OhioLINK Electronic Journal Use at Ohio State

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Abstract

A five-question survey, randomly presented to users at Ohio State University (OSU) as they viewed articles in OhioLINK's Electronic Journal Center (EJC) in fall 2002, probed the user's status, academic unit, reason for viewing, path to the article, and frequency of EJC use. Usage by faculty and graduate students, frequent users, and by those in the sciences predominated, as did usage for a class assignment and browsing a journal's issues. OSU polls in 2003 and 2004 probed EJC awareness and actions after viewing articles. Half of undergraduates were non-users. Printing was favored over reading entire articles online.

As availability and usage of electronic journals have increased, so has interest in learning more about the nature of that use and its impact on library collection development practices and on scholarly communication. Rising costs of electronic journals coupled with declining library budgets also have led to heightened interest in being able to justify expenditures by gaining a better understanding of the benefits being realized. Vendor statistics often provide information about relative levels of use of electronic resources, but we have tended to know less about the users themselves and what they are doing with the electronic content that they access.

Ohio State University's (OSU) faculty and students are offered access to more than 5,600 electronic journals through the Ohio Library and Information Network (OhioLINK), a
consortium of 84 Ohio academic libraries and the State Library of Ohio. OhioLINK has usage data organized by publisher, journal title, institutional affiliation of the user, and time period for articles in its Electronic Journal Center (EJC), which was established in April 1998. These data show, for example, that overall usage in terms of the number of full-text articles downloaded (i.e., accessed) has increased dramatically each year.¹ However, demographic data about the users—for example faculty or student status, academic discipline, and so on—are not available nor is information about the type of use that was made of the articles after they were accessed—assigned reading, dissertation, or other scholarly research. Therefore, in 2002 the authors undertook a study to collect additional information about EJC usage by OSU users.

Related Literature

Studies of electronic journal use can be categorized in various ways. For example, many focus on users in a certain discipline.² Others examine usage at a particular institution or in relation to a specific e-journal service.³ A number of these studies compare the use of print and electronic formats and discuss how user behaviors and attitudes are changing. For an in-depth review of recent research studies, see Carol Tenopir's overview and analysis published by the Council on Library and Information Resources in 2003.⁴

General studies of library and information use also often focus on electronic resources as a major component. Outsell, Inc. conducted one such study in 2001 that was commissioned by the Digital Library Federation (DLF) and the Council on Library and Information Resources (CLIR). This large-scale study interviewed 3,234 faculty members, graduate students, and undergraduate students from research universities and liberal arts
colleges. It examined perceptions of the library's value and of the relevance of its services. Many questions dealt with the use of electronic formats, including how faculty and students find and access e-journals to support their teaching, research, and coursework. For example, the survey explored whether information about e-journals was found through various online or printed sources or through personal assistance from librarians or colleagues. The study's report includes summary tables of the survey responses to each question that facilitate data comparison and further research.

Studies of e-journal use by particular disciplines often focus on the sciences in which the largest concentration of electronic content was first available. Tenopir, et al. provide an excellent overview of the history of e-journal development and use in the scientific community from 1990 to 2003. They also reference previous studies of journal use. One such study, funded by the Mellon Foundation and conducted by Stanford University Libraries, investigated scientists' usage of the electronic journals published by HighWire Press. This two-year e-Journal User Study (eJUSt), which concluded in December 2002, used interviews, online surveys, and Web log analysis to collect data from more than 10,000 scientific users to assess their behaviors and attitudes relative to e-journal use. For example, survey respondents were asked how frequently they used e-journals and whether they found features such as alert services and hyperlinks in articles to be useful. An extensive description of the research methodologies and results is available on the eJUSt Web site.

There have been other studies centered on particular e-journal services that did not have a single discipline orientation. Over a three-year period, the SuperJournal project, which offered 49 electronic journals in four subject areas, examined the usefulness and value of various electronic journal functions through log file analysis, surveys, and focus group discussions. Because the logs allowed the identification of repeat users, Ken Eason, Sue
Richardson, and Liangzhi Yu were able to classify user behavior into eight categories—including focused regular, specialized occasional, exploratory, and so on; they concluded that e-journal services need to support a variety of patterns of use. The authors also provide a substantive review of earlier journal use studies.  

