

Using a Tetradic Network Technique and a Transaction Cost Economic Analysis to Illustrate an Economic Model for an Open-Access Medical Journal

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Abstract: There is a crisis in scholarly publishing. The value of the scholarly information is frequently much less than the cost of providing that information. Consequently, libraries are suffering and scholars do not have access to information that they need. However, certain for-profit publishers and scientific societies are benefiting substantially from the current system. The Internet has demonstrated the potential to change this structure. The Budapest, Berlin and Bethesda initiatives show there is significant worldwide interest to replace the current controlled system with one that allows open-access of scholarly information to anyone with Internet access. An examination of the scholarly publishing process is offered using a Tetradic Network Technique (TNT) and a Transaction Cost Economic (TCE) analysis as applied to a traditional subscription-based, print medical journal, Medical Physics, and a web-based, open-access medical journal, the Journal of Applied Clinical Medical Physics. The analysis identifies stakeholders and considers transaction and production costs. TCE analysis is performed between each of the following: Libraries, Scholars, Publishers and Societies, for a total of six transaction exchanges for both the traditional and the open-access journal. This analysis allows production costs to be compared more easily between the two types of journals, and provides the basis for a model online journal proforma. Results demonstrate that while production costs remain approximately equivalent for the traditional and open-access journal, total transaction costs are reduced by a factor of between 5 and 10. While the cost of producing an eight page article in a traditional medical journal is approximately \$2500, the cost of publishing the same article in an open-access journal is less than \$500. Recommendations are offered that illustrate how an open-access online journal may be produced by a University for little more than the cost of several library subscriptions and electronic storage. Universities may therefore benefit through greater involvement with the scholarly publishing process. There are several considerations and recommendations that one may draw from this investigation. Universities pay for scholarly research, and then pay again to obtain access to published results. University libraries, always a significant cost center, are now in financial crisis. Scientific societies and large publishers gain under the traditional scholarly publication model. The copyright is essential; the one that holds the copyright holds the power in scholarly publishing. Modern open-access initiatives state that scholars should retain copyright and publish online. Universities should require Promotion and Tenure Committees to give equal weight to open-access publications. Universities should go into the publishing business with scientific societies and control dissemination of scholarly knowledge for the public good.

I. Introduction: Understanding the Crisis in Scholarly Publishing

Over the past 20 years, several trends in scholarly publishing have served to limit access by scholars to scientific and clinical investigations. However, a revolution has formed that has the potential to reverse that trend in a dramatic way. Since the word “revolution” may be used improperly, let us quote from some contemporary thinkers on this term. David Close says in *The Meaning of Revolution*, “...the essential feel of revolution derives from its cataclysmic quality...it destroys people’s security and unsettles their convictions.” Thomas Kuhn says in *The Structure of Scientific Revolutions* “...the transition from a paradigm in crisis to a new one from which a new tradition can emerge is far from a cumulative process.” A revolution is a new way of thinking about an important issue, concept or problem in human endeavor. Scholarly activity is trusted method of solving human problems, but it is often slow and systematic. By its nature, this activity does not lend itself easily to a revolution.

Scholarly activity can be thought of as the creation of knowledge and evaluation of its action. It encompasses the preservation of information and the transmission of information to others. This communication often includes information about technologies: the economics of technologies, and information about institutions and how they are affected by technology and economics. Publication, or dissemination of knowledge, is an essential component of scholarly activity. Scholars communicate their research and ideas through publication. The academic culture expects publication. Ideas are preserved and identified with the author through publication. The author receives recognition and prestige through scholarly activity. There is sometimes profit for the author (mostly for popular textbooks). Often there is profit for the publisher and/or the owner of the copyright. Sometimes the publisher is a publishing arm of a not-for-profit scientific society. It is also common for the publisher to be a for-profit corporation with offices in many countries. The money and profit associated with access to scholarly information is the source of both a crisis and a revolution to address that crisis.

The Budapest Open-Access Initiative was published and signed by a number of open access publishers on February 14, 2002. According to the Initiative, “The public good is served by worldwide electronic distribution of the peer-reviewed journal literature with completely free and unrestricted access. Any user can read, download, copy, print, search or link to the full text of any open-access article. Authors retain the copyright of their articles.” The Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities was signed on October 20, 2003. According to the Declaration, “The author(s) and right holder(s) of such contributions grant(s) to all users a free, irrevocable, worldwide, 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 (community standards, will continue to provide the mechanism for enforcement of proper attribution and responsible use of the published work, as they do now), as well as the right to make small numbers 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 an appropriate standard electronic format is deposited (and thus published) in at least one online repository using suitable technical standards (such as the Open Archive definitions) that is supported and maintained by an academic institution, scholarly society, government agency, or other well-established organization that seeks to enable open access, unrestricted distribution, inter operability, and long-term archiving.”¹ Clearly, the lines have been drawn for a protracted battle between for-profit publishing interests and those that would make scholarly research freely available.

