

INFORMATION-SEEKING BEHAVIOR OF SCIENTISTS AND THEIR
ADAPTATION TO ELECTRONIC JOURNALS

by
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This paper presents a study that was conducted at the National Institute of Environmental Health Sciences (NIEHS) during the Spring 2001 semester. The study examined the affect of electronic journals on the information-seeking behavior of scientists over the past ten years. The author attempted to prove that the relationship has become stronger at the Institute during this time frame and that it has, in turn, affected the physical usage of the library. An end-user survey, which was distributed to approximately 200 scientists, was employed as the method of evaluation. The main goal of this research was to better inform the librarians at the NIEHS Library about the preferences of their patrons and assist them in making important decisions about the library's physical and electronic collection. Among the results it is revealed that a majority of the scientists have integrated e-journals into their information-seeking routine and considered them an important resource.

Headings:

Library Schools – Theses – University of North Carolina at Chapel Hill

Information needs – Evaluation

Communication of scientific and technical information

Surveys – Electronic journals

Information services – Special subjects – Environment

Table of Contents

Abstract.....	i
List of Tables and Charts	iii
Introduction	1
Review of the Literature	4
Methodology	9
Results	13
Conclusion	26
Works Cited	28
Appendix A	29
Appendix B	31
Appendix C	33
Appendix D	35
Appendix E	38

List of Tables and Charts

Table I	13
Table II	14
Table III	23
Figure 1	15
Figure 2	16
Figure 3	17
Figure 4	18
Figure 5	19
Figure 6	20
Figure 7	24

Introduction

The past couple of decades have bared witness to a revolution in computer-based communication technology. These changes have revolutionized the way people utilize information in various communities. One of the more recent advances in this realm has been electronic publishing, specifically the production of electronic journals.

Electronic journals (also known as e-journals) have altered the way scholarly information is disseminated throughout much of the world, especially in the fields of the “hard sciences” where, on average, many scientists could be described as early adopters of innovation. In other words, they possess a rather high degree of innovativeness and are the second group to adopt an innovation (Rogers, 1995). E-journals have not only affected the way information is spread, but the way information is acquired and how scientific researchers seek that needed information. There is no doubt that this particular innovation has changed the information behaviors of scientists (Brown, 1999), but the important questions that still remain are: How has the innovation affected these behaviors and have these changes affected the role of the library as an information provider?

Though librarians and information specialists do possess some knowledge about these issues, there is still much to learn in this area. During the time of frequent change in technology, it is becoming increasingly important to keep up with the constant fluctuation in user information needs. Thus, more effort is called for if answers to these

questions are to be found. Information professionals will then gain a better understanding of their user populations and how to serve the user's needs.

The major goal of this research is to acquire insights relative to how electronic journals have changed the information-seeking behavior of investigators and in turn, affected end-user access to the library. The study will specifically analyze the information-seeking behavior of one set of investigators (or scientists) at the National Institute of Environmental Health Sciences. The main focus will be to describe and analyze the effects of electronic journals on the information-seeking behavior of these scientists during the course of the past ten years. The study will also examine the impact that electronic journals have had on the utilization of the library by these scientists.

The National Institute of Environmental Health Sciences (NIEHS) is one of the 25 Institutes and Centers of the National Institutes of Health (NIH). It began as a division in 1966 as a result of public demand for research on environmental-related illnesses, and in 1968 it was elevated to an institute. NIEHS is located in Research Triangle Park, North Carolina and specifically focuses on the study of environmental-related diseases and health risks. This involves a combination of multidisciplinary biomedical research programs, prevention and intervention efforts, and communication strategies that encompass training, education, technology transfer, and community outreach. In the past, researchers and grantees at the NIEHS have lead experiments that proved the deadly effects of asbestos exposure, the developmental impairment of children exposed to lead and the health effects of urban pollution. Current research is being done in such areas as women's health, lead poisoning, agricultural pollution, and Alzheimer's and other neurologic disorders.

Many studies in the past have surveyed the information-seeking behavior of the scientist and some have even examined the effect of electronic resources on this behavior (Hallmark, 1995; Curtis et. al., 1997; Brown, 1999). However, very few, if any have focused solely on the electronic journal, perhaps the single most important resource to be produced in this age of information technology. The lack of research in the area could be attributed to the relative “newness” of this resource. Not only does the present study have much to offer to the field of science librarianship, but is also applicable to virtually any audience that a library serves, especially other scholarly disciplines.

On average, with each new technological resource that emerges comes a change in the way a user’s information-seeking behavior is structured. According to Brown (1999), these changes are currently challenging the well-known traditional model of the scientists’ information-seeking behavior that was proposed by Garvey and Griffith in the 1970’s. They proposed that scientific information was primarily disseminated through and subsequently became the most highly valued when printed in a referred journal (Garvey and Griffith, 1972).

It is crucial to explore the metamorphosis that has taken place and continually update our user models. It is also important to note that this phenomenon is not restricted to scientists, but is happening throughout the scholarly world. The study addresses an issue that all librarians should be concerned about.

Review of the Literature

Information-Seeking Behavior

The study of information-seeking behavior of various populations is a well-known and major research area in library and information science, but this concept is not exclusive to the library and information science discipline. The idea of information-seeking behavior is broad in scope and stretches across other disciplines as well. For example, Pirolli and Card's "Information Foraging" explores the psychological theory that all people are *informavores*. Their article specifically examines the means by which information-seeking, gathering, and consumption are adapted to the fluctuation of information in the environment. Pirolli and Card state that, "The structure of the interface between people and information repositories in the external world determines the time costs, resource costs, and opportunity costs of different information foraging and sense-making strategies" (1999). When people search or forage for information they will commonly choose a mode of retrieval that provides them the maximum amount of useful information in the minimum amount of time. According to Pirolli and Card, a cognitive strategy will be considered superior to another if it produces more useful information per unit cost.

Scholars within library and information science as well as outside the field have designed several schematic models to demonstrate the phenomenon of information-seeking behavior. These models include one proposed by Mick, Lindsey, and Callahan which focuses primarily on environmental and situational variables – those that can be

easily manipulated, but play a major part in information behavior (1980). Gloria Leckie and her colleagues designed a rather complex model of information-seeking of the professional that involved six components: (1) work roles, (2) associated tasks, (3) characteristics of information needs and three factors affecting information-seeking: (4) awareness, (5) sources, and (6) outcomes (1996). They go on to discuss how these six components interact with one another during the act of information-seeking.

In terms of the library literature on this topic, a review of the previous literature revealed that a plethora of studies and articles have examined various factors that can affect information-seeking behavior. The studies can vary from examinations of the information-seeking behavior phenomenon (such as the ones discussed in the paragraph above) to profiling the information-seeking behavior of a specific group of individuals such as Marilyn Von Seggern's "Scientists, Information Seeking, and Reference Services" (1995). During the past several decades, scholars of the "hard sciences" have increasingly become the subjects of these types of studies. Perhaps this is due to their frequent use of library-related resources and their relatively quick adoption of innovation. Consequently, they are frequently studied because their information-seeking behavior is constantly changing.

Electronic Resources and Their Effect on Information-Seeking Behavior

During the late 1980's and early 1990's many new information technologies arose that would revolutionize the ways in which people searched for and gathered information. More and more publications began to profile the impact that new electronic resources (such as online database systems, CD-ROMs, etc.) had on different populations.

Surprisingly, only a few articles were found in the review of the literature that specifically considered the relationship between scientists and these electronic resources, especially Internet or Web based resources.

