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The Changing Access to Electronic Journals:
A Survey of Academic Library Web Sites Revisited

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ABSTRACT

This article analyzes the content, organization, and features of academic library electronic journal Web pages and examines major trends that we found. In a replication of a 1997-1998 study, the authors revisited 114 academic library e-journal Web sites from North American universities to see how they have evolved in the past few years. The authors discovered that the Web sites are much more elaborate and sophisticated than just three years ago, and they discuss the four basic organizational models that they see emerging in this field: high maintenance HTML model, new "low maintenance" HTML model, catalog-driven model and database-driven model.

Electronic journals have become an accepted component in an academic library's journal collection. Many large collections of e-journals are now available to libraries, and many libraries are cataloging these electronic holdings. With more and more libraries adding electronic journals to their online catalogs, are libraries still finding it necessary or worthwhile to provide access to electronic journals via an electronic journal Web site? Are librarians still spending time maintaining e-journal pages, when they could assert that access is being fully provided via the catalog? These are a few of the questions that the authors of this paper had before embarking on the study of academic library e-journal sites described in this paper.

In 1997-1998 the authors conducted their first study of academic library e-journal Web sites, visiting and analyzing 114 of them, to see how libraries were providing access to their electronic serials. [1] The current study replicates the first and clearly shows that access to electronic journals is changing. Libraries are certainly cataloging their electronic journals, but they are not abandoning their electronic journal Web sites. In fact, the e-journal sites are not only still being maintained, they are becoming much more elaborate and sophisticated.

Definitions of what constitutes an electronic journal continue to vary, but the authors still define an electronic journal, as in the first study, as "periodical literature that is made available as an individual title via an electronic medium, typically the World Wide Web." [2] However, in practice, many libraries are broadening that definition to also encompass the full-text articles included in indexing and abstracting services such as *Lexis-Nexis Academic Universe* and *Periodical Abstracts*. The expanded definition is evidenced by the inclusion of the full-text titles as part of e-journal collections.

In this article, the authors will discuss and analyze the major trends in academic library electronic journal Web pages. We will introduce four basic organizational models in which e-journal Web sites can be categorized and examine the content, organization, and features of the Web sites that we visited. Finally,

we will discuss thoughts on the future direction of e-journal Web sites and examine a few progressive sites.

LITERATURE REVIEW

Numerous articles related to providing electronic journal access have been published since we wrote our original article. While it would be impossible to cover them all, we will discuss a selection of publications that addressed points closely related to our study. Curtis, Scheschy, and Tarango [3] recently published a manual on developing and managing electronic journal collections -- their chapter on cataloging and access (pp. 149 – 92) dealt with all these issues and more in great detail from the standpoint of librarians preparing to set up an e-journals page.

ACCESSIBILITY

Taylor [4], Chan [5], and Publicker and Stoklosa [6] each provided a discussion of issues related to e-journal accessibility. In a brief article, Taylor reviewed the literature published in 1997-1998 regarding such access issues as technology requirements, restricted access, access via publisher or aggregator, and patron awareness of online access. Chan wrote a lengthy review of the literature connected to electronic journals and academic libraries. Among other topics, she covered a variety of access issues including copyright and licensing, longevity and storage, archiving, cataloging, and selection. In addition, Chan noted several barriers that could hinder access to electronic journals -- technological, sociocultural, and economic. "Sociocultural barriers" are the changes in habit readers must make when shifting from browsing and photocopying print journals to searching and downloading electronic journals. Publicker and Stoklosa related a number of access issues in the context of the National Institutes of Health Library's model for selection of electronic journals. They described pricing structures and licensing considerations, database links from search results to full text journals articles on the Web, authorizing users, and secure delivery methods. They also gave a particularly thorough discussion of selection criteria.

STUDIES

Several studies concerning access to electronic journals have been carried out in recent years. In a 1997 survey of fifty academic librarians regarding attitudes toward e-journals, Chu [7] found that access-related issues topped the list of librarian concerns. Overall, she found that librarians had great enthusiasm for e-journals. The SuperJournal Project, described by Pullinger, [8] included a survey of participating faculty members. Once again, access was an issue. That study found that local factors such as the need for passwords and lack of user awareness of the existence of e-journals had the effect of lowering e-journal use. In 1997-1998, Shemberg and Grossman [9] surveyed academic libraries to determine what level of access the libraries were offering to electronic resources. They found that ARL libraries were more likely to provide access to e-journals, whether through the catalog, a Web page, or other means, than were non-ARL libraries. They further found that access to e-journal articles through an indexing and abstracting service with links was one of the most common methods provided by all types of academic libraries surveyed. A 2000 study by Fosmire and Young [10] investigated the number of libraries offering access to free scholarly electronic journals. They found that relatively few libraries offered access to free titles, and that the smaller the institution, the less likely it was to offer such access. Furthermore, their research showed that major indexing and abstracting services were more likely to include free titles than were libraries.

CATALOGING

Several excellent articles on e-journal cataloging have appeared since our earlier article. In 1997, Simpson and Seeds [11] advocated cataloging e-journals and described the procedures used at Penn State. They included a thorough discussion of the issues that must be considered before adding electronic journals to the catalog, discussed the use of call numbers and location codes for electronic resources, and debated whether the online version of a journal should have a separate record from the print version. Hudson and Windsor [12] addressed these same issues from a public services point of view, considering what would make the most sense to patrons as well what would create the most accurate cataloging.

Hawkins [13] described the Program for Cooperative Cataloging Task Group on Journals in Aggregator Databases and its efforts to provide standards for creating analytic catalog records for electronic journals that are part of full-text databases. He stated that an ideal approach would involve cooperation among libraries, publishers, and other interested parties.

E-JOURNAL DATABASES

A number of articles described new methods for creating e-journal Web pages, beyond the "traditional" hand-built HTML lists. Knudson [14] and Knudson et al. [15] recounted the development of the Los Alamos National Laboratory's Library without Walls, a database of electronic journals generated from MARC records in their OPAC. In these two articles, they described their implementation process, which involved identifying their "customers" (including library staff and users), defining electronic journals, developing a new model of e-journal access, and designing the new Web page. They further dealt with the definition, storage, collection, and updating of the metadata used to create the e-journal records for their database. Montgomery [16] described Drexel Library's e-journal maintenance database that dynamically created a Web page using PERL scripts. This database, combined with Drexel's revolutionary policy of subscribing to print journals only when an electronic version was unavailable, lessened the workload related to handling print materials but took a great deal of time to maintain. Montgomery reported that Drexel librarians view their online catalog as the ultimate solution to providing journal access and are working to that end. Easton interviewed key people involved with developing The California State University Journal Access Core Collection (JACC), which stands out as a collection of e-journals that were specifically selected and aggregated by CSU librarians.[17] She stated that many libraries are looking to the JACC database as a model for e-journal acquisition.

