller	1 Deming
26-35	1 Smith		
36-45	1 Smith		4 Deming
46+	2 Smith	3 Waller	

InfoTrac

Age			
8-12	0		
13-18	2 Smith	1 Waller	2 Deming
19-25	1 Smith	2 Waller	
26-35	1 Smith	1 Waller	1 Deming
36-45	2 Smith	3 Waller	2 Deming
46+	3 Smith	1 Waller	2 Deming

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TABLE 3

ASSISTANCE NEEDED BY AGE GROUP

Reader's Guide

	YES	NO	MAYBE
8-12	1	1	
13-18	1	2	
19-25	3	1	
26-35	1		
36-45	1	4	
46+	1	4	

InfoTrac

	YES	NO	MAYBE
8-12			
13-18	2	3	
19-25		3	
26-35	2	1	
36-45	1	6	
46+		5	1

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TABLE 4

INFOTRAC SUCCESS RATE/SATISFACTION
(n=24)*

| User Success | | | User Satisfaction | |
Recall	Precision		Yes	No
1.00	1.00		X	
1.00	1.00		X	
1.00	1.00		X	
1.00	0.80		X	
1.00	0.80		X	
1.00	0.73		X	
1.00	0.56		X	
0.92	1.00			X
0.89	1.00		X	
0.88	1.00		X	
0.88	1.00		X	
0.88	1.00		X	
0.88	0.82		X	
0.88	0.82		X	
0.87	1.00		X	
0.25	0.15		X	
0.13	1.00		X	
0.13	1.00		X	
0.03	1.00		X	
0.00	0.00			X
0.00	0.00			X
0.00	0.00		X	
0.00	0.00		X	

* one survey not completed or used in survey

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TABLE 5

READERS' GUIDE SUCCESS RATE/SATISFACTION
(n=20)

User Success		User Satisfaction	
Recall	Precision	Yes	No
0.17	0.14		x
0.50	0.75	x	
0.66	1.00		x
0.67	0.57		x
0.67	1.00		x
0.67	1.00		x
0.67	1.00	x	
0.67	1.00	x	
0.75	1.00	x	
0.83	0.71		x
0.83	1.00	no answer	
1.00	0.86	x	
1.00	1.00	x	
1.00	1.00	x	
1.00	1.00	x	
1.00	1.00	x	
1.00	1.00	x	
1.00	1.00		x
1.00	1.00		x
1.00	1.00		x

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FIGURE 1
Search Time/Readers' Guide

number of searchers

minutes

Smith (n=7)   Waller (n=8)   Deming (n=5)
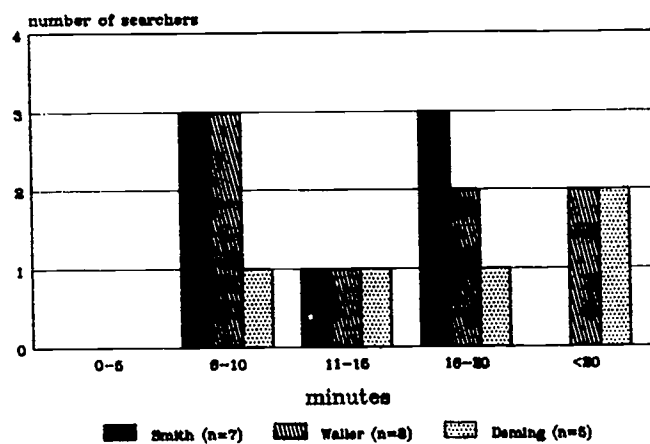
FIGURE 2
Search Time/InfoTrac

number of searchers

minutes

Smith (n=9)   Waller (n=8)   Deming (n=7)

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FIGURE 3
Readers' Guide Help Needed

number of searchers

Smith (n=7)   Waller (n=8)   Deming (n=5)

FIGURE 4
InfoTrac Help Needed

number of searchers

Smith (n=9)   Waller (n=8)   Deming (n=7)

