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## Scholarly Communication: A Journey from Print to Web

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## Scholarly Communication: A Journey from Print to Web

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### Introduction

Nobel Prize recipient Joshua Lederberg made a speech in 1991 entitled "Communication as the Root of Scientific Progress" (Lederberg 1993). In this speech, he indicated the significance of scholarly literature, scholarly publishing, and scholarly communication for the progress of science. The new information resulting from modern scientific research led to the development of a "knowledge society." For a knowledge society, knowledge generated through research is a critical national resource. It is not enough to focus on the generation of knowledge. It is equally essential to spread and share it. The system of scholarly communication consists of the generation of knowledge and the means to share and communicate it. The concept of scholarly communication (SC) can be seen in ancient cultures such as the Greeks, although it was not known by that name and clear distinctions between formal and informal communication did not exist (Feather and Sturges 2003). In Western Europe, scholarly communication was primarily a product of universities and this is now established worldwide. The term "scholarly" is generally used in the academic domain, especially higher education, for activities that entail research or investigation. Scholarly communication is generally used to describe how research is communicated among peers and evaluated.

### Definitions from the Literature

There is no single definition of the term "scholarly communication." It is sometimes narrowly defined to include only the peer-reviewed literature published upon completion of research (Rowlands, Nichols, and Huntington 2004) but a broader definition includes all communication among peers (Harnad 1995). Borgman (2000) describes scholarly communication as "the study of how scholars in any field (e.g. physical, biological, social and behavioural sciences, humanities and technology) use and disseminate information through formal and informal channels. The study of scholarly communication includes the growth of scholarly information, the relationships among research areas and disciplines, the information needs and uses of individual user groups, and the relationships among formal and informal methods of communication." University College London (n.d.) states that, "scholarly communication is the method and route by which academic information is passed from author to reader, via various intermediaries such as libraries and publishers." Scholarly communication can be seen as a process in which research results are made available through publication and preservation. Computer mediated communication (CMC) has redefined scholarly communication. The CMC literature explores how computer networks are used to communicate, independent of print journals (Peek and Pomerantz 1998). Scholarly electronic communication includes the distribution of articles, research papers, and messages by electronic means as opposed to their distribution in print. Lyman and Chodorow (1998) assert that scholarly communication originated when information technology became more prominent in scholarly research. They observe that scholarly communication is a term "invented to frame both print publication and digital communication within a single functional schema." ACRL (2004) defines scholarly communication as "the system through which research and other scholarly writings are created, evaluated for quality, disseminated to the

scholarly community, and preserved for future use. The system includes both formal means of communication, such as publication in peer-reviewed journals, and informal channels, such as electronic listservs”

### **Means of Scholarly Communication**

Communication through informal means includes face-to-face discussion, exchange of personal communication, sharing views, opinions, etc. The term “invisible college” is sometimes used to describe this informal communication network (de Solla Price 1963). The channels established are fast and easy. New researchers may lack this informal network. Formal communication uses public and permanent vehicles such as books, journals and monographs. The advantages of formal channels are:

- information can be disseminated to a widely scattered group of readers;
- detailed information, such as descriptions of methods, tables, diagrams, results etc. can easily be given;
- printed documents contain information which can be critically examined and verified;
- the documents can easily be referred to as and when required; and
- published documents provide a means for establishing "priority" of academic work, and thereby contribute to establishing academic merit for the author(s).

Formal scholarly communication can research articles, letters, memos, conferences, technical reports, monographs, edited books, and so on. Scholarly electronic communication uses a number of genres. Kling and Callahan (2003) categorise them as:

- social and socio-technical research literature like journals, research monographs, specialized research conference;
- technological research literature which includes analytical examination of technological standards and design strategies;
- practitioner literature (professional writing) where primary audience includes publishers, librarians, academic administrators and faculty who may publish in e-media, organize electronic collections, evaluate such electronic publications; and
- scholarly electronic forums.