VENDOR SEVICES

Serials subscription services have tried to develop products to help libraries manage and acquire electronic journals. In 1997, Cooley and Nilges [18] discussed "second generation" electronic journal

management, that is, acquisition of e-journals by the title rather than by the package. They suggested that

products such as OCLC's Electronic Collections Online (ECO) could provide "third generation"

management, by integrating e-journals with a library's complete reference system. Stankus [19] suggested

that subscription services could help libraries create recommended standards for library e-journal Web

pages, as well as assist with the actual design of these pages. Knibbe [20] discussed the subscription agent's

role in making an active contribution to the electronic publishing process. His article provided an

excellent overview of the services offered by serials vendors. Huber [21] gave a valuable overview of

electronic journal publishing, in which he listed and described those publishers involved in the summer of

2000. He included large, medium, and small publishers as well as e-journal and specialty aggregators.

METHODOLOGY

In our first study, we visited and analyzed 114 academic library Web sites using a checklist to record

what we found. The sample consisted of all the academic library sites we identified in late 1997 that had

built a distinct page for electronic journals. This original sample was gathered using two different

methods -- a message sent to reference listserv LIBREF-L requesting URLs for local e-journal sites

generated seven responses and a search of academic library home pages listed in the Yahoo! Internet

Directory identified an additional 107 e-journal Web sites. [22] For the present study, we revisited the same

114 sites to find out what changes they had undergone in the past three years. For consistency, we made

no attempt to add sites to the study, although many new and interesting sites have been mounted since

that time.

In our first study we devised a checklist to help us conveniently record our findings. For this study, we

revised the original checklist to reflect some of the changes in electronic publishing and to make it easier

to use (see Figure 1). Some of the items on the original checklist occurred infrequently, so we omitted

them from the revised checklist; these features were still included in the study as "write-ins" whenever we

encountered them. Other features on the first checklist proved difficult to define and tally, thus yielding

no useful information. These were also omitted from the revised checklist. Additions to the previous

survey included recording what other kinds of resources, if any, were grouped with electronic journals,

and noting the presence of a search engine for e-journals or links to pre-packaged research articles such as

Questia or XanEdu.

The most substantial addition to our survey was to check whether the e-journals at each site were listed in

that library's catalog. To determine this, we chose five e-journal titles from each site to test in the

catalog. Although our selections were not truly random, we did not work from a predetermined list since

not every library subscribes to the same e-journals. We took care to choose titles from each site that

represented the variety of publishers or collections found on the e-journal page at that library. Whenever

possible, we also included a free-access title in the test sample.

We visited all 114 sites between November 27, 2000 and January 10, 2001, almost exactly three years

after our first round of visits. We viewed all sites using Netscape 4.7. As in the first study, we completed

a checklist for each site, making special note of interesting features and characteristics that were not

specifically included on our checklist. We collected all of our information directly from the Web site,

without interviewing any of the sites' creators. Our intent was to approach each site as though we were

patrons of that library.

FINAL SAMPLE

Of the 114 library sites we revisited, seven no longer maintained an e-journal site. Of these seven, three

of the libraries included one or more e-journal collections (i.e. JSTOR, Project Muse) in their list of all

electronic databases. We speculate that the remaining four did not abandon e-journals entirely, but rather

had chosen to offer access to their e-journals solely via their online catalogs. [23] We eliminated two more

institutions from the study because we were unable to view their e-journal sites due to access restrictions. Our final sample thus consisted of 105 e-journal sites that were suitable for complete content analysis.

DISCUSSION AND ANALYSIS

Electronic journal Web sites are changing -- we found much more variety when we revisited the sites than we had found three years ago. The typical e-journal page as it had existed – a discrete "virtual stacks" for individual e-journal titles -- still exists. But we found that e-journal pages are diverging in two directions. On one hand, we found that libraries are blending stand-alone e-journals with other electronic full-text resources such as research databases, e-books, and other full-text products (e.g. the Women Writer's Project). And on the other hand, we found that visitors to some e-journal pages were being directed to the catalog. We did not find that libraries were turning to commercial aggregator services, their consortium, or pre-packaged research articles to provide e-journal access. All the libraries in the study have had e-journal pages since at least 1997 and were therefore among those at the forefront of access provision. It would be interesting to learn whether libraries that began collecting e-journals later, especially smaller libraries, are more likely to rely on vendor services or consortial sites rather than creating their own.

BASIC MODELS

In our previous survey, we found two basic models for e-journal pages: the "high-maintenance" page that consisted of lists of individual titles with annotations and the "low maintenance" page with links to comprehensive sites maintained by others. This time we saw four general e-journal page models. However, these were not always clear-cut -- many institutions used a combination of or variation on the approaches described below. We ask the reader to remember that we gathered all data regarding these sites directly from the sites, without knowing the precise technology used to create or maintain any given page.

1. *High maintenance HTML model*

    There are still many libraries using the high maintenance model as we originally defined it – a

    hand-built HTML list of individual titles with annotations. Although this type of site is easy for

    patrons to use, as it grows, it may become very difficult and time consuming to maintain.

    Example: Bowling Green State University

    (http://www.bgsu.edu/colleges/library/infosrv/ejournals/ejhome.htm – accessed 3/22/01). See

    Figure 2.

2. *New "low maintenance" HTML model*

    We found a trend towards the use of list of e-journal packages. This new "low maintenance"

    approach features links to such packages as JSTOR, Muse, or Springer LINK, plus a separate

    listing of some individual titles. At times links to research databases were also included. Pages in

    this category could be very simple or quite elaborate, depending on the number of packages the

    library subscribes to. While this type of site is easier for library staff to maintain, patrons can find

    it very difficult to locate specific titles. Examples: Drake University

    (http://www.lib.drake.edu/cgi-bin/database.pl – accessed 3/22/01), Clark University

    (http://libref.clarku.edu/rhgelecbooks.htm – accessed 3/22/01). See Figure 3.

3. *Catalog-driven model*

    While most libraries included a link to the catalog on their e-journal pages, many used the catalog

    as the basis for e-journal access. We found two variations on catalog-driven e-journal pages:

    - Simple link to catalog: These sites direct users to their catalogs since they are more complete

      than their e-journal pages. Although easy to set up, this approach does not help people who

      want to browse a list of e-journals. Example: Claremont Colleges

      (http://voxlibris.claremont.edu/research/ejournals.html – accessed 3/22/01). Some libraries

      took the additional step of explaining how to create a list of e-journals using the catalog.

Example: Rutgers University

(http://www.libraries.rutgers.edu/rul/rr_gateway/ejournals/ejournals.shtml – accessed

3/22/01).

- Search box: A number of libraries have set up a search box that takes users directly to the

  catalog, sometimes without warning, to retrieve e-journals. Others have created links that

  automatically generate a list of e-journal records within the catalog. Examples: Dartmouth

  College (http://dciswww.dartmouth.edu/ejlist/all.html – accessed 3/22/01), Ohio University

  (http://www.library.ohiou.edu/electres/epub/epubjour.htm – accessed 3/22/01). See Figure 4.

4. *Database-driven model*

A number of libraries have created their own database of electronic journals, which may or may

not include other electronic resources or print journals. This type of access is very useful,

especially if it allows users to specify their desired subject or format. However, the model

requires the use of a library server and the expertise to create the necessary scripts. For now this

approach seems to be the province of larger libraries or those with a knowledgeable staff member.

Again, we found two variations on the model.

- Search engine: Some of these databases are searchable by title, subject, format, or publisher.

  They often include all the electronic full-text resources available at that library. Examples:

  the University of Pennsylvania

  (http://www.library.upenn.edu/webbin5/resources/ejspublic5.cgi – accessed 3/22/01),

  University of Notre Dame (http://lib.nd.edu/eresources/gateway/ejour/index.html – accessed

  3/22/01). See Figure 5.

- Generated list: Another automated approach to creating a Web page for e-journals is the

  alphabetical or subject list generated on the fly using what appears to be cascading style

  sheets or similar technology. Examples: Brown University

  (http://www.brown.edu/Facilities/University_Library/eresources/ejournals/A-C.html –

accessed 3/22/01), Miami University (http://www.lib.muohio.edu/research/ejournals/ -- accessed 3/22/01).