Some studies have focused on electronic journal use at a particular institution—often with an interest in assessing acceptance of the digital format and the impact of canceling subscriptions to printed journals. The Collection Management Initiative (CMI) at the University of California (UC) compared usage of digital and hardcopy formats of about 300 journals available electronically by transferring the printed volumes to remote storage on "experimental campuses" and by providing access to both electronic and printed formats on "control campuses." In addition, a survey of UC faculty, students, and staff was conducted early in 2003 to collect data on user preferences and reasons for using electronic journals. Project data and findings are available at http://www.ucop.edu/cmi/data.html.  

In addition to the above studies, the literature on electronic journals also includes a number of articles on purchasing models (such as the "big deal") and costs of acquiring and making available electronic versus printed journals. Although not the focus of this article, the economic aspects of e-journal provision constitute another set of critical issues and so are acknowledged here.

Environment

According to the September 2002 statistical summary compiled by OSU’s Office of University Relations, the number of OSU users who had access to the OhioLINK Electronic Journal Center during the survey period (September 25, 2002—January 5, 2003) included
approximately 44,000 undergraduates; 13,000 graduate and professional students; 4,700 faculty; and 16,600 staff. At the time of the survey, the Electronic Journal Center included 4,841 journals from 18 publishers (see appendix A). According to usage statistics provided by OhioLINK, 85.5 percent (4,137) of the EJC titles were used at least once by OSU users during the survey period. The top 20 percent of titles that were used accounted for 70.9 percent of the total number of downloads by OSU users during the survey period.

Methodology

The objective of the study was to develop some baseline characteristics of the use of the EJC by students, faculty, and staff of the Ohio State University. To that end, a five-question, Web-based survey was conducted during the fall 2002 academic quarter. The authors' goal was to determine the path users employed to find electronic journal articles in the EJC, their reasons for using the articles, and their frequency of use of the EJC. Demographic data were collected on the users' status (e.g., faculty, undergraduate student) and the user's primary academic unit (e.g., the arts, veterinary medicine). The questions were asked at the point of download, and the user was asked to respond based on the current use. Because the unit of analysis was downloads, meaning uses rather than users, respondents could answer the survey multiple times during the data collection period.

In summer 2002, a pilot was performed to test the questions, the technology for gathering and transferring the data from OhioLINK to a campus server, and the sampling technique. To gather the data, OhioLINK redirected each OSU sampled user to a question form on an OSU Center for Survey Research server. After the user filled out the form (or chose not to respond), the user was redirected back to OhioLINK and to the article requested.
In addition to the data from the questions, data were gathered on the date and time of access, location of original request (main campus or regional campuses), and the International Standard Serial Number (ISSN) for the journal from which the article was downloaded.

To decide upon the sampling interval, the authors experimented with two approaches: a five-question form and a two-question form. Using the two-question form involved using all five questions in various pair combinations and sampling more frequently to insure an adequate sample size. The goal in testing the two approaches was to determine whether it would be as easy for a survey recipient to answer two questions as it would be to close the window and not respond. If so, the response rate might be higher for the two-question method than for the longer survey. In either case, a single participant could receive the survey multiple times during the quarter. The Center for Survey Research controlled whether a user received the two-question or the five-question survey. The differences in response rates during the pilot were inconclusive. This might have been due to the limited time of the pilot; but in any case, the authors decided to sample users less frequently, using all five questions for the actual study (see appendix B). The sampling interval for the study was one in 30, resulting in the survey being presented 6,747 times. A 29.8 percent response rate (2,010) was obtained.

Subsequent to conducting the online EJC survey, the authors submitted one of the same questions (concerning frequency of use) for inclusion in the annual OSU Poll conducted in February and March 2003 by the OSU Center for Survey Research. Telephone interviews were completed for 302 of the randomly selected faculty (57 percent response), 303 of the graduate and professional students (65 percent response), and 303 of the undergraduates (65 percent response). The EJC question was not asked of the staff population group. Unlike the online survey, which was presented only to EJC users, the OSU
Poll drew samples from the entire population of faculty, graduate students, and undergraduates affiliated with OSU's Columbus campus. Therefore, it allowed measurement of non-use and lack of awareness of the EJC as well as frequency of use. In addition, because the poll sampled users rather than uses, the results provided a different perspective on the frequency question and the opportunity to draw conclusions about the behavior of each user group.

