The Nature of the Electronic Journal: Structure and Use of Information in Scholarly Electronic Journals

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ABSTRACT

The nature of the information in scholarly electronic journals and the use made of that information needs to be better understood by academic librarians seeking to serve faculty and students effectively. This paper is based on the results of an investigation of web accessible scholarly journals undertaken at Dartmouth College, and emphasizes the challenges to library user services. Scholarly electronic journals are different from print journals in form and access mode, and vary far more than print journals. However, the role of the scholarly journal has not changed with the form. User requirements for ease of access and reliability of content are still important considerations. By actively working with the providers of electronic journals, librarians have the opportunity to influence the development of this mode of scholarly communication in a direction that is beneficial to scholarship.

Introduction

Journals have long been a major vehicle for formal scholarly communication, by serving as the primary means of establishing priority and authority in a field, and providing an archival record. Print journals that serve this function successfully have been stable in form and content for a long period of time, although the continued viability of this format has been questioned for almost as long, particularly in terms of timeliness, quality, accessibility, and cost(1,2).

Electronic journals, developed as alternatives, supplements or replicas of print journals, have the potential to fundamentally change scholarly communication by offering an interactive environment, rapid dissemination, access to large data sets, and the ability to manipulate data, as well as other features. In some scientific research fields, such as high energy physics and space science, scholarly communication has been radically altered by the use of electronic communications and data transfer technology, but formal publication of research results still are found in traditional scholarly journals, whether electronic or print(3).

The scholarly electronic journal has not developed as quickly as expected, despite several research projects in the last few years, such as TULIP, CORE and others(4-6). A major factor in the current evolution of electronic journals is the ubiquitous nature of the World Wide Web. By late 1995, it appeared that both society and commercial publishers would be making significant efforts to make journals available through the Web, and there was a great deal of optimism that the Web would provide a technical solution to the problems of the scholarly journal.

To better understand the implications of this rapidly developing publishing environment on library operations and services to users, Dartmouth College's Electronic Information Group organized a concentrated effort to select, acquire, and catalog web accessible journals, and then obtain user feedback about these journals.

This paper is based on aspects of the project, and necessarily reflects the state of the art and the journals available at the time, late 1995 to late 1996.

Nature of the Electronic Journal

Scholarly print journals are fairly consistent in form and content, so users can transfer knowledge of how to use one title to others. In contrast, scholarly electronic journals on the web exhibit a great deal of variability in all aspects, from access mode to content to what the user can do with the material[7,8]. It is often difficult to tell what sections of a print journal are available in the electronic form. New journals that have attempted to truly change the nature of the journal are far fewer in number than the print mimics, and show even more variation.

How a journal is ordered, how access is controlled, and what services the publisher supplies also varies. Once a journal was ordered, we found large inconsistencies in the reliability of access to a title or issue; access problems are also documented by Harter and Kim[9]. These factors made it impossible to ensure that the journals ordered for the Dartmouth test would be easy to locate and use, and were the root of some of the problems that discouraged users.

Scholarly electronic journals currently or will soon include these forms:

- Print mimic: replica of a print journal, with all the same sections, issue and page numbers, and often including a picture of the cover. The information can be downloaded or printed, but not further manipulated in any way. The majority of currently available commercial electronic journals are in this form.
- Selected sections: not all sections of the print journal are available, although the electronic journal is considered a full text product. Examples are journals from the American Chemical Society and JAMA, which only include research articles, and exclude book reviews and news reports.
- Enhancements to the articles: text that is not in the print version, along with the print article; an example is Science Online.
- Supporting material: tables, graphs and data that are not in the print version of the article. Some of this has been traditionally issued on microfiche by society publishers such as the Geological Society of America and American Chemical Society.
- Individual articles: article by article publishing, instead of journal issue publishing; an example is The Chicago Journal of Theoretical Computer Science.
- Brief extracts: table of contents and abstracts only in the web version, with full articles available later on CD-ROM as an archive, such as the Geological Society of America provides.

Several examples will further illustrate these variations.

Most journals with print counterparts, for example the Project Muse titles from Johns Hopkins Press and the Institute of Physics (IOP) journals, look like the print version, are organized by issue numbers, and have page numbers that correspond with the print. The picture of the print cover further connects these to the printed journal. Tables and figures are embedded in the text of the IOP journals just as they are in the print version. These examples do not appear to make readers interact with the material differently than they do with the print versions. Other scientific journals, such as the Journal of Biological Chemistry, use hyperlinks to connect figures to the text, which emphasizes the differences in the two formats.