SCOPE OF E-JOURNAL COLLECTIONS

Librarians at each institution must decide how they will define and categorize e-journals for inclusion on their e-journal site. Will full-text articles from databases be included on the e-journals page? Will freely accessible e-journals with no print equivalent be sought out and evaluated for inclusion? We describe the current practices that we found below.

Free and Restricted-Access E-Journals

Libraries can choose to include either free- or restricted-access electronic journals, or both, on a Web site. The authors defined *free-access journals* as electronic-only journals that are available free of charge without access restrictions. *Restricted-access journals* require payment for access, thus restricting use to subscribing institutions, to departments, or even to a specific IP address. Clearly, the number of restricted-access journals available as of this writing has increased considerably from three years ago. The current, online version of the Association of Research Libraries' *Directory of Scholarly Electronic Journals and Academic Discussion Lists* [24] lists over 3900 *peer-reviewed* electronic journals. In contrast, the 1997edition of *The ARL Directory of Electronic Journals, Newsletters, and Academic Discussion Lists* [25] had just over 3400 electronic journals of all types. Thus it was no surprise to find that the percentage of libraries in our study that offered access to paid subscriptions had increased as well.

While we did not expect the dramatic drop found in the number of libraries offering access to free-access electronic journals, our findings were consistent with Fosmire and Young's recently published article. Their examination of academic library Web sites found that free scholarly e-journals are generally not accessible through academic libraries at "a level commensurate with their apparent value."[26] As shown in Table 1, many libraries are no longer choosing to offer access to free electronic journals. Our 1997-1998 study discovered that 79 percent of libraries included free-access titles on their e-journal site; in

contrast, in 2000-2001 we found that only 59 percent included free-access titles. We admit that there may

be some error in these numbers, as we did not look at each and every title to determine whether or not it

was freely accessible. Rather, we scanned the lists to search for titles that we knew to be free, which is

the same method we used in the first study. Perhaps it was more difficult to spot the free e-journals this

time since most sites had more titles overall, but we do not think this could have accounted for as large a

shift as we found.

Fosmire and Young believe that libraries should be rewarding freely available, high-quality journals by

making them accessible via the library catalog or Web site. We concur that a trend away from supporting

these publishing efforts is undesirable. Part of the mission of the academic library is to participate in the

free dissemination of scholarly information. Including links to freely accessible, peer-reviewed

publications would seem to mesh perfectly with this goal. We wonder whether the failure to provide this

access results from the lack of selection policies for free e-journals or the time needed to carefully select

free e-journals on a title-by-title basis.

While most of the libraries in our sample limit their e-journal collection to journals that include the full-

text of articles, we identified fourteen Web sites (13 percent) that included e-journals with less-than-full

text (journals with tables-of-contents or tables-of-contents with abstracts only). This is down from 27

sites (27 percent) we identified in the previous study.

Electronic Journals vs. Full-Text Article Databases

It became clear to us that librarians are struggling with the relationship between electronic journals which

are typically available cover-to-cover and databases such as *Lexis-Nexis Academic Universe* which

contain selective full text. Forty-six percent of the electronic journal Web sites we analyzed considered

journals in full-text databases to be e-journals, at least for the purpose of including them as part of the

Web site. Many libraries, in fact, listed the individual journal titles found in the databases with their

"true" e-journals. For an example of this practice, see the Alphabetic Listing of Full-Text Journals at Wright State University's site (http://www.libraries.wright.edu/libnet/enewss/ -- accessed 5/25/01).

ORGANIZATION

Librarians must determine how to organize their e-journal pages as well as where to place them in the library's Web site to provide the best access for their patrons. Although we found a variety of ways to do this in our study, some patterns stood out.

Arrangement

The arrangement of e-journals for access via Web sites remains about the same as we found it in our 1997-1998 study (see Figure 6): title, publisher, narrow subject, and broad subject are still the most common arrangements. We expanded our definition of "publisher" to include "collections" or "aggregations", which may or may not all be from the same publisher. This expanded definition became necessary because that is how many libraries were dividing and defining electronic journals.

One emerging trend was the inclusion of a search engine that searched specifically for e-journals. Forty sites (38 percent) maintained such a search engine, using a variation of either the catalog-driven model or the database-driven model. In the first study we looked for a search engine that allowed searching of the entire library site, although we did make note of a few "unique" sites that had an e-journal search engine. Thirty-three of ninety-eight (34 percent) offered a library site search engine in the first study and thirty-seven of 105 (35 percent) did in the second study.

Accessibility from Library Home Page

Ease of access to the e-journal Web pages from the library's home page was an area where we anticipated seeing an improvement, and we did (see Table 2). Sixty-five percent of the libraries we visited had a link to the electronic journal page — or to their actual e-journal collection — available on the library's home page. This practice makes the collection readily accessible to patrons, eliminating the need to search for a

list of electronic journals.   Interestingly, in seven instances, the electronic journals link from the library home page was offered as a choice on a drop-down menu or through a mouseover option. In some instances, there were multiple pathways to the e-journals page.

Thirty-six institutions, however, still required more than one click to get to e-journal Web pages. "Electronic Resources" was the most common intervening link (used five times). "Resources" and "Journals" were each used by two libraries, and variations of "Research Resources," "Internet Resources," and "Gateway" were also used several times. The authors judged there to be fewer non-descriptive and misleading intervening links (such as "Library Services" and "Gateway to the Internet") than we found in the first study.

We found that librarians are placing greater value on their electronic journal Web sites; more e-journal pages are directly available from the home page, names of intervening links are more descriptive, and fewer libraries are burying the e-journal lists in their library Web pages. Only 1 percent required users to click three or more times to get to the e-journal site, as opposed to 8 percent in the 1997-1998 study.

FEATURES

One of the things that made this study interesting was the wide variety of extra features we encountered. Although we were specifically searching for the items on our checklist, we also discovered a number of additional common or noteworthy features.

Annotations

We found some degree of annotation for at least a few individual e-journal titles in eighty-seven of the 104 e-journal pages, which is an increase of 8 percent (see Table 3). We also noted a significant increase in the number of libraries providing full-page annotations, from 7 percent to 18 percent. The trend

appears to be for librarians to supply their users with more detailed information about individual e-journals.

As in the first study, we found that the amount of information provided in the annotations varied greatly. In fact, the annotations vary not only between sites, but within the same site. The authors originally criticized the practice of providing inconsistent annotations, recommending "uniformity whenever possible" and stating that "uniformity adds to the credibility and usefulness of the site." [27] While we stand by this recommendation, we have come to realize—through first-hand experience—that absolute uniformity might not always be feasible or desirable. Time is one issue. If a library purchases a collection of e-journals that contains hundreds of titles, then the benefits of lengthy annotations may not be worth the time necessary to create them. Practicality is another issue. Depending on the type of information included in an individual journal's home page, some e-journals simply need annotations more than others. If the link to an e-journal title takes users to a page that includes a description of the journal content, dates of coverage, etc., an annotation may be redundant. However, annotations are beneficial when: (1) the title is non-descriptive, (2) the link doesn't take the user directly to the desired journal's contents, or (3) the e-journal requires special software such as Adobe Acrobat in order to view the articles.

Since uniform annotations are difficult to achieve, one "compromise" solution that we encountered was to organize e-journals and the accompanying annotative information into a table. This format contributes to a uniform approach even when every cell is not filled in for every title. MIT Libraries' VERA: Virtual Electronic Resource Access site is an excellent example of entries displayed in table format (http://libraries.mit.edu/vera -- accessed 3/23/01).