The primary scholarly literature is social and socio-technical research literature, especially journals, which provide the most up-to-date, advanced, and peer-reviewed information. The web has changed journal publishing. Scientists are being encouraged to take electronic journals seriously as an opportunity for faster, more accessible and even less costly communication. As print journals have been replaced with the electronic version, most publishers have accepted this model of scholarly communication.

### **First Phase of Change in Journal Publishing: From Print to Electronic**

Some three hundred and forty years ago, there were only two scholarly journals in existence. They were *Journal des Scavans*, first published January 5th, 1665 in Paris, and *Philosophical Transactions of the Royal Society*, first published March 6th of that same year, in England (Fjallbrant 1997). These journals contained not papers read at the meetings of the society but also reviews of scientific. Print journals as a means of scholarly communication dominated for some two hundred years. Beginning in the 20th century, journals have proliferated, which has overwhelmed university libraries. The major portion of library budgets is allocated to journals. Now, scholarly communities are using the web to improve the communication of research articles by using web-based e-journals. The development of the web allowed the creation of sophisticated e-journal models. The development of early electronic journals, which were ASCII text-based, struggled to keep pace with technology (McKnight 1993). The pace of change is shown by the long curve of print journals, starting in 1665, compared with the 20 years

from the creation of the concept of the e-journal to the beginning of the web-based model (Senders 1977).

Harrassowitz (n.d.) explicitly defines electronic journals as "serial publications available in digital format. Some are distributed on CD-ROMs, some over the Internet. Of the Internet-available ones, some are delivered over the World Wide Web, some by e-mail. Some are ASCII texts, some are HTML WWW pages; some use proprietary formats such as Adobe's PDF (portable document format). Some have paper equivalents, some are purely electronic. Some are published in electronic form; some are digitally reformatted print journals. Some are free; some are available by subscription only. Some are peer-reviewed scholarly journals; many are not quality-controlled."

### **Varieties of Electronic Journals**

There are two distinct eras of e-journal development: ASCII text-based pre-web era and graphics-enabled post-web era. In the pre-web era, these ASCII text based e-journals appeared in four different forms: newsletters, non-refereed e-journals, refereed e-journals, and tailored and structured journals (Peek and Pomerantz 1998). With the arrival of the web, e-journals in all disciplines have proliferated, finding widespread, enthusiastic acceptance by end users. Some electronic publications replicate existing print publications; others exist only in electronic form. Kling and McKim (1997) have distinguished at least four kinds of e-journals in the post-web era. They are:

- Pure e-journals which are originally distributed only in digital form e.g. *Electronic Journal of Communication, Journal of Digital Information, Information Research*.
- E-p journals which are primarily distributed electronically, but may have very limited distribution in paper form. e.g. *Journal of Artificial Intelligence Research, Electronic Transactions on Artificial Intelligence*.
- P-e journals which are primarily distributed in paper form, but are also distributed electronically. E.g. *Nature, Science, Physical Review*.
- P+e journals which are initiated with parallel paper and electronic editions that may be widely distributed. e.g. *Organic Letters*.

### **Some Issues with e-Journals**

#### **Speed of Publication**

E-journals can be published more quickly, which overcomes the delays experienced with print publications. Peek and Pomerantz (1998) pointed out that delay in getting scholarly works to print detracts from its usefulness as a vehicle for disseminating research. One reason for the delay is the "backlog effect," in which a fixed number of pages per year can be published.

In the electronic era, authors submit their manuscripts through e-mail. After submission, the time required for editing manuscripts remains the same for both electronic and print journals, e-journal manuscripts require less time in the formatting process. Formatting ASCII-based text files required less time than complex SGML-coded files, but still less than the time required for print. Including graphics, sounds, or animation in text requires considerable time but the product is more interactive than a print journal. Some e-journals publish articles as they are accepted, but others bundle articles together as an issue.