The authors also submitted several follow-up questions for inclusion in the OSU Poll conducted in February and March 2004 to probe how users first learned about the EJC and what they did with the last article they viewed. Data collection was accomplished in part through an online survey and in part through telephone interviews. Usable responses to the 2004 Poll were collected from 306 of the randomly selected faculty (43 percent response), 303 of the graduate and professional students (52 percent response), 305 of the undergraduates (48 percent response), and 301 (55.5 percent response) of the staff.

Data analysis was performed using frequency distributions for each of the EJC survey and OSU Poll questions and chi-square testing for dependency between the variables in the EJC study. In addition, measures of strength and association also were used to examine relationships among the EJC study variables.

Results

There were 2,010 usable returns for the Fall 2002 EJC survey, although all five questions were not answered on each return. The number of cases for each question varied depending upon the number of people who responded. For example, for the question about the respondent's status, there were 2,010 usable responses, because everyone who submitted a
survey answered the question. However, for the question asking to which academic unit the respondent belonged, there were 2,007 usable responses. In reporting the results for each question and the chi-square result for dependency between questions, the number of usable responses is given (shown as n = sample size in the tables and figures).

**Status of User**

The first of the five online survey questions concerned the status of the user. More than half of the 2,010 uses (1,113/2,010) came from graduate and post-doctoral students (figure 1). However, these two groups together comprised only 13 percent of the university population as shown in table 1.

[Insert figure 1]

[Insert table 1]

Uses by faculty (297/2,010; 14.8 percent) also were high in proportion to their presence on campus (6 percent of population). Conversely, uses by undergraduates (379/2,010; 18.9 percent) and staff and A&P personnel (180/2,010; 9 percent) were low when compared to population size (undergraduates, 56 percent; staff/A&P, 21.1 percent).

**Academic Unit**
Figure 1. Status of User

How Do You Describe Yourself?

n = 2010

- Graduate Student: 48.3%
- Post-doctorate Student: 7.1%
- Staff: 5.2%
- Undergraduate Student: 18.9%
- A & P: 3.7%
- Faculty: 14.8%
- Other: 2.0%
- Graduate Student: 48.3%
<table>
<thead>
<tr>
<th>Status</th>
<th>University Population</th>
<th>EJC Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
</tr>
<tr>
<td>A &amp; P</td>
<td>10862</td>
<td>13.8</td>
</tr>
<tr>
<td>Faculty</td>
<td>4753</td>
<td>6.0</td>
</tr>
<tr>
<td>Graduate students</td>
<td>10218*</td>
<td>13.0</td>
</tr>
<tr>
<td>Staff</td>
<td>5736</td>
<td>7.3</td>
</tr>
<tr>
<td>Undergraduates</td>
<td>43993</td>
<td>56.0</td>
</tr>
</tbody>
</table>

*Includes Post-doctoral students
When survey respondents (N=2,007; figure 2) were asked to indicate their primary academic unit, the largest number of uses were from individuals in medicine and public health, followed by uses of people in the biological sciences and engineering.

[Insert figure 2]

In addition to looking at the academic disciplines individually, the authors collapsed the data into three broad categories—arts and humanities, sciences, and social sciences—based on the groupings of disciplines listed for coverage in the ISI Web of Science databases. The collapsed data indicate the dramatic predominance of uses by those in the sciences as compared to the other two areas (figure 3).

[Insert figure 3]

Chi-square analysis of academic unit and user status show that these variables are dependent ($\chi^2 = 782.4; \text{df} = 120$). Further analysis of the relationship between these variables using Lambda showed that unit is dependent on status (value = .011), meaning that if the status is known, the ability to predict the unit is improved. However, status is not dependent on unit.

*Reason for Viewing*

Each respondent was asked to indicate the primary reason for viewing the article. Overall, the most frequently cited reason was for a class paper or project (figure 4).