Whether the libraries provided each annotation on a separate page or not, the majority of sites included at least the following information: an electronic holdings statement (75 percent), publisher information (68

percent), and indication of use restriction (55 percent). Full-page annotations supply such additional information as subject headings (often searchable) or a free-text description of the content. Full-page annotations also permit a more in-depth description of the journal content. Table 4 lists the informational items that we found more frequently on full-page annotations. For a good example of full-page annotations select a title from Ball State University's Electronic Journals and News Sources page (http://www.bsu.edu/library/getmaterials/ejournal/index.html -- accessed 3/23/01).

Other Features

Libraries continue to offer a variety of other features and informational items on their electronic journal Web sites. The most common are discussed below; Table 5 compares the first and second study.

Links to Other Library or Institutional E-Journals Sites. Libraries are depending less on meta-sites to provide access to e-journals than they did three years ago. In the 1997-1998 study, 62 percent of e-journal sites included links to other library or institutional collections (e.g. NewJour Electronic Journals and Newsletters or the Scholarly Societies Project), whereas in 2000-2001 only 30 percent did. In fact, in the first study, sixteen of the 114 sites *only* had links to other institutional sites, while only one of the 114 fell into that category this time.

Links to E-journal Publisher Sites. The number of libraries with links to publisher sites fell from seventy-four in the first study to sixty-five in the second study. Although not as large a decline as the links to other library and institutional sites, this change demonstrates an increasing trend toward libraries independently providing direct access to electronic journals.

Links to Vendor/Aggregator Sites. Despite recent predictions that commercial aggregator services would provide more e-journal management for libraries, [28] the authors found none of the libraries in our sample relying on aggregators to administer their pages. Thirty-two percent (thirty-four of 105) of the e-journal

Web sites provided a link to the Web sites of one or more e-journal aggregator services, but that service was just one of many collections listed. The services most commonly found, with the number of times encountered, were as follows: OCLC Electronic Collections Online (16), EBSCO Online (11), Catchword (10), and OVID Journals (7). In some cases, following the link to the aggregator was the only way to access the e-journals made available via that service. In other cases, libraries linked directly to individual titles contained in aggregators' collections, bypassing any visible component of the aggregator service and once again appearing to provide their own access.

Links to the Online Catalog. The percent of libraries providing links to the online catalog through their e-journal Web sites has doubled in the past three years (see Table 5). Many of the sites, in fact, are very closely related to the online catalog. As discussed in a previous section, some of the e-journal search engines actually search the catalog to retrieve the e-journal records. It was also common to find a statement about the availability of e-journal records within the catalog. Some Web sites stated that all e-journals or additional e-journals were listed in the catalog, and a couple went so far as to encourage patrons NOT to use the e-journals page, but to use the catalog instead. Others simply gave instructions on how to search for e-journals within the catalog.

Electronic Databases. The number of libraries including links to electronic indexing and abstracting services on e-journal Web sites has also doubled since the first study. As more and more periodical indexes are providing the full-text of articles, they are more frequently being grouped together with electronic journals. Forty-eight of the 105 sites (46 percent) included full-text databases or individual titles from databases on the electronic journal pages. One example is Air University Library (http://www.au.af.mil/au/aul/periodicals/elecj.htm --accessed 3/23/01), where the table format allows the user to quickly look up a journal, note how it can be accessed, and then link to the database. A problem with this type of page arrangement is that upon entering the database it will not be obvious to the patron how to get to a specific journal. The University of Virginia Libraries

(http://www.lib.virginia.edu/journals.html -- accessed 3/23/01) addressed this problem by inserting an

intermediary page ("Finding Journal Articles in InfoTrac") between the e-journal catalog record and the

InfoTrac database. This intermediary page offers instruction on how "to browse a specific journal" before

the user actually connects to InfoTrac.

Consortia. As with aggregator services, none of the libraries in our survey relied totally upon their

consortium to provide e-journal access. Though a number of consortia provide an e-journal collection for

their members, all libraries in our survey with such a link used the consortium site to supplement their

own collection. Thus the role that consortia play in providing e-journals seems to be a supportive one.

Twenty-two of the sites (21 percent) provided links to their own consortium's site, compared to just ten of

ninety-nine (10 percent) in the first study. Interestingly, three CIC member sites still supported a link to

the CIC Electronic Journal collection even though it had ceased to exist.

In addition to the common features just outlined, Table 6 highlights many other notable elements,

including several "new" ones not found in the first. One feature was a link to jake

(http://jake.med.yale.edu/ --accessed 3/23/01), a Yale University reference source that allows users to

determine which database covers or provides full text articles for a particular journal. There were also a

considerable number of libraries (over twenty-five) that instruct users about remote access and proxy

servers. There was also a marked increase in the number of links to the ARL Directory. Three other

"new" features were links to help pages (see TriUniversity Group of Libraries, http://www.tug-

libraries.on.ca/ejournals/help/ejournal_help.html, accessed 6/19/01), to FAQs (see University of Illinois

at Chicago, http://www.uic.edu/depts/lib/science/resources/ejfaq.shtml, accessed 6/19/01), and to

copyright or fair use statements (see Grinnell College, http://www.lib.grin.edu/internet/mags.html,

accessed 6/19/01).

ELECTRONIC JOURNALS IN ONLINE CATALOGS

An important trend that we noticed is that libraries are actively cataloging electronic journals. There is

strong support in the literature for this. [29] Shemberg and Grossman [30] found that 79 percent of ARL

libraries and 39 percent of non-ARL libraries offer access to their electronic journals through the OPAC.

Our research supports this, as nearly all the libraries we studied cataloged at least some of their e-journals.

For each library e-journal site we visited, the authors tried to search the respective online catalog to see

whether e-journals found on the library's Web site also had records in the OPAC with hotlinks to the

online title. We were unable to conduct catalog searches for three of the 105 library sites because one

library did not have an online catalog and two others restricted access to their catalogs. We therefore

completed catalog searches for only 102 libraries.

The authors selected five titles from each Web site to search in that library's catalog, taking care to select

a variety of titles whenever possible. We strove to include both free-access and restricted-access e-

journals, as well as e-journals on a variety of topics, from various collections. Ninety-eight of the 102

libraries (96 percent) had cataloged at least one of the five titles that we searched, and a full 34 percent of

the libraries had all five titles in their catalog (see Figure 7). It appears that librarians believe at least

some types of e-journal titles should be included in the local catalog. In some cases, it appeared that

"true" electronic journals were cataloged, while titles available via full-text databases were not. Free-

access titles also seemed less likely to have been cataloged. Cataloging requires significant time and

effort; we conjecture that many of the libraries are working to catalog all of their e-journals but have not

yet completely realized that goal.

CONCLUSION

Librarians continue to provide access to electronic journals through Web pages, even while adding e-

journals to the catalog. It is likely that users value a list to browse as they would shelves, in addition to

having the ability to search out titles through an OPAC.[31]   Both staff members and users may also find it

helpful to have a list of all of the library's e-journals in one place. [32]   Our survey found that, at least

among libraries with relatively long-established Web sites, e-journal Web pages are not disappearing, but

rather are increasing in size and complexity.