In 1995, Julie Hallmark published an article on the information-seeking behaviors of scientists and the effects of technology on their behavior. In the article she explores the various applications of the Internet for scientists as well as the problems and issues associated with this innovation. She quotes one scientist as saying:

“It’s (the Internet) the most fundamental shift since Gutenberg. The Internet is basically a space and time destroyer. It shrinks distance and time to zero. It’s as if all the world’s scientists were in one room, available at one computer. Needless to say this is having a profound impact on the way science is done” – astrophysicist, Larry Starr (Hallmark, 1995).

Despite that quote along with some other positive ones, a major problem she reveals is that many scientists were actually quite slow to adopt this new technology. As evidence of this she cites S.R. Heller’s 1994 book, *Further Advances in Chemical Information*, which indicated, “the routine use of computers in support of research and production in a chemistry laboratory or office, other than for word processing, spreadsheets, and literature searching, is less than 25% of the potential users” (Hallmark, 1995). Further, she proceeds to bring to the reader’s attention that at one large university only 20 out of 60 chemists had an email address in 1994, and that many of those twenty had been “automatically assigned.” Thus, it seemed that in general many potential users were not taking full advantage of the resources the Internet had to offer.

Sometime between 1994 and 1996 there was shift in electronic resource usage by scientists. The shift could be attributed to the increase in popularity and usability of the

Internet itself as well as the resources it contained. One previous study surveyed health sciences faculty in 1995 at the University of Illinois and discovered that use of electronic resources had gradually been incorporated into the scientist's information-seeking. It also revealed that electronic resource usage had substantially increased compared to a study administered to the faculty in 1991. The increase was attributed to the availability of more and better electronic resources, desktop access through networked workstations, and user-friendly interface design (Curtis, Weller, & Hurd, 1997). In general, the survey respondents had come to prefer electronic access as opposed to traditional information-seeking methods to find their information materials. When asked about their sources for journal articles, the majority still relied on their own personal subscriptions as their primary source. They also came to the library and made photocopies of articles. It is important to note that during the study the Health Science Library was not offering full-text access to electronic journals and therefore did not investigate whether the resources involved had any impact on the faculty's information-seeking behavior.

Brown published an article in 1999 that profiled a study similar to Curtis, which surveyed astronomers, chemists, mathematicians, and physicists at the University of Oklahoma. Her survey was actually distributed electronically via email, which at that time had become an acceptable mode of communication. Unlike the Curtis article, Brown questioned the scientists about their use of electronic journals as an information resource. She found that:

“Less than 50% of the respondents reported utilizing some form of electronic subscription. Sixty-two percent to 65% of the scientists reported a preference for a print journal while 23% to 31% preferred an electronic version. A small fraction of the scientists (5 – 16%) expressed a preference for access to both print and electronic forms and two of these

scientists stipulated that the electronic would be preferred only if it were ‘printable’” (Brown, 1999).

Additionally, the last time a published study of this nature was conducted at the National Institute of Environmental Health Sciences was nearly ten years ago, essentially before the birth of the medical/scientific electronic journal. The 1992 study by Borrée Po-Yee Kwok, a SILS graduate student, sampled a group of “scientists” that were queried on their use of materials such as CD-ROM databases, online databases, journals, monographs, etc to do research. Below is the respondents’ resulting ranked list of the five most useful resources (Kwok, 1992):

1. Journals (*obviously print*)
2. Personal contacts
3. Conferences/Meetings
4. Online Databases
5. Research Reports

It is clear that the results of the study, though viable at the time, cannot be used to assess the current user population at the Institute.

In conclusion, the dearth of the literature in the area indicates the significance of the current study. First, the concept of information-seeking behavior is important to library and information science and is frequently studied in the field as well as by other disciplines. Second, electronic resources have undoubtedly had some affect on the way scientists search for information and it is necessary for librarians to study this process continually. Lastly, not very much data has been gathered on how electronic journals affect information-seeking behavior. In addition, the data that has been published is at least a year old, making it grossly out-of-date in terms of today’s electronic revolution.

Methodology

Understanding the Question

“How have electronic journals changed the information-seeking behavior of investigators and in turn, affected end-user access to the library?”

In order to understand the methodology of this research, various terms used in the question need to be contextually defined. First, “electronic journals” are the journals (both free and paid subscriptions) accessed by the investigators via the NIEHS library’s web page. Second, the term “changed” is defined as whether these journals have been incorporated into a researcher’s search for information, and if they are deemed as an important resource to the researcher. This was measured by the frequency and placement of the term “electronic journals” in the investigators’ ranked lists of resources they use. Third, “information-seeking behavior” is defined as how a person locates the information he/she needs to complete a task, specifically a research project or study, using various sources. These sources may take any form whether they are paper, electronic, or human in nature. Fourth, “investigators” are defined as researchers that possess either a Doctorate of Philosophy (PhD), a Doctorate of Veterinary Medicine (DVM), a Doctorate of Science (DS), be a Doctor of Medicine (MD) or are considered a “principal investigator” for the Institute and are employed (either temporarily or permanently) to do scientific research there. Fifth, the term “affected” is defined as an increase or decrease of either the “amount” of use of the library by an individual end-user or the actual number of end-users. “Affected” is also defined by whether the use of the library has changed in terms of being physically accessed (the end-user actually goes to the library)

or remotely accessed (the end-user accesses the library's web page from their desktop computer and uses the various resources available through the page, including electronic journals). This was measured by survey questions asking the researchers about their use of the library. Sixth, an "end-user" is a person that uses the library or may potentially use the library physically and/or remotely. Finally, the library in question is defined as the library at the National Institute of Environmental Health Sciences (located in Research Triangle Park, North Carolina).

The Measuring Instrument

Because this study was primarily targeted at the information-seeking behavior of the scientist, an end-user survey was administered as the measuring instrument. It asked a variety of questions about the investigator's usage of various resources and their use of the library at the NIEHS. Specifically, the survey attempted to get the researcher to describe their current information-seeking behavior as well as their history of resource usage over the past ten years.

The development of the questionnaire was based on a combination of factors. A review of similar studies that had been conducted provided a base for the survey and helped in deciding what kinds of questions to ask. Once the questions were formulated several meetings were held with the Director of the Library and the Technical Services Librarian to get their input. During these meetings each question was discussed in-depth and attempts were made to troubleshoot any problems there might be inherent in them. Also the two reference librarians were queried for any advice they might have for

improving the survey. After multiple meetings and several revisions, the final version of the questionnaire was finally produced.

The finished survey was two pages long and consisted of 12 questions (see Appendix A). It was anonymous, but each individual survey was assigned a number for tracking the returns. A cover letter was also composed explaining the experiment, its purpose, and the fact that the survey was confidential (see Appendix B). The surveys were sent out through the inter-departmental mail accompanied by the cover letter and a return envelope with the author's name and mail drop designation. This would ensure that no one other than the author would view the completed surveys.

The initial mailing of approximately 220 surveys was sent on February 8th, 2001. As the questionnaires were returned they were checked off on the list according to the corresponding number on the survey. On February 22nd, two weeks after the initial surveys were distributed, a second copy of the survey along with a revised cover letter (see Appendix C) was sent out to those participants who had not returned the first copy of the questionnaire. March 9th, two weeks following the distribution of the second copy of the survey, the tabulation of the results began. Any surveys that were received after that time were excluded from the analysis. To ensure confidentiality, after March 9th, the list of survey recipients with corresponding survey numbers was deleted. Once the data from the surveys was entered into a spreadsheet the questionnaires were discarded.