[Insert figure 4]
Figure 2. Academic Unit of User

What is Your Primary Unit?
n = 2007
Figure 3. Academic Unit of User (Data Collapsed)

What Is Your Primary Unit?
(Data Collapsed)*

*Categories based on the groupings of disciplines listed for coverage in the ISI Web of Science Arts & Humanities, Sciences, & Social Sciences Indexes.
Figure 4. User’s Reason for Viewing Article

What Is Your Primary Reason for Viewing This Article?

n = 2010
A cross tabulation with the users' status showed that 77.8 percent (295/379) of the undergraduate uses and 30.4 percent (294/968) of the graduate student uses were for a class paper or project. Together, graduates and undergraduates contributed 95.5 percent (589/617) of the uses for this purpose.

An examination of each of the reasons for use reveals that for assigned reading, graduate student uses (37) and undergraduate student uses (26) account for 77.8 percent of the 81 uses for this purpose. In viewing for personal interest, graduate students accounted for 46.7 percent of the uses (42/90). Faculty and post-doctoral students account for another 30 percent of the uses for personal interest (14 and 13 uses, respectively).

Preparation for teaching was an infrequent selection overall; and, not surprisingly, cross tabulation shows that most of the uses for this reason came from faculty (33/42, 78.6 percent). Preparation for teaching is the fourth highest reason given by faculty (after scholarly research, grant preparation, and current awareness) for using the EJC. Relatively few of the uses by graduate students were for teaching preparation (6/968; 0.6 percent); however, these 6 uses accounted for 14.3 percent (6/42) of all uses for this purpose.

Uses that were described as assisting someone else accounted for only 4.1 percent (82/2,005) of the total uses. Three status groups contributed fairly equally to the majority (64.6 percent) of the uses for this purpose; there were 20 uses by graduate students, 17 by staff, and 16 by A&P.

As might be expected, faculty and graduate students accounted for most of the uses described as research. Graduate student uses accounted for 95.9 percent (278/290) of the uses for dissertation research and 94.0 percent (78/83) of the uses for master's thesis research. Of the total uses by faculty, 38.6 percent (114/295) were for other scholarly research (e.g.,
conference paper or publication), and 12.2 percent (118/968) of graduate student uses were for this purpose. Together, faculty and graduate students contributed nearly 60 percent of all the uses for scholarly research (114/396 for faculty; 118/396 for graduate students). Post-doctoral students accounted for another nearly 20 percent of the usage for this purpose (77/396).

Faculty, graduate students, and post-doctoral students were also the principal contributors to the usage for grant preparation: faculty contributed 43.9 percent (47/107); graduate students, 28.0 percent (30/107); and post-doctoral students 15.9 percent (17/107). The three most frequently cited reasons for use by undergraduates, graduate students, and faculty are shown in figure 5a. This view of the data shows that other scholarly research was the one reason for viewing that appeared among the top three for each of these status groups. In fact, other scholarly research appears in the top three reasons for use given by all of user groups (figure 5b). Current awareness was one of the top three reasons listed by four groups: faculty, post-doctoral, staff, and A&P.

[Insert figures 5a and 5b]

*How the Article Was Found*

Each respondent was asked how the article being viewed was found. The option selected most often was browsing a journal's issues online. However, use of citations (online or printed) and the EJC search feature were popular choices as well, as shown in table 2.

[Insert table 2]
Figure 5a. Top Three Reasons for Use by:
Undergraduate Students, Graduate Students, and Faculty

- Assigned Reading
- Class paper/project
- Current awareness
- Dissertation
- Grant preparation
- Other scholarly research
Figure 5b. Top Three Reasons for Use by:
Post-doctoral Students, Staff, A&P
Table 2.
How Did You Find This Article?