We saw four basic approaches to electronic journal Web sites: high maintenance HTML, low

maintenance HTML, catalog-driven, and database-driven. These approaches respond to trends in e-

journal access. For example, there is a definite movement toward publisher or aggregator packages and

collections of e-journals. As a result, some libraries constructed low maintenance HTML pages with

links to publisher and aggregator sites. The trend toward including e-journal records in OPACs is seen in

the many libraries that have built their e-journal pages around the catalog. The database-driven model is

perhaps the best answer to managing access to an ever growing and ever more loosely defined set of full-

text electronic resources, as it provides the flexibility of access needed by users and the management

capability required by librarians. We saw several interesting, progressive sites that were variations of this

model.

Notre Dame has built an Electronic Resources Gateway

(http://lib.nd.edu/eresources/gateway/ejour/index.html -- accessed 3/22/01) that uses drop-down menus to

allow users to sort the list of all available electronic resources by title, detailed subject, broad subject, or

format. Users can also choose to sort only e-journals by the same categories, as well as by publisher.

This artfully designed site used icons to designate any access restrictions as well as full-page annotations

for each title.

The University of Pennsylvania used a somewhat different approach that includes only electronic

journals. Their site (http://www.library.upenn.edu/webbin5/resources/ejspublic5.cgi -- accessed 3/22/01)

is centered around a subject classification, but allows the electronic journals to be listed and sorted in

many different ways – by title, full-text availability, broad subject, detailed subject, publisher/aggregator package, or availability of remote access. A search box also allows users to search for a particular known title.

A novel site is the University of Connecticut's @Compass Full-Text E-Journal Locator (http://norman.lib.uconn.edu/NewSpirit/FullText/ -- accessed 3/22/01). UConn librarians have constructed a database that contains over 10,000 electronic journals, including those accessed through various databases and commercial online journal providers. Users can search for known titles using a search box or consult an alphabetical listing. The site also includes a page of links to free-access e-journals.

Will the database-driven model be the standard for e-journal access in the future? The authors believe that this is where e-journal access is headed as the necessary technology and skills become more commonplace. This model offers users the best searching functionality, allowing them multiple access points to electronic journals. Librarians are relieved of the need to maintain several separate pages arranged by title, subject, etc., as in the high maintenance HTML model. It also helps to solve the problem of whether to categorize e-journals with other full-text electronic resources because all can be combined in the library's database with "format" as an access option. Perhaps most importantly, it allows librarians to create a single listing of all of the electronic journal titles that are accessible to the library's users, without regard to publisher or aggregator.

E-journal Web sites will undoubtedly continue to evolve and change at a rapid pace, as technology and e-journal availability change, ensuring an appealing area of study for researchers. The database model for e-journal maintenance is an exciting development, and it will be interesting to watch the direction that these sites take. The literature concerning e-journal maintenance continues to predict an increased role for

aggregator services in e-journal collections, but we did not observe this in our study. Are libraries taking advantage of services that aggregators offer? And if so, in what capacity?

Additionally, two questions involving selection issues arise as future research possibilities. We find it troubling that a declining number of libraries include freely accessible academic e-journals on their sites and suggest a study to discover why they are not being included. And in broader terms, what selection criteria are librarians using for their e-journals? Are librarians still making selection decisions about individual titles or are we selecting packages of e-journals and accepting whatever titles come with that package? The issues surrounding e-journal maintenance certainly promise to remain an interesting area of study for years to come.

NOTES

1.   Linda A. Rich and Julie L. Rabine, "How Libraries Are Providing Access to Electronic Serials: A Survey of Academic Library Web Sites," *Serials Review* 25 no. 2 (1999): 35-46.

2.   Ibid, p. 35.

3.   Donnelyn Curtis, Virginia M. Scheschy, and Adolfo R. Tarango, *Developing and Managing Electronic Journal Collections: A How-To-Do-It Manual for Librarians* (New York: Neal-Schuman Publishers, Inc., 2000).

4.   Anneliese Taylor, "Access," in Chad Buckley et al., "Electronic Publishing of Scholarly Journals: A Bibliographic Essay of Current Issues." *Issues in Science & Technology Librarianship* (Spring 1999). [http://www.library.ucsb.edu/istl/99-spring/article4.html – accessed 12/4/00]

5.   Liza Chan, "Electronic Journals and Academic Libraries," *Library Hi Tech* 17, no. 1 (1999): 10-16.

6.   Stephanie Publicker and Kristin Stoklosa, "Reaching the Researcher: How the National Institutes of Health Library Selects and Provides E-Journals Via the World Wide Web," *Serials Review* 25, no. 3 (1999): 13-23.

7.   Heting Chu, "Promises and Challenges of Electronic Journals: Academic Libraries Surveyed," *Learned Publishing* 13 (July 2000): 169-75.

8.   David Pullinger, "Academics and the New Information Environment: The Impact of Local Factors on Use of Electronic Journals," *Journal of Information Science* 25, no. 2 (1999): 164-72.

9.   Marian Shemberg and Cheryl Grossman, "Electronic Journals in Academic Libraries: A Comparison of ARL and Non-ARL Libraries," *Library Hi Tech* 17, no. 1 (1999): 26-45.

10.   Michael Fosmire and Elizabeth Young, "Free Scholarly Electronic Journals: What Access Do College and University Libraries Provide?" *College & Research Libraries* 61, no. 6 (2000): 500-8.

11.   Pamela Simpson and Robert Seeds, "Electronic Journals in the Online Catalog: Selection and Bibliographic Control," *Library Resources & Technical Services* 42, no. 2 (1998): 126-32.

12.   Laura Hudson and Laura Windsor, "Providing access to Electronic Journals: the Ohio University Experience," *Against the Grain* 10 no. 3 (1998): 1,16,18.

13.   Les Hawkins, "Title Access to Full Text Journal Content Available in Aggregator Services," *Serials Review* 25, no. 4 (1999): 43-48.

14.   Frances L. Knudson, "Database-Driven Electronic Journal Web Pages," in *IOLS 2000: Integrated Online Library Systems Proceedings – 2000* (Medford, NJ: Information Today, Inc., 2000).

15.   Frances L. Knudson et al., "Creating Electronic Journal Web Pages from OPAC Records," *Issues in Science & Technology Librarianship* no. 15 (Summer 1997). [http://www.library.ucsb.edu/istl/97-summer/article2.html – accessed 12/4/00]

16.   Carol Hansen Montgomery, "'Fast Track' Transition to an Electronic Journal Collection: A Case Study," *New Library World* 101 no. 1159 (2000): 294-302.

17.   Christa Easton, "The California State University Journal access Core Collection," *Serials Review* 26 no. 2 (2000): 44-50.

18.   Elizabeth Cooley and Chip Nilges, "Integrating Solutions: Examining the Collection Management Process Using OCLC's FirstSearch Electronic Collections Online Service," *Library Acquisitions: Practice & Theory* 22 no. 1 (1998): 97-102.

19.   Tony Stankus, "Electronic Journal Concerns and Strategies for Aggregators, Subscription Services, Indexing/Abstracting Services, and Electronic Bibliographic Utilities," *Science & Technology Libraries* 18, nos. 2/3 (1999): 97-110.

20.   Andrew Knibbe, "A Subscription Agent's Role in Electronic Publishing," *The Journal of Electronic Publishing* 4 (June 1999). [http://www.press.umich.edu/jep/04-04/Knibbe.html – accessed 12/4/00]

21.   Charles F. Huber, "Electronic Journal Publishers: A Reference Librarian's Guide," *Issues in Science & Technology Librarianship* no. 27 (Summer 1997).   [http://www.library.ucsb.edu/istl/00-summer/article2.html – accessed 12/4/00]

22.   Rich and Rabine, "How Libraries Are Providing Access," p. 38.

23.   We discovered that this is definitely the case at one of the libraries, the University at Buffalo, State University of New York, through correspondence with a librarian at that institution.