The Survey Population

The population that received the questionnaire was what the library at National Institute of Environmental Health Sciences considered their targeted primary users. This

was a group of approximately 220 researchers (investigators) that possessed a Doctorate of Philosophy (PhD), a Doctorate of Veterinary Medicine (DVM), a Doctorate of Science (DS), were a Doctor of Medicine (MD) or considered a “principal investigator” for the Institute. Additionally, they were employed (either temporarily or permanently) to do scientific research there. Although there are many other employees of the Institute that access the library, (such as lab technicians and students working with the investigators) these users were considered secondary because they were assumed to be acting as information intermediaries for the investigators. Thus, the survey instrument was distributed to only these 220 individuals.

In order to produce a list that would include all or most of the individuals desired, the human resources branch of the Institute was contacted. Based on the requirements that were given to them they provided a printed list of investigator that possessed the criteria. The list was then cross-referenced with the Institute’s membership list for the Assembly of Scientists to ensure everyone on the membership list appeared on the human resources list. The assemblage of the two lists furnished the names of the desired investigators.

Data Analysis

After the surveys were returned, the responses were coded and entered into an Excel spreadsheet. Excel was also used to manipulate, calculate, and graph the data for the analysis.

Results

Characteristics of the Participants

Of the initial 220 surveys sent out, a total of 149 surveys were returned (67% return rate). The total number of useful surveys was 146 since three of the surveys were returned after the deadline and therefore not included in the results. Table I shows the demographics of the survey participants. Of the people who responded to the question, the majority of the participants (78%) received their highest degree before 1991 as opposed to the 25 scientists (22%) who completed their degrees during the past ten years.

Table I: Demographic data

Gender (n=146)	Number	Percentage (%)
Male	106	73.6
Female	38	26.4
No Response	2	1

Age (n=144)		
20-30	1	.6
31-40	31	21.5
41-50	50	34.7
51-60	45	31.3
61-70	16	11.1
71 and over	1	.6
No Response	2	1

Preferred Information Resources

The survey participants were queried about their usage of information resources over the past ten years. Figures 1 (Today), 2 (5 Years Ago), and 3 (10 Years Ago) show the total frequency of usage for each resource during each of these time periods. Table II

displays the five most useful resources, in descending order of ranking for each time period.

There was a concern about asking the scientists to recall their resource usage from ten years ago, because of the possible lack of accuracy. However, when responses to this question (question 4 on the survey) are compared to (see Figure 3) the earlier study done at the NIEHS by Kwok in 1992, many of the most preferred resources remained same. For example, print journals, personal contacts, and conferences, all listed in the five most useful resources (Kwok, 1992), can be found in the top five of Table II.

Table II: Ranking of Information Resources

Today	Five Years Ago	Ten Years Ago
1. Electronic Journals	1. Print Journals	1. Print Journals
2. Print Journals	2. Conferences/Meetings	2. Reprints
3. Online Databases	3. Colleagues/Personal Contacts	3. Conferences/Meetings
4. Colleagues/Personal Contacts	4. Reprints	3. Colleagues/Personal Contacts
4. Conferences/Meetings	5. Books	4. Books

An examination of Figures 1, 2, and 3 on the following pages shows the fluctuation in popularity among the various resources. Looking across the ten-year period, one can see that the combination of conferences, reprints, colleagues, print journals, and books (the most used resources) made up 83% the total resource usage in the early 1990's, whereas today they make up only a little over half (51%) of the total. Despite this, print journals have remained the most used resource by scientists only to be replaced by their electronic form in today's research world. In fact, there has been an increase in usage of all electronic resources during the ten-year period of 1991-2001. The most astounding of these increases is in electronic journals, which have more than