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READERS GUIDE TO PERIODICAL LITERATURE

SMITH, KATE
```
        Vol 46 (1986)
                    obit            Newsweek   6/30/86        1740

        Vol 47 (1987)
                                    Peop Wk    6/15/87        1749
                                    New York   10/19/87       1749

        Vol 48 (1988) -      0
        Vol 49 (1989) -      0
        Vol 50 (1990) -      0
        Vol 51 (1991) -      0
        Vol 52 (1992) -      0
        Vol 53 (1993) -      0
```

WALLER, ...
```
        Vol 46 (1986) -      0
        Vol 47 (1987) -      0
        Vol 48 (1988) -      0
        Vol 49 (1989) -      0

        Vol 50 (1990)
            WALLER, ROBERT, 1913-   (not applicable)
                                    Hist Today   1/90         1975

        Vol 51 (1991)
            WALLER, ROBERT J.
                                    Read Dig     2/91         2075

        Vol 52 (1992)
            WALLER, ROBERT J.
                                    Newsweek   9/7/92          2181
                    Mutter          Pub Wkly   7/20-21/92      2181
                                    Peo Wkly   11/16/92        2181

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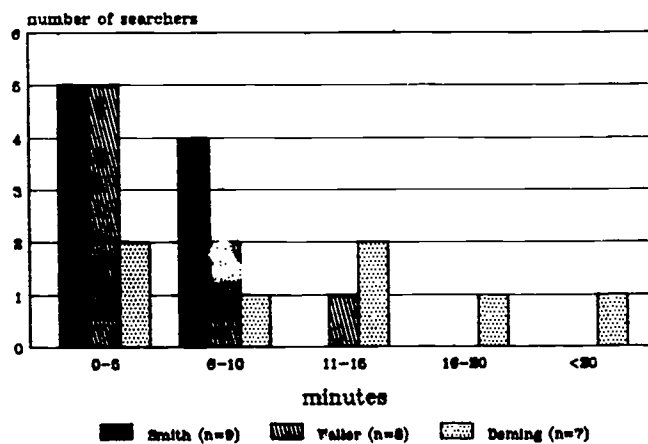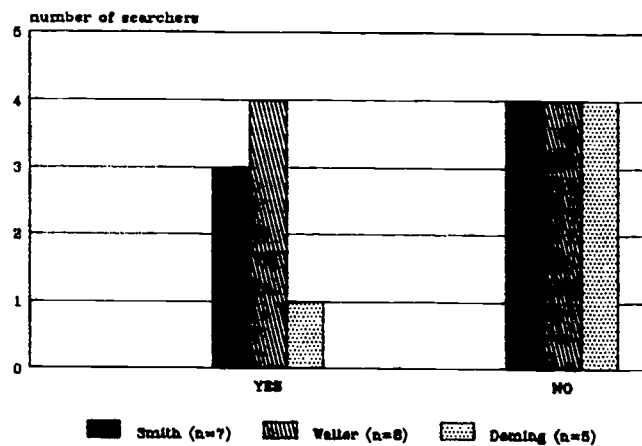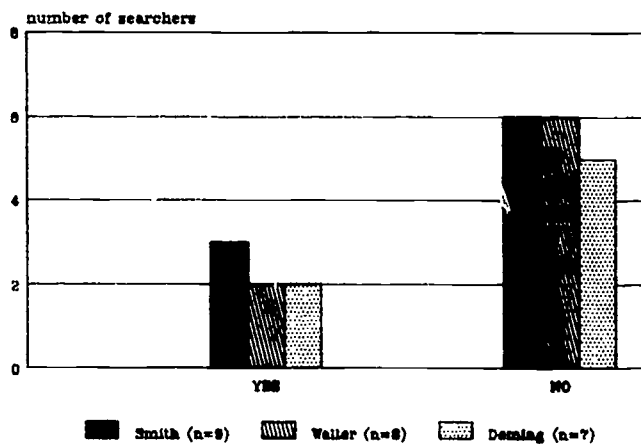
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