24.   Association of Research Libraries, *Directory of Scholarly Electronic Journals and Academic Discussion Lists* (Washington, DC: Association of Research Libraries, [no date]).

25.   Association of Research Libraries, *ARL Directory of Electronic Journals, Newsletters, and Academic Discussion Lists* (Washington, DC: Association of Research Libraries, 1997).

26.   Fosmire and Young, "Free Scholarly Electronic Journals," p. 507.

27.   Rich and Rabine, "How Libraries Are Providing Access," p. 45.

28.   Shemberg and Grossman, "Electronic Journals in Academic Libraries," p. 34.

29.   See Pullinger, "Academics and the New Information Environment," p. 166, Simpson and Seeds, "Electronic Journals in the Online Catalog," p. 129, and Montgomery, "'Fast Track' Transition," p. 299.

30.   See, for example, Shemberg and Grossman, "Electronic Journals in Academic Libraries," p. 29.

31.   When considering the removal of our e-journal subject list, we posted a message asking patrons to e-mail us if they used the page regularly. Twenty people responded, saying that the ability to browse by subject was very important to them. See also Hudson and Windsor, "Providing Access to Electronic Journals," p. 16.

32.   Knudson, "Database-Driven Electronic Journal Web Pages," p. 66.

Figure 1: Copy of our Survey Checklist

Date: _____	**Li**brary name: _____
Institution: _____	**URL:** _____

YES	NO	
☐	☐	This site has disappeared. (If YES, do not continue.)

How many clicks from the library's home page to the e-journals home page? _____

Home page link name:_____ 2nd link name:_____

YES	NO	
☐	☐	This site links **only** to its own consortium e-journals page. (If YES, do not continue.) Which one?
☐	☐	This site links **only** to a single vendor aggregator. (If YES, do not continue.) Which one?
☐	☐	This site links **only** to other e-journals sites. (If YES, do not continue.) Which ones?

*   *   *   *   *   *   *   *   *   *   *   *

E-journals are listed by: Title | Broad Subject | Narrow Subject | Publisher | other_____

E-journals are mixed in with: None | Web Sites | Research Databases | Other Full Text | other_____

Prepackaged research: None | Xanadu/Blackboard.com | Questia/WebCT | other_____

Other features -- Do the e-journal pages **include***:*

YES	NO	
☐	☐	Link to consortium e-journal site (of which they are a member) Which one?
☐	☐	Link(s) to vendor aggregator site(s) Which ones?
☐	☐	Link(s) to other library/institutional e-journal site(s) (including other consortia) Which ones?
☐	☐	Consideration of Lexis-Nexis or other full text databases as e-journals
☐	☐	Library site search engine (not provided by publisher)
☐	☐	E-journal specific search engine
☐	☐	Links to indexes or databases (not in annotations)
☐	☐	Link to library catalog

YES	NO	
☐	☐	Are **any type** of selection criteria given? (list or print out)
☐	☐	Are journals with less than full text included?
☐	☐	Are paid* subscriptions included?
☐	☐	Are free-access** titles included?
☐	☐	Are links to publisher e-journal sites included? (including general link to publisher's site from individual title)

*Paid = paying for any access to this journal, electronic or print; restricted access
**Free-access = recognizable as a free, electronic-only journal; no use restrictions

Annotations: none | separate page
FT vs TOC vs Ab | publisher | use restriction | description | electronic holdings | print holdings
If annotations are on a separate page, what are main features:

Five test titles found in catalog: 5   4   3   2   1   none   no WebPAC
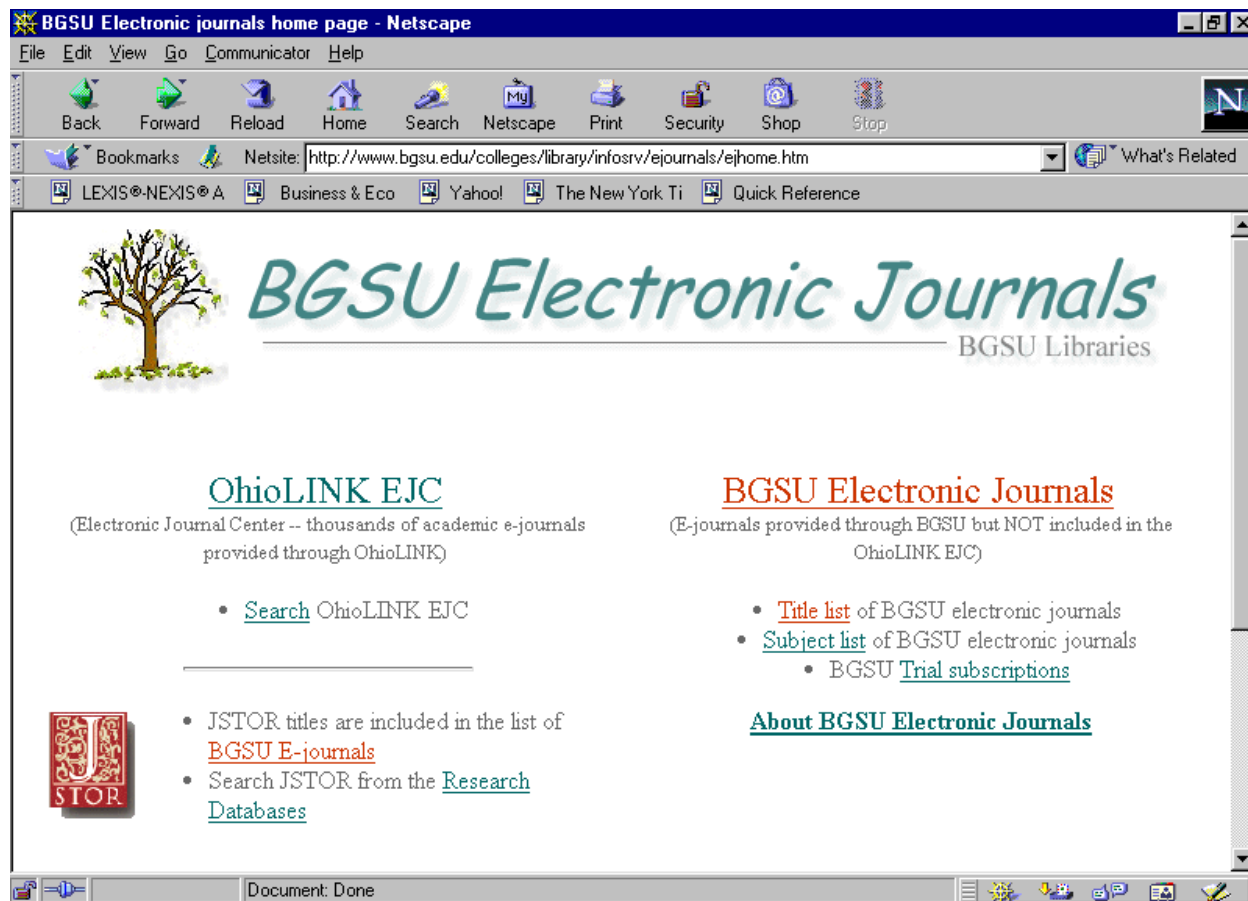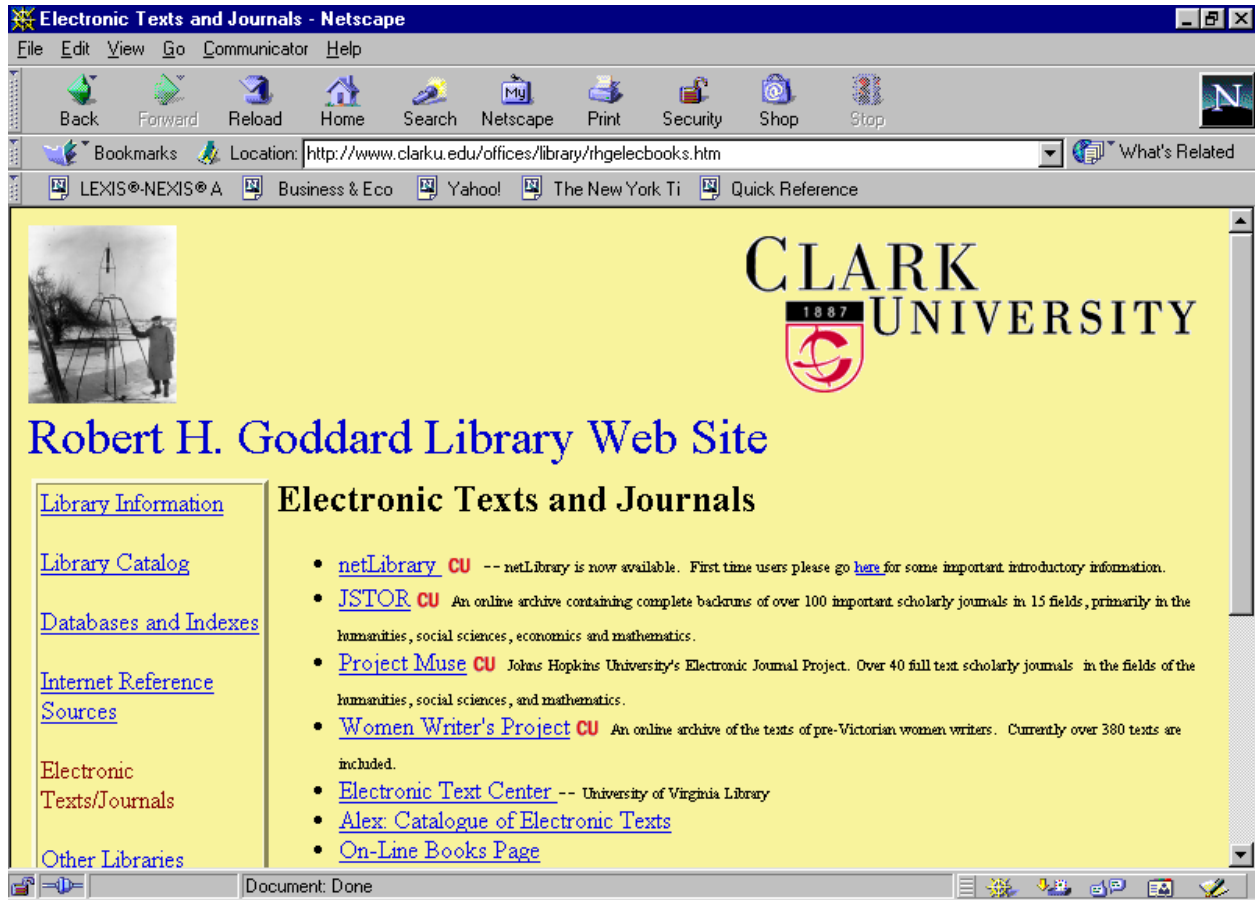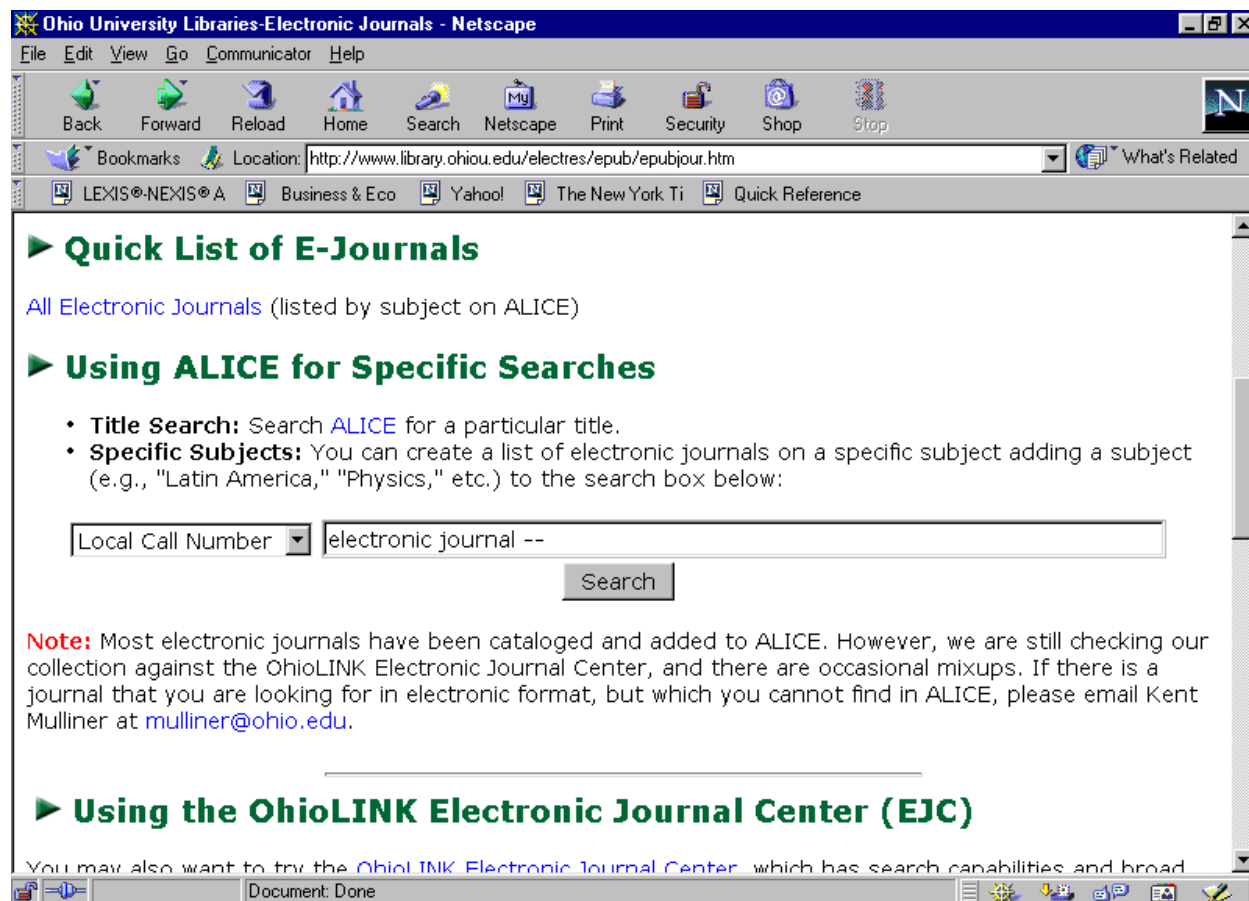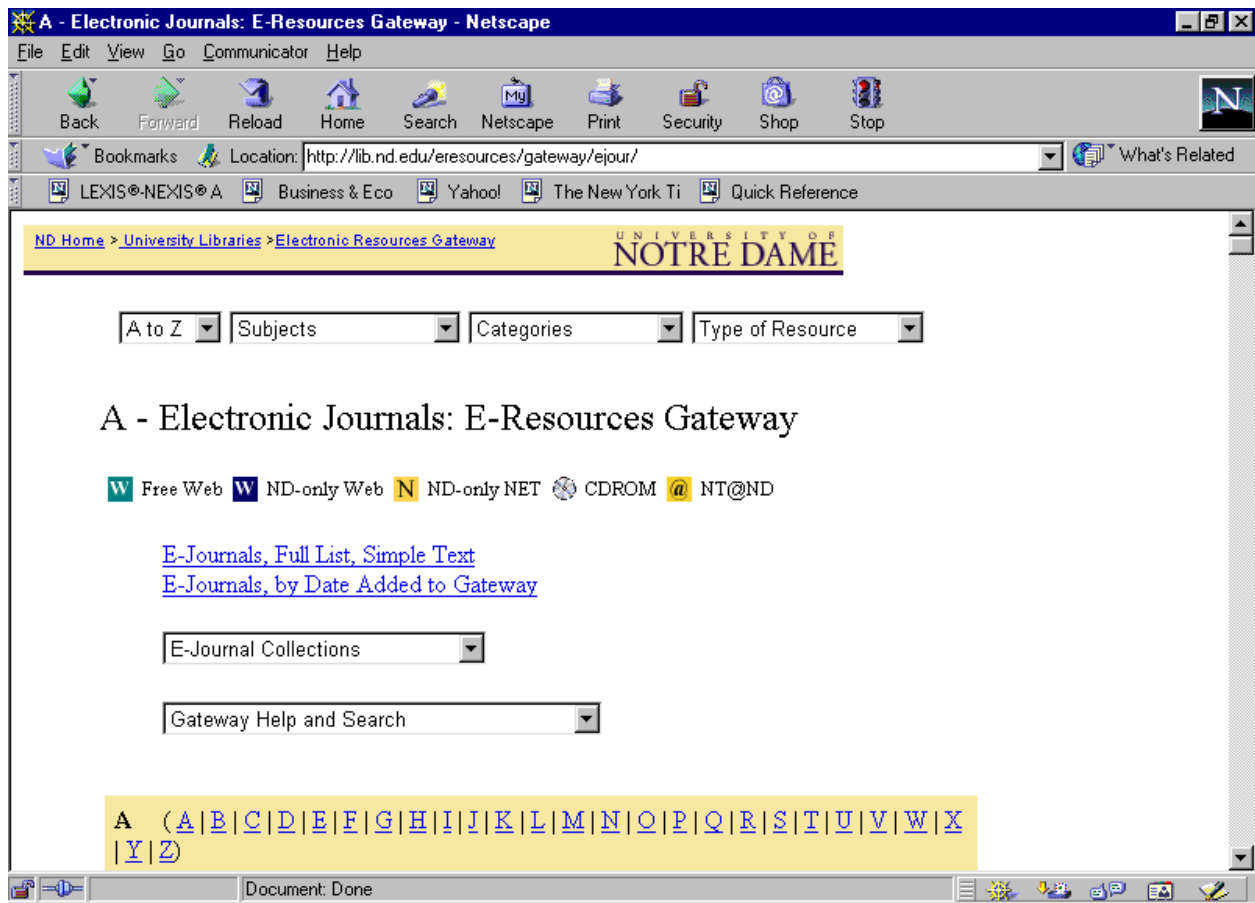
Figure 2: Example of High Maintenance HTML Model