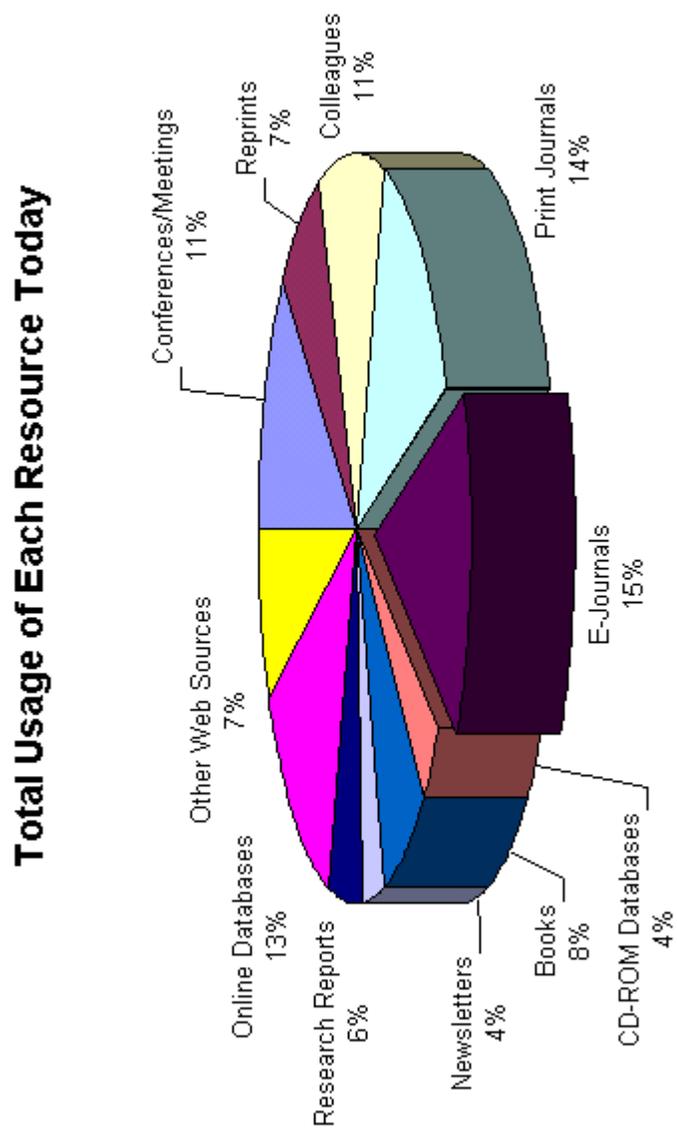


Figure 1

Total Usage of Each Resource 5 Years Ago

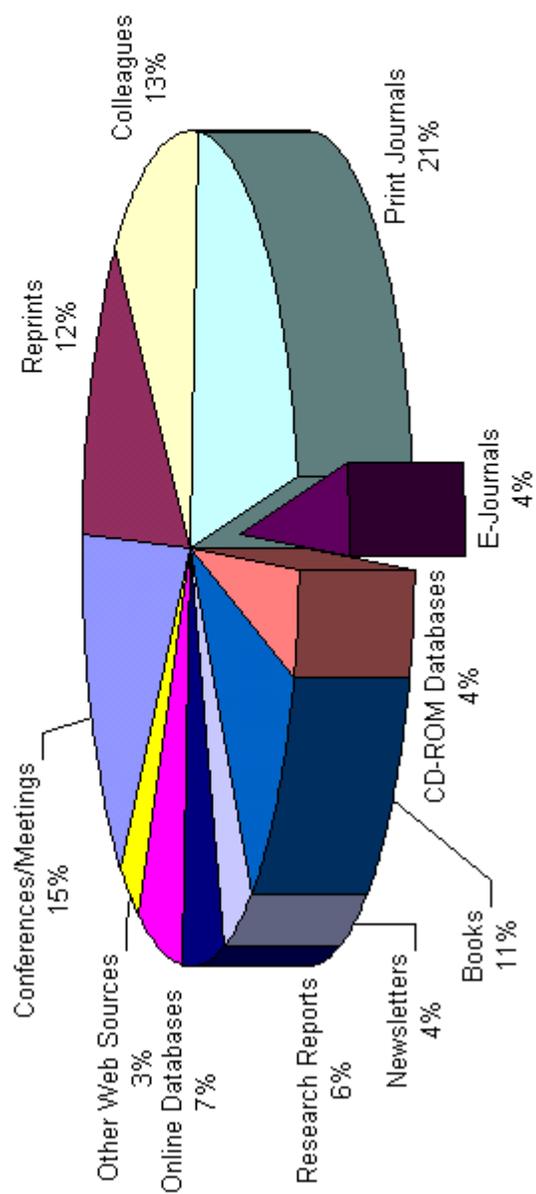


Figure 2

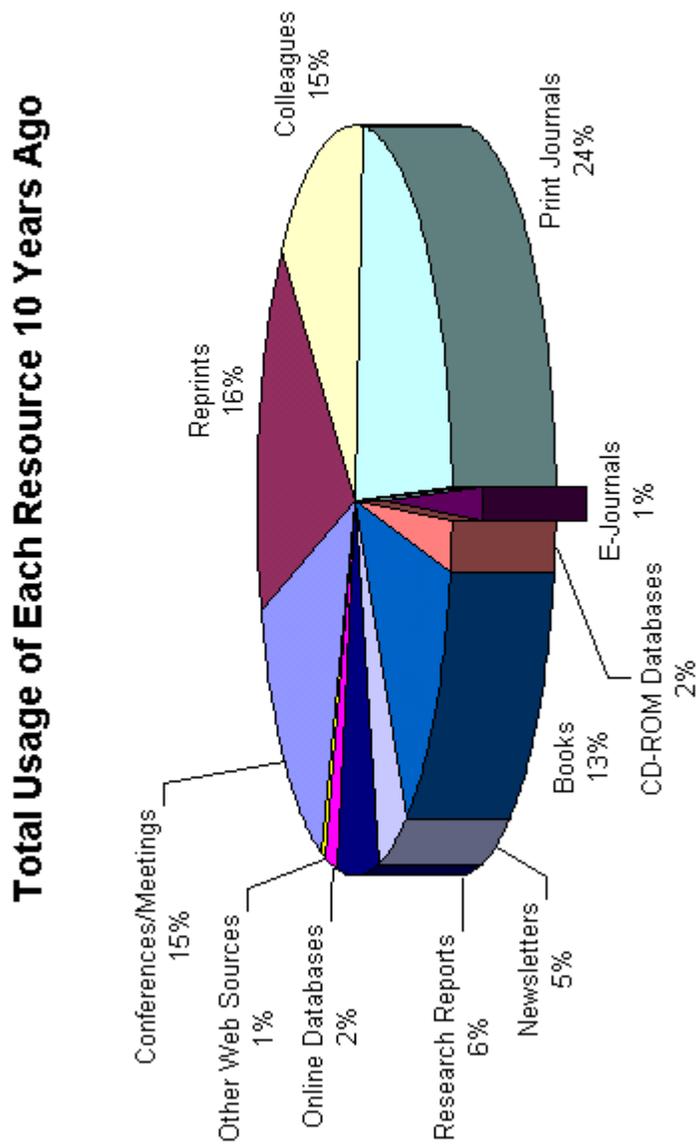


Figure 3

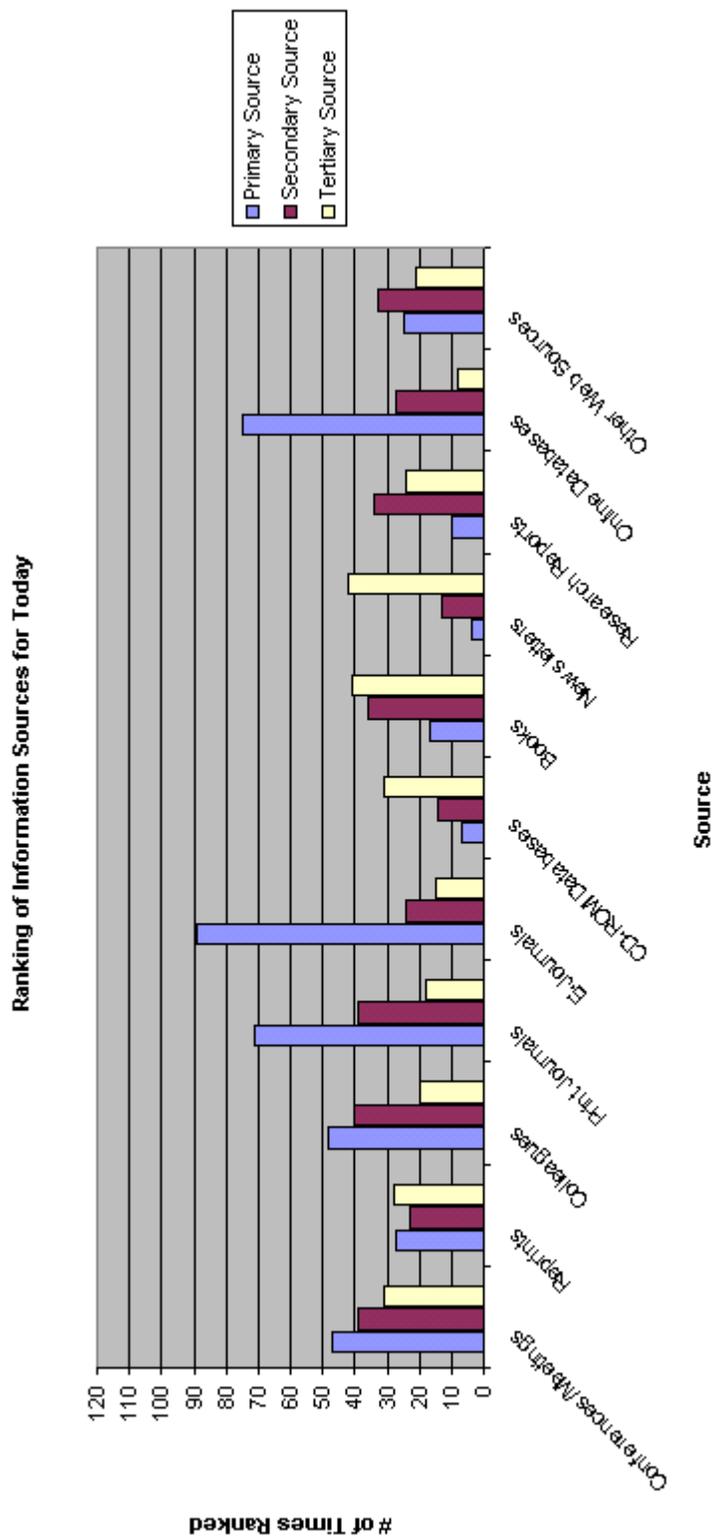


Figure 4

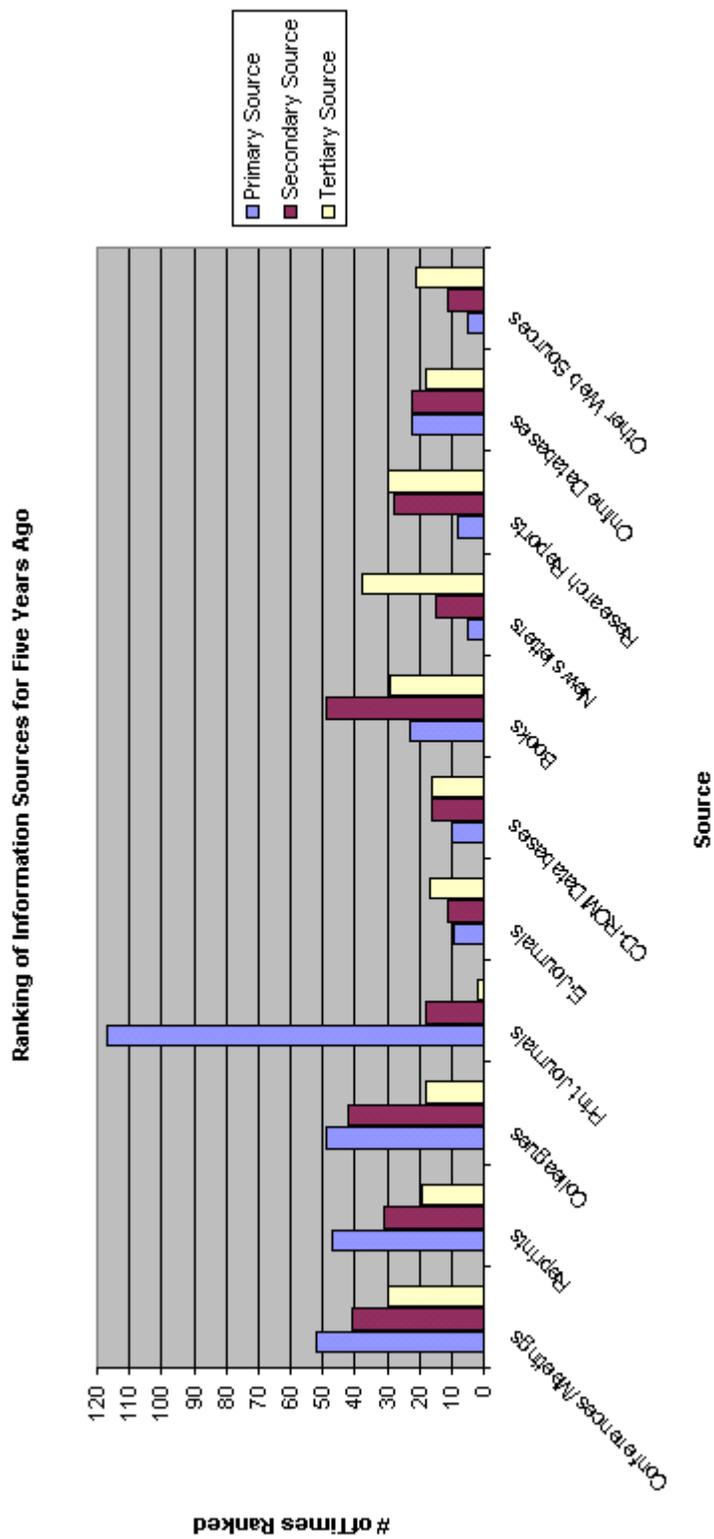


Figure 5

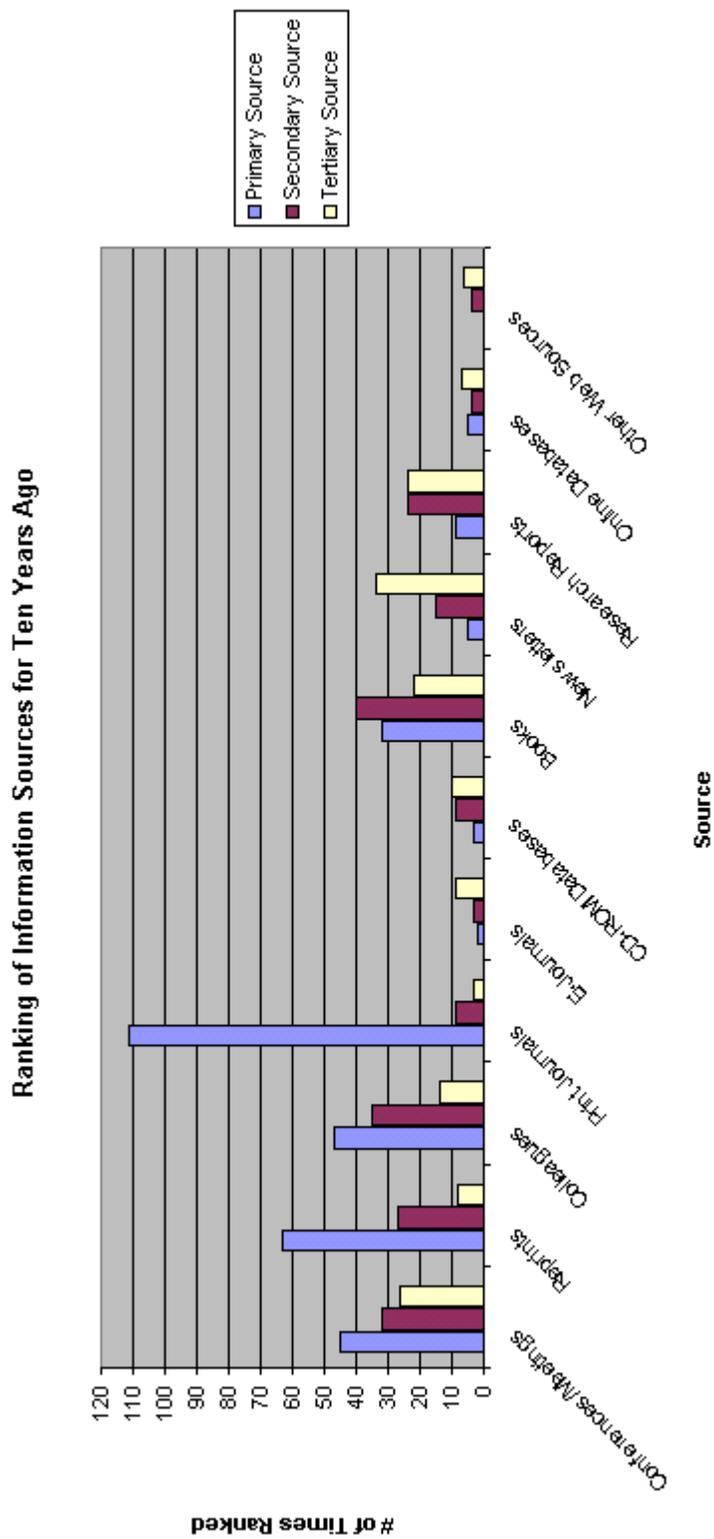


Figure 6

tripled in usage during the past 5 years and are now considered to be the most heavily used information source.

Electronic Journals and Their Usage

The participants in the survey were asked to rank several informational resources as a primary, secondary, or tertiary source over the past ten years. If there were several sources that they themselves considered primary they could rank them all as primary and the same went for secondary and tertiary resources. Basically, the objective of the question was to determine the steps in the scientist's information-seeking process. Where do they turn first when faced with a research question? What is their second or third step, etc.? Question #4 on the survey was also meant to query the researcher about the amount of importance they placed on certain resources. Figures 4 (Today), 5 (5 Years Ago), and 6 (10 Years Ago) found on the preceding pages, graph the responses to this question.

Throughout the ten-year period, there was much fluctuation in the considered value of many of these resources. Electronic journals have especially impacted the information-seeking behavior of the scientific researcher. They are not only the most used resource, but are currently considered to be the most valuable to the researchers at NIEHS. This incorporation into the scientist's information-seeking process has only occurred during the past five years, which agrees with the notion and research literature that many scientists tend to adopt innovation quickly. This may be attributed to what Pirolli and Card would call an optimal forager, a person who "finds the best solution to the problem of maximizing the rate of net energy returned per effort expended" (1999). In other words, scientists have adopted electronic journals because of quick, convenient access from their desktops and the little effort required to retrieve information from them.