<table>
<thead>
<tr>
<th>Path</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browsed a particular journal's issues</td>
<td>628</td>
<td>32.1</td>
</tr>
<tr>
<td>Used EJC search option to enter a search term and view results</td>
<td>493</td>
<td>25.2</td>
</tr>
<tr>
<td>Cited in a printed source (e.g., book, reading list)</td>
<td>195</td>
<td>10.0</td>
</tr>
<tr>
<td>Cited in an online source but not as a clickable link</td>
<td>180</td>
<td>9.2</td>
</tr>
<tr>
<td>Cited in an online source as a clickable link</td>
<td>216</td>
<td>11.0</td>
</tr>
<tr>
<td>Received through an awareness service but not as a clickable link</td>
<td>40</td>
<td>2.0</td>
</tr>
<tr>
<td>Received through an awareness service as a clickable link</td>
<td>27</td>
<td>1.4</td>
</tr>
<tr>
<td>Another person told me about it</td>
<td>141</td>
<td>7.2</td>
</tr>
<tr>
<td>Memory</td>
<td>38</td>
<td>2.0</td>
</tr>
<tr>
<td>Valid responses</td>
<td>1958</td>
<td>100.1</td>
</tr>
<tr>
<td>Did not answer question</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Submitted surveys</td>
<td>2010</td>
<td></td>
</tr>
</tbody>
</table>
To determine if there were differences among the disciplines in how people found articles in the EJC (path), the authors compared the three broad disciplinary groups (arts and humanities, sciences, and social sciences) to four categories of path: browsing a particular journal's issues online, citations (including printed and electronic citations, clickable and non-clickable links), awareness services, and the EJC search option to enter a search term and view results. For the remainder of this discussion, these paths will be referred to as browsing, citations, awareness services, and the EJC search option. There were differences among the groups. Chi-square analysis of broad discipline and path shows that these variables are dependent at the .000 significance level ($\chi^2 = 53.1; \text{df} = 6$). Lambda shows that path is dependent upon discipline (.003 significance level).

People in the arts and humanities browsed more frequently than would have been expected by chance alone (statistical expected uses of browsing by this group = 23.3; actual uses = 34). Uses of citations were lower than expected for people in the arts and humanities (expected uses = 22; actual uses = 12). Uses of awareness services and the EJC search option by this group were about what would have been expected (awareness services expected use = 3; actual use = 0 and expected uses of the search option = 18; actual uses = 20).

The paths to articles by people in the social sciences were similar to the paths used by people in the arts and humanities; browsing was higher than expected (expected = 168; actual 215) and uses of citations were lower than expected (expected = 159; actual =121). Uses through awareness services were slightly lower than expected (expected = 18; actual = 11); and uses through the EJC search option were close to expectations (expected = 132; actual = 130).
In contrast, uses of citations by people in the sciences were higher than expected (expected use = 395; actual = 443); uses of awareness services were higher than expected (expected = 45; actual = 53); uses through browsing were lower than expected (expected = 418; actual = 360); and uses through the EJC search option were equal to what was expected (expected and actual = 327).

Frequency of Use/Non-Use

For the final survey question, respondents were asked to indicate how frequently they used the EJC (figure 6).

[Insert figure 6]

More frequent users were more likely to be redirected to the survey multiple times. Only 16 percent of the responses came from those reporting first time or infrequent use. Not surprisingly, many of those responses came from undergraduates. Sixty-nine percent (1,357/1,970) of the uses were by those who reported using the EJC at least weekly. Almost 80 percent (228/296) of the faculty responses, 75.1 percent (718/955) of the graduate students responses, and 36.3 percent (135/372) of the undergraduate responses indicated at least weekly use.

The question on frequency of use was included in both the EJC survey and the 2003 OSU Poll. However, the data from the two studies provide different perspectives on the frequency question rather than being comparable. The EJC survey sampled uses of the EJC throughout a quarter, allowing a single respondent to answer the survey multiple times. The OSU Poll sampled users rather than uses, resulting in a single response per person and
Figure 6. Frequency of Use

How Frequently Do You Use the EJC?
n = 1970

- **Daily**: 38%
- **Weekly**: 31%
- **Monthly**: 15%
- **Infrequently**: 8%
- **First time**: 8%
allowing conclusions to be drawn about frequency of use by the sampled populations. Examination of the 2003 OSU Poll data shows that 48 percent (145/302) of faculty, 39.3 percent (119/303) of graduate students, and 16.5 percent (50/303) of undergraduates responding to the poll said that they used the EJC daily or weekly.