Figure 3: Example of Low Maintenance HTML Model

Figure 4: Example of Catalog-Driven Model with Search Box

**Figure 5: Example of Database-Driven Model with Search Engine**

Table 1
Free- or Restricted-Access E-Journals

Type of Access	First Study Number of Libraries n=100	Second Study Number of Libraries n=105
Sites including Free-Access E-Journals	79 (79%)	59 (56%)
Sites including Restricted-Access E-journals	86 (86%)	104 (99%)
Sites including Both Types	65 (65%)	58 (55%)

Figure 2
Web Site Arrangement of E-journals
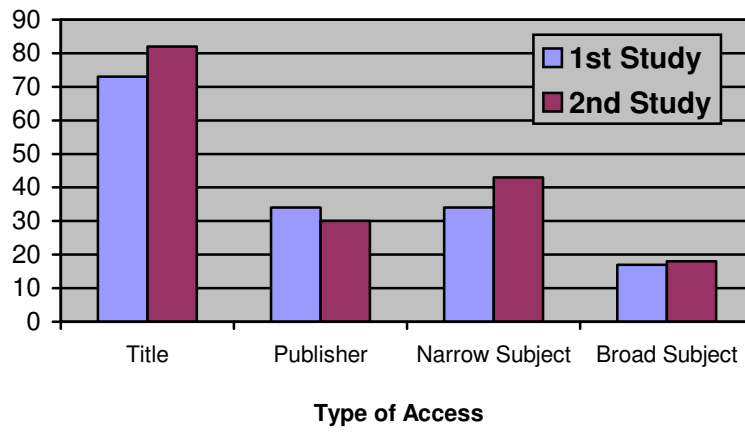
Table 2
Distance from Library Home Page To E-journal Page

Distance Away	Number of Libraries First Study n=109	Number of Libraries Second Study n=105
On home page	0	2 (2%)
One click	53 (49%)	67 (63%)
Two clicks	47 (43%)	35 (33%)
Three clicks	7 (6%)	1 (1%)
Four clicks	1 (1%)	0
Five clicks	1 (1%)	0

Table 3
Sites Including Annotations for E-Journal Titles

Annotation Availability	Number of Libraries First Study n=98	Number of Libraries Second Study n=104
Annotations on same page as e-journal list	68 (69%)	68 (65%)
Each annotation on separate page	7 (7%)	19 (18%)
No annotation available	23 (24%)	17 (16%)

Table 4
Information offered significantly more frequently on Full Page Annotations

Information Items	Percent of Libraries Same Page Annotations n = 68	Percent of Libraries Full Page Annotations n = 19	Change in Percent
Assigned Subject Descriptors	2 % (1 of 68)	63% (12 of 19)	61%
Description of Content	21% (14 of 68)	63% (12 of 19)	42%
URL or Web Address	3 % (2 of 68)	42% (8 of 19)	39%
ISSN	4 % (3 of 68)	42% (8 of 19)	38%
Frequency of Publication	2 % (1 of 68)	32% (6 of 19)	30%
Miscellaneous "Notes"	9 % (6 of 68)	32% (6 of 19)	23%
Print Holdings	7 % (5 of 68)	26% (5 of 19)	19%

Table 5
Featured Links on E-Journal Web Sites -- Comparison

Type of Link	First Study (1997-98)	Second Study (2000-01)	Change in Percent
E-journal publisher sites	74%	62%	↓ 12%
Other library or institutional e-journal sites	62%	30%	↓ 32%
Local OPAC	39%	78%	↑ 39%
Electronic indexes or databases	35%	73%	↑ 38%
Consortium site to which they belong	10%	21%	↑ 11%
Vendor aggregator sites	n/a	32%	n/a

Table 6
Other Notable Features

Link to ARL Directory
Link to Jake
Proxy Server Information
Remote Access/Login
Instructions
Help pages
Copyright/Fair Use Statement
New Title List
Trial Subscriptions
Link to get Adobe Acrobat
Request for Comments
Reported (known) problems
Electronic Journal FAQ
Requesting subscriptions

Figure 7
Test Titles in Online Catalog
n=102