The new journal Frontiers in Biosciences asks the user to make choices before it is possible to read an article, and some of these (frames, floating index) might be unintelligible. This journal also guarantees freedoms from the limits of the print format, in offering no page limits, no limits on numbers of color photographs, minimum page charges and access to other links. However, this electronic-only journal uses print for special issues. Manuscripts being reviewed are available for reading. They are moved into the numbered issues with page numbers once they are finalized.

Articles in the Chicago Journal of Theoretical Computer Science are neither grouped into issues, nor do they have page numbers(10). This electronic-only journal offers the reader more options than most, and the long section titled "Instructions for readers" is therefore very important. There are six ways to access the articles (ASCII, DVI, PostScript, an Audio format, LaTeX, and a custom format), as many as there were articles listed for 1996. However, if someone wants to cite the material, it is necessary to refer to the LaTeX source, which specifies sections of the article. Ease of citation is one reason why the page numbering system has carried over from print to electronic journals, even though it should have lost meaning in that format.

A significant new entry into the electronic journals field is Earth Interactions, a joint project of the American Geophysical Union, the Association of American Geographers, and the American Meteorological Society(11). A complex and ambitious project, Earth Interactions has been under development since 1992, with no first issue ready for publication yet. The journal is intended to offer a publication outlet for a diverse group of researchers in earth system science, who would like to include in their publications large data sets, computer models and animation.

The Royal Society of Chemistry is intending to publish electronic journals that use a variety of software, both existing and under development, to enable chemists to move beyond the limits of two-dimensional paper. New features, such as rotating molecules, displaying full data sets, and manipulating these, might make it possible for the reader to have enough information to repeat or otherwise thoroughly investigate the experiment reported(12).

The variability exhibited by these examples has implications in all areas of library services, as was found during the Dartmouth project. Library staff and users found that journals most similar to the print counterpart were the easiest to handle, and those which offered the most choices for printing and downloading were more difficult. The current ordering environment is chaotic, the bibliographic control experimental, and the technological challenges in bringing the journals to users' desktops significant. These factors presented obstacles in enabling faculty to locate and use the electronic journals available during the test.

User Reactions to Web Journals

One goal of the Dartmouth Web Journals Test was to understand how faculty and students would learn about web journals and how they would react to using electronic journals via the web. All the electronic journals subscribed to during the test were listed on a web page. At the end of the test period, there were 108 titles listed on the web page.

From the web page, users had the option of giving feedback by filling out a questionnaire or sending an e-mail message. The hope was that many of those accessing the page for the first time would respond regarding the journals they used. However, only nineteen people filled out the questionnaire and one sent a general e-mail question from the page. Other users sent e-mail notes or talked to individual librarians, usually with complaints about not being to access a particular title that was listed on the page. Follow-up interviews with selected faculty members were held, covering their use of electronic journals and how the library might make that use easier.

Few people found the web page on their own. Most responses were from faculty who had been contacted personally by a librarian, had read a notice in a newsletter, or had received an e-mail message sent to their department. Most titles in the test were also available in print. In some cases, the users sought out the web journals because a print issue was at the bindery or at a remote location. As the test progressed, some journals were also listed in the Dartmouth College Library Online Catalog, with active URLs pointing to the web test page.

Most faculty liked the idea of electronic journals, even those who did not use any, or who had technical problems connecting to the journals and printing articles. The convenience of remote access to electronic journals was cited as the major positive feature. Some faculty, including those who did not find any titles they wanted to use on the web page, felt it was important that the library was paying attention to electronic journals, regardless of the usefulness of the titles.

Many complained that reading from the screen was awkward, and they could not use the material in the way they wanted. All the features of a useful electronic journals system listed by Olsen, Bishop, Stewart and others(13-15), do not currently exist, although these are needed to make electronic journals more compelling to use than print. A typical statement was:

> I think computer journals offer a lot more flexibility in terms of being able to connect from where I want to be instead of the library, but it's also a pain because reading from the computer screen does not allow for taking notes or underlining.

On the other hand, a few people recognized the flexibility that the electronic format provides, and noted that it was useful to select and print needed sections. However, this statement from a computer literate young mathematics researcher probably best sums up faculty opinion about the problems with current web journals:

> For an active researcher who spends a certain amount of time each day browsing through the new journals, reading the introductory sections of numerous articles in a range of journals, the response is unacceptably slow! If the online version of a journal appeared significantly in advance of the print version, there might be some advantage to the former (and one hopes that eventually electronic journals will be significantly cheaper than print journals, which would be another advantage), but at present most electronic journals are slow, cumbersome, inconvenient, and fraught with difficulties when one wishes to print a hardcopy version.