The opportunity to participate in the 2003 and 2004 OSU Polls also provided data on lack of use and unawareness of the EJC that was not available from the EJC survey. The 2003 Poll responses to the question about frequency of use showed that 15.2 percent (46/302) of faculty, 22.4 percent (68/303) of graduate students, and 50.2 percent (152/303) of undergraduates never used the EJC or were not aware of it. When respondents to the 2004 Poll were asked how they first learned about the EJC, 10.9 percent (33/304) of faculty, 15.3 percent (46/301) of graduate students, and 33 percent (100/303) of undergraduates reported being unaware of the EJC. When they were asked to consider the last article they had viewed, of those who were aware of EJC, 5.2 percent (14/270) of faculty, 4.3 percent (11/254) of graduate students, and 21.4 percent (43/201) of undergraduates said that they did not use it.

*Action after Viewing Article*

The 2004 OSU Poll provided some insights regarding what EJC users are doing with the articles that they view. Respondents were asked to think about the last EJC article that they viewed and to answer yes or no to a series of actions that they might have taken after viewing the article.

[Insert table 3]
<table>
<thead>
<tr>
<th>Action</th>
<th>Faculty</th>
<th></th>
<th>Graduate</th>
<th></th>
<th>Undergraduate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 306</td>
<td>n = 303</td>
<td>n = 305</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
<td>Number</td>
<td>Percent</td>
<td>Number</td>
<td>Percent</td>
</tr>
<tr>
<td>Printed it</td>
<td>192</td>
<td>62.7</td>
<td>173</td>
<td>57.1</td>
<td>84</td>
<td>27.5</td>
</tr>
<tr>
<td>Read copy (offline)</td>
<td>184</td>
<td>60.1</td>
<td>142</td>
<td>46.9</td>
<td>67</td>
<td>22.0</td>
</tr>
<tr>
<td>Read portion of it online</td>
<td>176</td>
<td>57.5</td>
<td>129</td>
<td>42.6</td>
<td>107</td>
<td>35.1</td>
</tr>
<tr>
<td>Cited it as a source</td>
<td>133</td>
<td>43.5</td>
<td>117</td>
<td>38.6</td>
<td>80</td>
<td>26.2</td>
</tr>
<tr>
<td>Talked about it</td>
<td>123</td>
<td>40.2</td>
<td>75</td>
<td>24.8</td>
<td>51</td>
<td>16.7</td>
</tr>
<tr>
<td>Sent citation</td>
<td>60</td>
<td>19.6</td>
<td>33</td>
<td>10.9</td>
<td>17</td>
<td>5.6</td>
</tr>
<tr>
<td>Read all of it online</td>
<td>44</td>
<td>14.4</td>
<td>46</td>
<td>15.2</td>
<td>65</td>
<td>21.3</td>
</tr>
<tr>
<td>Created link to it</td>
<td>18</td>
<td>5.9</td>
<td>9</td>
<td>3.0</td>
<td>6</td>
<td>2.0</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>2.6</td>
<td>5</td>
<td>1.7</td>
<td>1</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Number and percent of “yes” responses within the sample (vs. “no” by same group)
The actions that were presented as options included: reading a portion or all of the article online, printing it, reading a printed or downloaded copy, talking with someone about the article or sending someone the citation for it, citing the article as a source in a document or presentation, and creating a link to it. The actions receiving the most yes responses from faculty, graduate students, and staff were: printed the article, read a printed or downloaded copy, read a portion online, cited the article, and talked with someone about it. Undergraduates gave the most yes responses to the same actions with one exception—reading all of the article online was one of the top five actions for undergraduates but talking with someone about it was not.

Discussion

By sampling EJC transactions and capturing additional information about those uses through an online survey, the authors were able to add to the value of the usage statistics already available from OhioLINK. The OSU Polls provided data not available from the EJC transaction logs or from the online survey, particularly concerning non-use of the EJC and actions taken by users after viewing an article. Increased knowledge about how EJC resources are being used and what populations are being served should assist those responsible for making collection management decisions, particularly in difficult budgetary times.