Whether or not this is the case, it is obvious that electronic journals are a resource of convenience and therefore will be quickly adopted by most groups. Although most of the scientists utilized electronic journals in some way or another, 61% of them still preferred to print out the electronic version to read it as opposed to the mere 8 scientists (6%) that liked to read directly from the screen. Surprisingly, of these eight, all had received their highest degree before 1991 and half of them were between the ages of 61-70 years old. Thirty-four percent of researchers still chose to read the print version or a photocopy of the print version over any type of electronic version.

Table III shows the frequency of electronic journal use by the scientists at NIEHS (question #7). In question 8 on the survey, the scientists were asked to give the reason why they did or did not utilize electronic journals. For those researchers who did utilize e-journals: convenience, speed, and easy access were the top three reasons why (see Appendix D). Although only eleven (7.5%) of the 146 researchers surveyed stated that they never used electronic journals, when asked why they used or did not use e-journals, several more researchers stated why they did not use them (see Appendix E). Many of them responded to the question in this way because they only used electronic journals for certain researching situations, such as scanning Tables of Contents or printing a graphic. Others that did not use electronic journals said things like “Not used to it -- I don't think of it. Also I like perusing a journal.” or “Not well trained to access electronic journals and so far haven't had a compelling reason to learn.”

Table III: Frequency of Electronic Journal Use

Frequency	Number of Scientists (n=146)	Percentage (%)
Daily	58	39.7
Weekly	50	34.2
Monthly	21	14.3
Yearly	6	4.1
Do Not Use	11	7.5

Figure 7 displays the various methods of obtaining journal articles. The most popular method of obtaining desired journal articles was through reading the library's electronic version. This was followed closely by photocopying the library's print copy and requesting photocopies from the library (which can be done remotely through an online form on the library's web page). Among the most unpopular methods, 8% said they still ordered reprints from authors. This is quite a change from ten years ago when reprints were considered the second most used resource. Two percent obtained journal articles through other methods, such as photocopying them at nearby university libraries or using their lab's subscription to print copy.

Use of the NIEHS Library

Today, the researchers at the National Institute of Environmental Health Sciences still utilize the library, but in different ways. Most (73%) access the library's web pages when in need of a library service before they even venture there physically. Most investigators prefer to do their own library work and only a small percentage (3%) send their students or assistants to the library. Twenty percent of scientists still physically go to the library when looking for information or a library service.

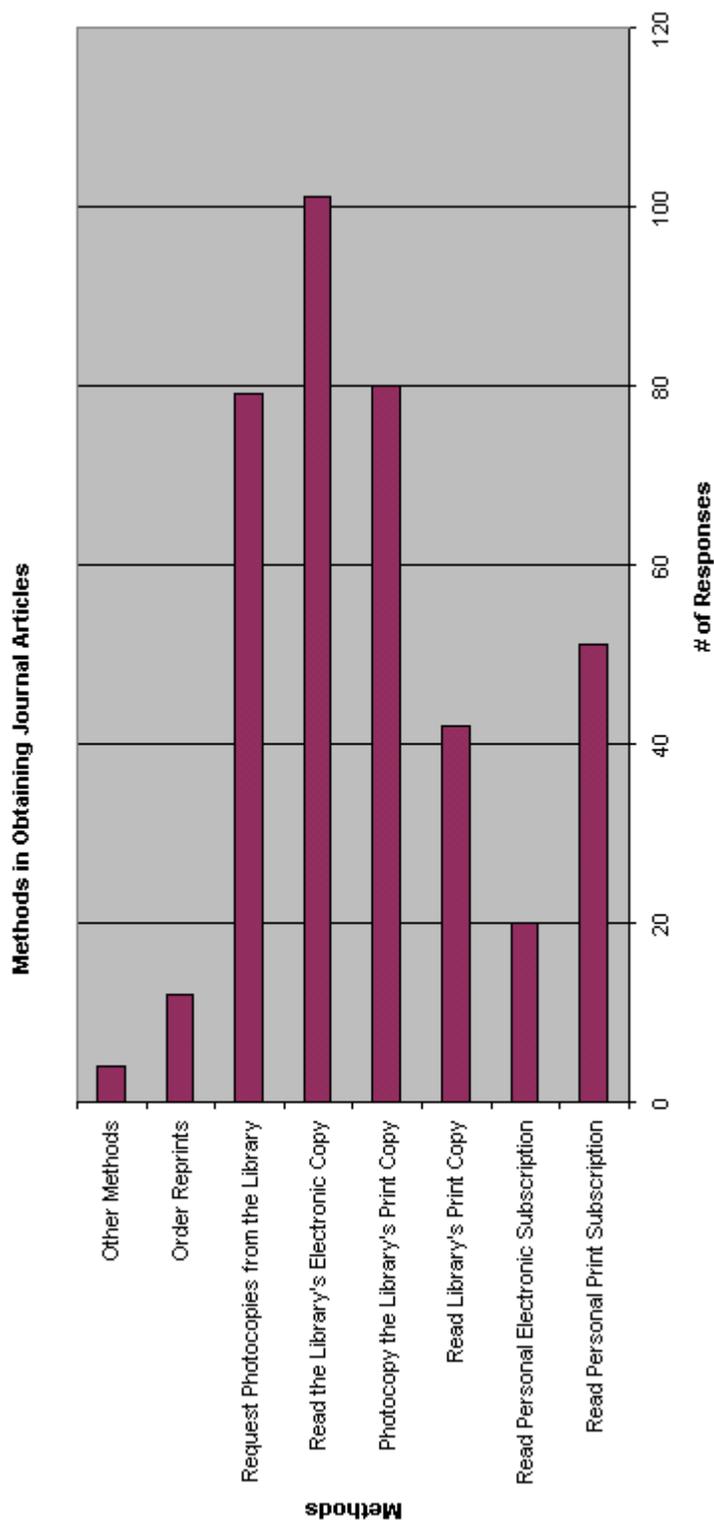


Figure 7

When asked how the frequency of their visits to the library had been affected by the emergence of electronic journals, many scientists (78%) agreed that their number of physical visits had decreased (either slightly or substantially). This could be attributed to the desktop access to electronic journals, which allows for direct access to electronic journals from the office or laboratory. A surprising 21% of the researchers said that their visits to the library had not changed. Upon closer examination, the high percentage was credited to those researchers who enjoy browsing the stacks and just being in a quiet place where they can sit and read.

Conclusion

The future of library and information science is to be more user oriented as opposed to collection-centered as it has been in the past. We must customize our information to the user. To be able to do that we must be in sync with the information needs of our user populations. This study was undertaken in an attempt to help us, the information specialists, become better in touch with some of our users' preferences regarding information access. Undoubtedly, the electronic journal has been embraced by this research community and has even become a tool of daily work life for some. Although there are still some scientists at the Institute who have not adjusted their information-seeking behavior to include electronic journals, a few of their comments indicate that they are what E.M. Rogers would say are part of the "late majority" of adopters, a group that many people belong to (1995). In other words, with the introduction of some sort of training or presentation accompanied by a compelling reason, these scientists would readily adopt this innovation. If nothing else, they would begin to follow along with the early adopters at the Institute. This perception is corroborated by Rogers (1995), who states:

"... most people depend mainly upon a subjective evaluation of an innovation that is conveyed to them from other individuals like themselves who have previously adopted the innovation. This dependence on the experience of near peers suggests that the heart of the diffusion process consists of the modeling and imitation by potential adopters of their network partners who have adopted previously. So diffusion is a very social process."