#### **Availability of Hyperlink**

The availability of hyperlinks to related resources in the articles is another important feature of e-journals. Hyperlinks have been compared to traditional citations, although they are more convenient. Links may disappear or change over time.

## **Interactivity**

Web-based e-journals offer features that print journals lack. Article length is not important. Also in e-journals the length of an article is not important. E-journals can use comments and discussion lists to encourage immediate feedback. Some provide a customized alert service, and post citations to related articles.

## **Accessing and Searching Facility**

Immediate access to contents is a major advantage of e-journals. Commercial publishers have adopted various models for delivering content. Wells (1999) lists a number of models:

### **Traditional Subscription or Site Licensing**

Remote users can access a journal by using a site license. The IP address of remote computers are recognized by the journal server. Most libraries prefer this model and have put pressure on providers to use it.

### **Priority Charges**

Some publishers allow immediate online access to current issues for a fee, with older content available immediately. The delay in access for new issues ranges from a few months to years.

### **Pay-per-view**

The concept of pay-per-view focuses more on individual papers than on a journal as a collection of papers. Users can choose only relevant content and pay for it.

These models are attractive for countries where the cost of airfreight is very high and print editions take a long time to arrive, but they can also limit access to e-journals from off-campus, even for readers with Internet access. Institutions in developing countries, which may lack infrastructure and have slow or limited Internet connectivity face even greater problems.

Searching for articles can be done in several ways, including searching the journal's website using a specially-developed crawler, or using Internet search engines. The first method scores higher in precision while the second is better in recall. Most electronic content is also available through commercial databases and aggregators such as Dialog, LexisNexis, Ebsco, etc. The content of those databases is often not discovered with a web search using Google or another search engine.

## **Archiving**

Printed journal issues remain accessible even if a publication ceases or a subscription is cancelled; however, continuing accessibility can be a problem with e-journals. The huge increase in electronic content in the past ten years compounds the problem. The amount of web space required and the need to maintain archives is an issue for publishers and for libraries.

## **Plagiarism**

Plagiarism can be a problem for both print and e-journals, but it is more acute with e-journals because of the ease of copying and pasting in an electronic document. Plagiarism can be avoided by following the guidelines in style manuals, and there are a number of software packages that help detect plagiarism.

## **Cost**

There was a belief that switching from paper to electronic form would decrease the cost of publication, because e-journal costs are mostly those associated with peer-reviewing and copy-editing. Some costs have shifted from editors to authors, because manuscripts are accepted from authors in a specific electronic format. The actual cost of e-journals is in the production, editing, and marketing, as well as the features publishers include in their products (Crawford 1998).

Maintenance is a major cost associated with e-journals. Open access journals incur these costs without support from subscriptions. It is difficult to estimate future costs for maintenance because of the speed at which technology changes.

## **Price**

Price depends on production cost and profit, but the rising prices of some journals puts them beyond the reach of libraries. The result has been cancellations, which decreases access to information. Rising prices may aggravate geographical and also institutional disparities and may widen the “digital divide.”

Publishers and libraries traditionally focused on print. Optional electronic versions of print were priced higher than the print versions, because print copies reach fewer people and can be used by only one person at a time, while electronic copies can easily be reproduced and passed around. The print version was considered primary, and producing an electronic version seemed like an additional cost without matching revenue (Crawford 1998).

## **From Electronic to Open Access (OA) Publishing**

Rising costs and license restrictions have had a negative impact on the ability of libraries to provide students and faculty with resources. The Open Access (OA) movement has had an influence on publishers, causing some to take a look at their pricing and other practices (Bailey 2005). According to Suber (2003), “open-access literature is characterised by two essential properties. First, it is free of charge to everyone. Second, the copyright holder has consented in advance to unrestricted reading, downloading, copying, sharing, storing, printing, searching, linking, and crawling. The first property solves the pricing crisis. The second property solves the permission crisis.” OA seeks to change scholarly publishing so that readers will have unrestricted electronic access to scholarly literature.