In general, the studies showed that EJC usage patterns for OSU faculty and graduate students were similar. However, the pattern of use by undergraduates was different, as discussed below.
Status of User

More than half of the uses in the EJC survey came from graduate or post-doctoral students—high use compared to their presence on campus. Conversely, use by undergraduates and staff or A&P personnel was low when compared to population size. Several explanations are possible. Undergraduates and staff may not have been as aware of the EJC as faculty and graduate students. The OSU Poll results showed this to be true for undergraduates in 2003 and 2004. Faculty and graduate students (including post-doctoral students) together comprise only 19 percent of the university population (6 percent for faculty; 13 percent for graduate students), yet their use accounted for 70 percent of all the uses during the study (14.8 percent for faculty; 55.4 percent for graduate students). Because of the commitment that faculty, graduate students, and post-doctoral students have to scholarly research, these users may be more aware of the resources available to them to aid their research. Because faculty librarians at OSU work closely with the faculty in the colleges and departments to develop, maintain, and promote the resources of the libraries, faculty and graduate students may have had more systematic contact with librarians. The results of the EJC study and the OSU Polls suggest that more effort should be made to market EJC services to undergraduates and other low-use groups.

Academic Unit

Most of the faculty and graduate students' EJC uses were in the sciences. Faculty uses in the sciences accounted for over 76 percent of all faculty uses. Graduate/professional student uses in the sciences accounted for over 72 percent of all graduate/professional student uses (808/1,113). The high number of the uses by scientists overall (68.7 percent) is not surprising
because the content of the EJC is primarily science based. Conversely, the low number of uses by those in the arts and humanities (4 percent) also is not surprising, given that these disciplines are the areas least represented in the EJC. These proportions could change over time as efforts are made to bring additional subject matter into the EJC.

Undergraduate uses were highest in the social sciences; uses in these disciplines by undergraduates accounted for 51 percent (194/379) of all undergraduate uses and for over 38 percent 194/504 of all uses in the social sciences by faculty and students. Uses by undergraduates in human ecology and the humanities were higher than would be expected by chance alone, while uses by those in mathematics and the physical sciences were lower than expected.

Reason for Viewing

A class paper or project was the most frequently cited reason for use overall. Nearly 78 percent of the undergraduate uses were for that purpose, and an additional 6.9 percent of undergraduate uses were for assigned reading. Use for teaching preparation was low overall, and less than 1 percent of the uses came from graduate students (excluding post-doctoral). Because many OSU graduate students do teach, this result was somewhat surprising. Use by graduate students for other scholarly research also was low (12.2 percent). This too was surprising, because graduate students often prepare conference presentations (and this reason was included on the survey as an example of other scholarly research). It is possible that those who answered that the purpose of their use was to assist someone could have been assisting a faculty member in preparation for teaching or in research. More investigation is
needed to determine if the results reflect the authors' definitions of categories or if the options for answering the question about reason for use were unclear to the respondents.

How the Article Was Found

Browsing was the most frequently cited method for finding articles overall, but citations and use of the search option were popular choices as well. To do the additional analysis of cross tabulating status and path, the authors collapsed the two awareness services answers into one group and the three citations answers into one group. Faculty most frequently found the EJC articles they used through citations or browsing. Graduate student EJC uses also frequently relied on citations. However, undergraduates used citations as paths to EJC articles very infrequently and far less than would be expected by chance alone. Undergraduates most frequently found the articles they used by browsing a particular journal's issues online or by using the EJC search option.

Frequency of Use / Non-Use and Action After Viewing

Most of the respondents to the EJC survey were frequent users of the EJC; 69 percent of the uses were by those who use the EJC at least weekly. Most of these frequent users were faculty or graduate students. The 2003 OSU Poll showed that 48 percent of faculty and 39.3 percent of graduate students use the EJC at least weekly; however, half of the undergraduates never use EJC or are not aware of it. The 2004 OSU Poll showed that most EJC users do still make printouts for offline reading of full articles. Online reading of full articles was slightly more popular among undergraduate respondents than with other user groups.
Usage Patterns

Overall, EJC usage by faculty and graduate students was very similar, but usage by undergraduates showed some different patterns. Such results raise the question whether our systems should be designed to favor undergraduate usage patterns, because today's undergraduates are our future scholars. Or perhaps we should conclude that the systems are designed appropriately, because undergraduates will change their usage patterns as they progress through the educational system. For example, they could be expected to learn the importance of following certain paths to information in their disciplines that were already known to graduate students and faculty. This is a question for further study.

Implications

The objective of the studies described above was to gather more information about how the OhioLINK Electronic Journal Center is being used by members of the Ohio State University community. Having accomplished that objective, how can the additional information be used?