All else aside, the study answered some necessary questions that the library at the National Institute of Environmental Health Sciences wanted to know about their patrons.

The survey results supplied the librarians with current data on their targeted user population, which will in turn be used to make important management decisions about the journal collection. In the age of shrinking shelf space and a movement that is demanding free online journal access (Wadman, 2001), it may be safe to assume that this medium will soon become both the scientist's and library's most desirable resource.

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Appendix A: The Survey

1. What is your gender?

Male Female

2. What is your age?

20-30 31-40 41-50 51-60 61-70 71 and over

3. What year did you receive your highest degree?

4. Where do you go for scientific information?

Please rank the following information sources 1-3 for each time period that applies to you.

1 = primary sources

2 = secondary sources

3 = tertiary sources

0 = not applicable

<u>Today</u>	<u>5 Years Ago</u>	<u>10 Years Ago</u>
<input type="checkbox"/> Conferences/ Meetings	<input type="checkbox"/> Conferences/ Meetings	<input type="checkbox"/> Conferences/ Meetings
<input type="checkbox"/> Reprints	<input type="checkbox"/> Reprints	<input type="checkbox"/> Reprints
<input type="checkbox"/> Colleagues/ Personal Contacts	<input type="checkbox"/> Colleagues/ Personal Contacts	<input type="checkbox"/> Colleagues/ Personal Contacts
<input type="checkbox"/> Print Journals	<input type="checkbox"/> Print Journals	<input type="checkbox"/> Print Journals
<input type="checkbox"/> Electronic Journals	<input type="checkbox"/> Electronic Journals	<input type="checkbox"/> Electronic Journals
<input type="checkbox"/> CD-ROM Databases	<input type="checkbox"/> CD-ROM Databases	<input type="checkbox"/> CD-ROM Databases
<input type="checkbox"/> Books	<input type="checkbox"/> Books	<input type="checkbox"/> Books
<input type="checkbox"/> Newsletters	<input type="checkbox"/> Newsletters	<input type="checkbox"/> Newsletters
<input type="checkbox"/> Research Reports	<input type="checkbox"/> Research Reports	<input type="checkbox"/> Research Reports
<input type="checkbox"/> Online Databases	<input type="checkbox"/> Online Databases	<input type="checkbox"/> Online Databases
<input type="checkbox"/> Other Web Sources	<input type="checkbox"/> Other Web Sources	<input type="checkbox"/> Other Web Sources
<input type="checkbox"/> Other (please specify):	<input type="checkbox"/> Other (please specify):	<input type="checkbox"/> Other (please specify):
<input type="checkbox"/> Other (please specify):	<input type="checkbox"/> Other (please specify):	<input type="checkbox"/> Other (please specify):

5. When in need of a library service, are you most likely to?

- Access the library's web pages
 Physically go to the library
 Send an assistant or student to the library
 Call the library
 None of the above

6. Given the option, in what format would you prefer to read journal articles? (pick one)

- Original print version/
photocopy Read the electronic (web)
version on the screen Print out the electronic
(web) version

7. On average, how often do you use electronic journals?

- Daily
 Weekly
 Monthly
 Yearly
 I do not use electronic journals.

8. Why do you use or not use electronic journals?

9. By the end of 2001, the NIEHS Library will run out of shelving space for the journal collection. In order to make room for subsequent years, which would you rather see the Library do. (pick one)

- Continue to subscribe to both the print and electronic (web) versions of current journals and discard the **oldest** year of selected journals
 Continue to subscribe to both the print and electronic (web) versions of current journals and discard the print version of the **current** year of selected journals at the end of the year
 Subscribe to only the electronic (web) versions of selected current journals

10. How do you currently obtain most of your journal articles for your research? (Check all that apply)

- Read personal subscription to print copy
 Read personal subscription to the electronic (web) version
 Read the library's print copy in the library
 Photocopy the library's print copy
 Read the NIEHS or NIH Library's subscription to the electronic (web) version
 Request photocopies from the library
 Order reprints from author
 Other (please describe):

11. Now that electronic (web) versions of journals can be accessed from my own computer, my visits to the library have (circle one):

Decreased
substantially

Decreased
slightly

Not
Changed

Increased slightly

Increased
substantially

12. Please feel free to add any other comments on library resources / services that you would like to let the library know about. (Please use the backside of this sheet if you need more room)

Appendix B: The Initial Survey Cover Letter



THE UNIVERSITY OF NORTH CAROLINA
AT
CHAPEL HILL

School of Information and Library Science
Phone# (919) 962-8366
Fax# (919) 962-8071

The University of North Carolina at Chapel Hill
CB# 3360, 100 Manning Hall
Chapel Hill, N.C. 27599-3360

Dear NIEHS Researcher,

I am writing to seek your help in a survey on electronic (web) journals and how they affect the way scientists search for and acquire scientific information.

I am a graduate student at the University of North Carolina at Chapel Hill and I am presently working as an intern in the NIEHS Library. The main purpose of this research is to better understand your information needs and to analyze the way NIEHS researchers seek information. I will be using the results of this survey to write my Master's Paper. Additionally, the **NIEHS Library will also be using the results to make collection-related decisions for the future.**

I hope you will take the time to complete the following survey and return it in the enclosed envelope at your earliest convenience. The survey should take approximately fifteen minutes of your time. Please try to be as honest as possible when answering the survey questions. It is not necessary for you to put your name on the survey; I do not need to know who you are. The results of the survey will be nameless, but I will be assigning a number to each survey to track the return rate. Your responses will never be associated with your identity. Participation is voluntary and there is no penalty if you do not participate, but I urge you to do so. Your invaluable effort in completing this survey is greatly appreciated and your responses will help the Library to better serve you.

If you have any questions please contact me or my project advisor, Dr. Claudia Gollop at (919) 962-8362 or gollop@ils.unc.edu. You may also contact Dav Robertson, the NIEHS Library Director at robert11@niehs.nih.gov.

Thank you for your time.

Amy Gleeson,
UNC-CH Student
NIEHS Library Intern
(919) 933-7522
gleeson@niehs.nih.gov
gleea@ils.unc.edu

You may contact the UNC-CH Academic Affairs Institutional Review Board at the following address or telephone number at any time during this study if you have questions or concerns about your rights as a research participant:
Dr. Barbara D. Goldman, Chair
CB# 4100, 201 Bynum Hall
The University of North Carolina at Chapel Hill
Chapel Hill, North Carolina 27599-4100
(919) 962-7761, or Email: aa-irb@unc.edu

Appendix C: The Follow-Up Survey Cover Letter



THE UNIVERSITY OF NORTH CAROLINA
AT
CHAPEL HILL

School of Information and Library Science
Phone# (919) 962-8366
Fax# (919) 962-8071

The University of North Carolina at Chapel Hill
CB# 3360, 100 Manning Hall
Chapel Hill, N.C. 27599-3360

Dear NIEHS Researcher,

As you may know, I sent you a short survey about two weeks ago and today I am sending you a second copy in hopes that you will complete it. The results of this survey are essential to the completion of my Master's Paper. Additionally, **the NIEHS Library will also be using the results to better understand your information needs and to make collection-related decisions for the future.**

I am writing to seek your help in a survey on electronic (web) journals and how they affect the way scientists search for and acquire scientific information. I am a graduate student at the University of North Carolina at Chapel Hill and I am presently working as an intern in the NIEHS Library. The main purpose of this research is to better understand your information needs and to analyze the way NIEHS researchers seek information.