## **Definition of OA**

OA has many definitions and approaches, with many supporters and abundant detractors. Wikipedia defines OA as “an ongoing publication practice which differs from the traditional methods of publishing papers, particularly in context of how the papers get submitted, reviewed, authenticated and finally published. The word ‘open’ here means a change in how publication is negotiated between author and publisher and ‘access’ has an inflex on how the audience can obtain the publication” (“Definition of open access,” 2008). Suber (2004) defines OA as “digital, online, free of charge, and free of most copyright and licensing restrictions” whereas, Harnad (2005) defines it as “immediate, permanent, free online access to the full text of all refereed research journal articles.”

A detailed definition is given by Budapest Open Access Initiative (BOAI) and Public Library of Science (PLoS).

BOAI and PLoS both define OA as: “the free availability of literature on the public Internet, permitting any user to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose

without financial, legal, or technical barriers other than those inseparable from gaining access to the Internet itself" (Budapest Open Access Initiative, 2002; Public Library of Science, 2005). The Bethesda Statement on Open Access Publishing and the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities, both from 2003, include the following:

- The author(s) and copyright holder(s) grant(s) to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship, as well as the right to make small number of printed copies for their personal use.
- A complete version of the work and all supplemental materials, including a copy of the permission as stated above, in a suitable standard electronic format is deposited immediately upon initial publication in at least one online repository that is supported by an academic institution, scholarly society, government agency, or other well-established organization that seeks to enable open access, unrestricted distribution, interoperability, and long-term archiving (for the biomedical sciences, PubMed Central is such a repository).

(Bethesda Statement on Open Access Publishing, 2003; Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities, 2003)

## Types of OA

The concept of OA has existed since the 1990s, when Harnad (1999) made his "subversive proposal." His proposal was to place scholarly pre-prints in open archives, along with post-prints of peer-reviewed published articles. This would cause publishers to have to stop charging subscription fees, for which they would have to substitute page charges or other subsidies. This proposal, while controversial, resulted in the basic principles of OA. There are presently two main OA strategies: self-archiving and open access journals, the "green" and "gold" strategies. A green publisher (or journal) has gives the green light to authors to self-archive their papers in an open-access repository. A majority of publishers now permit authors to post articles in these repositories. A gold publisher not only gives the green light to self-archiving, but archives all articles publicly on the journal website. Publishers may be delayed, partial, or purely OA (Willinsky 2003).

Funding for OA publishing and archiving is a serious question. Models include "author pays," in which authors pay charges, which may be part of a grant budget, to publish the results of research. Fees from publishers like Public Library of Science (PLoS) and BioMed Central range from \$525 to \$1500 (Regazzi, 2004). Purely OA journals charge no author fees. These journals are supported by grant funding or a subsidy from the institution for staff and infrastructure. Less than 20 percent of journals in the Directory of Open Access Journals (DOAJ) are author pay, and 28 percent are online versions of print journals. Societies, government institutions or universities typically subsidize the remaining titles (Regazzi, 2004).

Along with green and gold, there are some other colours in OA publishing. ACRL (2004) uses the following codes:

1. Open Access Journals (OA Journals , color code: green): These journals provide free access to all articles and utilize a form of licensing that puts minimal restrictions on the use of articles, such as the Creative Commons Attribution License.
2. Free Access Journals (FA Journals , color code: cyan): These journals provide free access to all articles and utilize a variety of copyright statements (e.g., the journal copyright statement may grant liberal educational copying provisions), but they do not use a Creative Commons Attribution License or similar license.

3. Embargoed Access Journals (EA Journals , color code: yellow): These journals provide free access to all articles after a specified embargo period and typically utilize conventional copyright statements
4. Partial Access Journals (PA journals , color code: orange): These journals provide free access to selected articles and typically utilize conventional copyright statements.

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