The EJC was created and is maintained through the investment of a sizeable portion of the OhioLINK budget, in conjunction with significant expenditures by the OhioLINK member libraries. The data gathered by the authors provide justification for this investment—particularly the part paid by OSU—by demonstrating that intended populations are being served for intended purposes. Given that the value of the investment is maximized when EJC usage is maximized, the data also show areas of opportunity to increase value by increasing use where it currently is low. Marketing and other strategies can be targeted to low-use groups such as undergraduates or toward low-use purposes such as instructional preparation.
The data also improve our ability to predict and manage the impact if budget cuts force EJC content reductions. Conversely, if budgets support adding content, the data provide some guidance for building the electronic collections to realize the most value for the dollars spent.

The knowledge gained regarding how current options and features of the EJC are being used will inform system redesign and migration decisions as technology changes. It can also guide the development of additional EJC services such as support for locally produced or sponsored e-journals.

In general, the EJC survey explored use of a critical mass of e-journal content by a large user population group. The methodology, which essentially combined the critical incident technique with transaction log analysis through the online survey, was one that the authors did not find documented previously in library literature. The findings raised questions that can be used to guide the design of additional research, and the data can serve as a baseline for further study of EJC usage within and across institutions.

Further Research

The online EJC survey provided usage data that previously were not available, but many interesting questions remain. For example, which disciplines are using which subject areas represented in the EJC? By looking at the Library of Congress Classification number assigned to individual titles used in the EJC study, it should be possible to examine usage across disciplines. How would OSU’s usage, in general, compare to use by other Ohio institutions? The online survey could be replicated for other OhioLINK members. How could non-users of the EJC be encouraged to take advantage of this resource? Is this a marketing issue or something more? There are also many questions that could be explored more
effectively through qualitative research methods such as focus interviews. For example, is the
path that a user follows to get to an article influenced by the intended use of that article? How
do users assess the value of the articles they access? The authors are considering conducting
a second phase of the study to explore some of these questions.

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Notes


11. Schottlaender.

Appendix A

Publishers Represented in OhioLINK Electronic Journal Center
During Survey Period (September 25, 2002 – January 5, 2003)

Academic Press
American Chemical Society
American Institute of Physics
American Physical Society
Association for Computing Machinery
BioOne
Blackwell Publishers
Blackwell Science
Elsevier Science
Institute of Physics
Kluwer
MCB University Press
Optical Society of America*
Project Muse
Royal Society of Chemistry
Springer-Verlag
Thieme
Wiley

*The eight titles from the Optical Society of America were added to the EJC in November 2002.
Appendix B

EJC Survey Questions

How do you describe yourself? (select from drop down menu)
- Administrative and Professional
- Faculty
- Graduate student
- Post-doctorate student
- Staff
- Undergraduate student
- Other

What is your primary unit? (select from drop down menu)
- Arts
- Biological sciences
- Business
- Dentistry
- Education
- Engineering
- Food, Agriculture & Environmental Sciences
- Human Ecology
- Humanities
- Law
- Libraries
- Mathematics & Physical Sciences
- Medicine and Public Health
- Nursing
- Optometry
- Pharmacy
- Social & Behavioral Sciences
- Social Work
- Support unit (for example, OIT or Physical Facilities)
- Veterinary Medicine
- Other

What is your primary reason for viewing this article? (select from drop down menu)
- Assigned reading (includes course reserve material)
- Assistance to someone else
- Class paper or project
- Current awareness
- Doctoral dissertation
- Grant preparation
- Master’s thesis
- Other scholarly research
- Patient care
- Personal interest
Preparation for teaching
Other

How did you find this article? (select from drop down menu)
   Another person told me about it
   Browsed a particular journal’s issues online
   Cited in a printed source (e.g., book, reading list)
   Cited in an online source as a clickable link
   Cited in an online source but not as a clickable link
   Memory
   Received through an awareness service as a clickable link
   Received through an awareness service but not as a clickable link
   Used EJC search option to enter a search term and view results

How frequently do you use the Electronic Journal Center (EJC)? (select from drop down menu)
   Daily (3 or more times a week)
   Weekly (1-2 times a week)
   Monthly (1-3 times a month)
   Infrequently (less than once a month)
   This is my first time using the EJC