I hope you will take the small amount of time to complete the following survey and return it in the enclosed envelope at your earliest convenience. The survey should take approximately fifteen minutes. Please try to be as honest as possible when answering the survey questions. It is not necessary for you to put your name on the survey; I do not need to know who you are. The results of the survey will be nameless, but I will be assigning a number to each survey to track the return rate. Your responses will never be associated with your identity. Participation is voluntary and there is no penalty if you do not participate, but I urge you to do so. Your invaluable effort in completing this survey is greatly appreciated and your responses will help the Library to better serve you.

If you have any questions please contact me or my project advisor, Dr. Claudia Gollop at (919) 962-8362 or gollop@ils.unc.edu. You may also contact Dav Robertson, the NIEHS Library Director at robert11@niehs.nih.gov.

If you have already completed and returned this survey, please disregard this mailing.

Thank you in advance for your time.

Amy Gleeson,
UNC-CH Student
NIEHS Library Intern
(919) 933-7522
gleeson@niehs.nih.gov
gleea@ils.unc.edu

You may contact the UNC-CH Academic Affairs Institutional Review Board at the following address or telephone number at any time during this study if you have questions or concerns about your rights as a research participant:
Dr. Barbara D. Goldman, Chair
CB# 4100, 201 Bynum Hall
The University of North Carolina at Chapel Hill
Chapel Hill, North Carolina 27599-4100
(919) 962-7761, or Email: aa-irb@unc.edu

Appendix D: Responses as to Why Researchers Use Electronic Journals

The Responses:

- Easy to access
- For the convenience
- Ease of use
- Quick, simple
- Ease of access
- Convenience
- Save time and labor; convenient
- Ease and speed of access to the information. Electronic copy on hard drive so easy to retrieve a paper by simply searching for filename rather than searching through piles of papers.
- Primarily convenience of quick access in my office
- Easy; available; don't need to go to library
- Use to get information
- It is very convenient
- Some journals are easily accessible even for PDF files. Once I searched a database, if the resulted literatures are available thru Web, I use those.
- Convenient & quick
- Quick access -- we are located on East Campus
- To keep up-to-date
- Simplicity
- Convenience
- Really convenient, can see color pictures
- I use electronic journals mainly because of the convenience. It is very easy and saves a tremendous amount of time.
- Because they are there
- Convenience, articles appear earlier than print versions
- It's easy and fast.
- Convenience and ability to have article on my computer for instant use.
- Faster access to the article
- Instant access anytime
- They are convenient
- Convenience
- Very easy access to information -- this makes researching a topic extremely quick & efficient
- Convenience
- Because of its convenience
- Convenience
- Simplicity, quick info.
- Can access from my desk very quickly. There is more detail than in an abstract.
- Convenience in obtaining information.
- For more time-efficient

- Easy to access.
- I use because of convenience.
- Convenience. So much so that when the journals is not electronic I under use it.
- Convenience
- I can myself update without leaving my desk between experiments.
- Convenience. It's better & faster to go to an e-journal and get primary info. Compared to walking to the library & getting distracted.
- I used them to immediately access the information and see if the article contains what I want.
- Convenience, speed of access, quality of copy, color if needed
- Ease of use
- Keep updated
- References
- Fast, desktop
- Ease of use, convenience
- I'd use them all the time if there were an easy link from the MEDLINE entry to the journal article. When that doesn't exist, I have to go to the library to find the printed article.
- Very convenient
- Fastest way to get information from my desk
- It's convenient and saves time.
- It's convenient and faster than walking to the library.
- Because it is the fastest way to get an article
- Convenience and speed of desktop access
- For quick information
- I use most of the time Medline to search then connect to electronic journals if available. It is easy and fast.
- Time and convenience
- Links
- Faster. Read before print version available
- Easy to access
- Need for info.
- For literature search
- Quick reference
- Easy access, can screen before printing out. Have access to a good color printer.
- Immediate access to many different journals
- Speed, easier to scan Tables of Content
- Convenience, clear digital image, color printing available
- Do use
- To find, print out article
- Easy access
- Some journals have e-versions, some don't, use where can since quick access, although after initial look may want paper version.
- Read and as references

- I use them when they are available. They are convenient & it's wonderful to access them at the desktop. I wish there were more available.
- Ease of access; download pdf files to desktop hard drive; download Medline files and impact to Endnote and format bibliography for paper reference
- Convenient & fast
- Easy
- Convenience, conserves time
- Faster, more convenient, better copy
- Efficiency
- Can obtain information immediately
- I need them for information searchers/fact checking (I'm an editor). Online is much faster than a trip to the library.
- Editor for EHP; use in daily work
- Saves time in acquiring publications for those journals that we do not subscribe to
- Quick access; sometimes available before journals arrive in library
- Ease of access
- Ease and availability (can do it at home at night)
- Quicker access
- Faster than going to the library
- Ease of use; convenient to work at computer
- Convenience, speed
- Don't have to go to library; access to journals that library does not have
- Convenience
- Easy access
- Because I am prompted by email messages
- Convenient, save time, easy
- It is very convenient to have access to the full text any time of the day.
- Ease
- Convenience
- Convenient, easier, faster
- They have become the easiest way of accessing information. If online and a pdf format I make a printout
- Fast and convenient
- Ease of access to information; usually have the most up-to-date information
- Fast and easy access to current and past literature.
- Faster
- Convenience; If I have even 5 min. available, I can use it to peruse an electronic journal or read or print out an article online. Also, some articles actually turn out to be less useful than indicated from the title or abstract.
- For writing technical NTP reports and to keep up to date on scientific information in my area of training and specialty.

Appendix E: Responses as to Why Researchers Don't Use Electronic Journals

The Responses:

- Due to unfamiliarity with methods & I find it easier & beneficial to highlight & refer to previous statements on a hardcopy
- Easier to carry photocopies home, when traveling, etc. Also, it is easier for me to read a paper version than to read from a monitor.
- Not a computer whiz; only use it infrequently
- Do not use to read articles
- When I want to read a journal article I need the quiet in which to do it. An electronic version -- unless we're including database abstracts -- just means I need to take it somewhere besides my office to read
- I find print version more convenient.
- Just haven't gotten in the habit.
- I like to browse and I enjoy scanning the entire volume in addition to the single paper.
- Many journals are not available to us electronically. Especially helpful are electronic archives so that papers can be retrieved online vs. going to library or submitting photocopy requests.
- I use electronic journals only for printing articles that I need. I do not read or scan electronic journals for articles that might be of interest. I do not read articles online, because it is not comfortable to my eyes. I need a printed copy.
- No time to read/ Limited time. Do much reading of journals in places without computer access (e.g. in bed, on vacation).
- Don't have that time
- Some journals I need aren't available and don't print out well
- Many of the journals I use are not available electronically
- The journals I am interested in are not available electronically.
- Habit. Do not know if reference is available via electronic journals
- Use print for original detailed image data
- Not well trained to access electronic journals and so far haven't had a compelling reason to learn.
- Not available for articles I need
- Inconvenient
- Most journals I use regularly not available in electronic format so I forget to check to see if available
- I haven't really been exposed to them.
- Don't know how
- Just used to hard copy (can read at home); like to read it in print not on screen; reprints easy to get
- There are not many in my field (statistics)
- Not used to it -- I don't think of it. Also I like perusing a journal.
- I need to learn how to access them, then, I'll be more likely to use them. I'll still print the articles -- they're easier to highlight than computer screens.