Use of electronic journals was and will continue to be driven by need for specific information or a particular citation. This was clear from the follow-up interviews. Some faculty did not respond to requests for feedback because there was not sufficient content in terms of time period, topics or titles covered in the journals on the test page. It was simply not worth their time to look at the journals without a need for information that could be filled by doing so.

A recurring theme from the faculty was that they feel overwhelmed by the number of articles that they think they should read. Therefore, any system that causes them to take more time to acquire what they need will not help them. No users commented on the ability to search for material in the text of electronic journals, although this is a clear advantage of web journals over print. There is not yet a significant body of electronic journals available from any one source, and faculty are aware of the advantages of using index and abstract services.

In the interviews about electronic journals, faculty indicated that they like the idea of CD-ROM format for journals as substitutes for their personal subscriptions to print journals. They like the reliability the CD-ROMs represented over some of the web journals. The web journals in the test, unlike print or even CD-ROM journals, had a variety of requirements for the software and hardware needed to support access, searching, and printing, and were not always available due to server, password or subscription problems.

Libraries need to use a variety of methods to inform users about the existence of electronic journals. Some faculty liked the idea of having a web page where all web journals subscribed to by the library are listed, and some indicated that signs in the print journal stacks would be useful. Relying solely on online catalog records for information about electronic journals would not be adequate.

Feedback from users confirms the importance of the three "dimensions of effective use", Connectivity, Content and Usability, as described by Covi and Kling(16). Without these in place, users will not see the advantages of using electronic journals over print. Libraries have a role in providing resources and services that support these dimensions.

User Services Challenges

Libraries know how to make access and use of print journals easy for faculty and students. Reference librarians are familiar with the kinds of questions they are likely to get from users regarding print journals, and the bibliographic tools are well known. In constrast, electronic journals require a different kind and level of service than print journals. During the test period, it became apparent that staff and users alike need formal and informal instruction in how to locate, use, print, download and manage the information from electronic journals. Access problems due to hardware and software configuration requirements, subscription lapses, publishers' errors, user ignorance, and network and server downtime all had a negative impact on the use of electronic journals.

Staff need to learn to diagnose problems, so these can be referred as necessary. It is often difficult to determine the cause of connection and printing problems, and even common error messages are not consistently worded. One result of the Dartmouth test project is a web journals problem solving guide for staff to help with this.

The user services challenges and opportunities provided by electronic scholarly journals identified in the test include:

- How to inform users of the existence and features of useful electronic journal. The faculty interviewed on this topic listed multiple ways this could be done, such as posting notes in the print journals stacks, having access to a web page maintained by the library, and having links from the online catalog to the journal web site.
- How to relate these journals to other information sources;
- The kinds of training faculty, students and staff need to effectively search, view, download, print and/or manipulate information from the electronic journals;
- How to give users information they need before going to a journal's web page, such as the latest issue or article posted, and what software they will need to print or download what they want.
- How to make electronic journals time-saving for faculty.

Many features predicted to take advantage of current technologies have not been implemented in full production, such as the ability to manipulate data or rotate molecules. Other features unique to the electronic environment have been implemented or are under development. Some of these will lead to more

effective and integrated use of electronic journals by researchers. For example, the American Mathematical Society has created hyperlinks between their electronic journals and MathSciNet. The Journal of Biological Chemistry has hyperlinks from cited references to other electronic journals. It is important for libraries to encourage these useful developments.

Conclusions

We have a lot more to learn about the ways faculty and students use electronic journals and how the library can make that use easier and more effective. However, the web journals test was a valuable step in understanding the issues. Through this work, we were able to have some influence on the ways publishers and vendors set up their dissemination systems. There were many changes in publishers and vendors plans over the course of the year, some in direct response to questionnaires or meetings with the library staff from Dartmouth and elsewhere. Although many publishers are establishing their own search systems for their journals, more of these publishers are also being convinced to join with vendors who are promising to provide ordering and searching services for their electronic titles.

From this experience, it is clear that the various players in the electronic journals matrix are very interdependent. Publishers, vendors, librarians, and creators and users of the information all want to benefit from the opportunities of electronic publishing. Publishers and vendors are listening more closely than ever to the input from their clients, both librarians and end-users. This gives libraries a good opportunity to influence the development of the systems and services for providing access to electronic journals.

Acknowledgements

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