II Research: Economic Models of Scholarly Journals

There are significant problems with traditional scholarly print journals. Today, it is common for the price of access to information to be too high, and the value to be too low. There is a long lag time between authorship, peer-review, publication and dissemination. It is most common for the author to lose ownership, copyright, other property rights and control over the information. Unfortunately, these problems are not recognized as public policy issues. Public policy is important because access to print journal information has traditionally been through publicly funded libraries, and libraries are in a long, downward crisis. Open-access journals have a different set of issues to address. Funding for the journal is often problematic because of the lack of subscription revenue. In particular, the loss of revenue from library subscriptions can be significant. Advertising revenue for the banner ads is usually only a small fraction of print advertising revenue. Open-access journals derive little or no income from reprints or royalties.

It is instructive at this point to evaluate the source of funding for scholarly activity, and follow the money through the publication process for a traditional print journal. Universities pay scholars, usually through income derived from governmental grants, grants from non-profit and for-profit corporations, tuition, fund-raising, corporate participation, etc. In many cases, the majority of funding for scholarly activities comes from public sources. Scholars produce scholarly articles, and then universities pay again for their libraries and scholars to have access to these scholarly articles. The control of academic publication is dominated by a small number of profit-driven commercial publishers.

Since most for-profit publishers provide on-line access to their articles, it is instructive to see how access restrictions have changed the traditional library model. On-line access is critical to modern scholarship, since most articles are searched and viewed online and may never actually be printed on paper. Online access to full-text archives is therefore an essential feature for modern dissemination of scholarly articles. For-profit commercial publishers are moving to monopolize online access to scholarly articles. They offer scholarly societies money and funding for projects in return for exclusive rights to the online access of their scholarly articles. If scholarly work is protected by copyright, preventing access, this restricts the influence and reach of scholars' ideas. When scholars give up copyright to creative work, they have no say about how their research is disseminated and priced. In fact, scientific societies are undermining their mission of

providing the widest possible distribution of their members' research by making deals with for-profit publishers.

Today, western libraries cannot keep pace with costs, and libraries in the developing world cannot pay for journals at all. In general, the financial returns offered to the societies are small compared to the subscription revenue from libraries and subscribers. While returns to societies are initially significant, they tend to increase little over time, if at all. On the other hand, subscription costs are out of control. Scholars and universities are both the producers and consumers of scholarly articles; ultimately both pay for these articles twice – once when they are produced, and once again to access the information. Universities, funding agencies, government and the public subsidize the research and authorship. Commercial publishers gain large profits through institutional subscriptions by selling that same content back to the scholars that produced it. These profits are diverted out of scientific activities into unrelated businesses, executive compensation, and to financing corporate mergers or takeovers.

While the library may look the same as it did 10 years ago, and may have most of the same print journals and books on the shelves, today a critical difference had changed the very meaning of what is a library. When a library subscribes to an electronic version of a journal, the library does not own the electronic archive in the same way it owned a print archive. Instead, the publisher decided who might view, copy and distribute the contents of the journal. Access to content is restricted to library users who are authorized by the publisher, not anyone who may walk in the door. When scholars sign away copyright, they inhibit dissemination of their work, and readers are prevented from accessing that work through high cost or lack of authorization.

At this point, let us evaluate the source of funding for scholarly activity, and follow the money through the publication process for an open-access journal. Universities pay scholars, usually through income derived from governmental grants, grants from non-profit and for-profit corporations, tuition, fund-raising, corporate participation, etc. In many cases, the majority of funding for scholarly activities again comes from public sources. Scholars produce scholarly articles and retain the copyright. Scientific societies or universities provide the journal articles to the worldwide community without cost. Libraries pay only to provide access for scholars to access articles that are otherwise freely available.

III Analysis: Understanding the Process for Production/Dissemination of Scholarly Publications

By analyzing the scholarly publication process, we can predict the future direction of academic publishing. If the analysis is correct, it may indicate a viable alternative to the traditional publication model. Each division of academic inquiry may have differences in resources, production and marketing. What works for one discipline may not work for another discipline. However, some costs are relatively consistent regardless of field of inquiry.

An interesting example is a comparison of economic models of journals published by the American Association of Physicists in Medicine (AAPM) and the American College of Medical Physics (ACMP). The AAPM publishes *Medical Physics* (Med Phys), through a not-for-profit publisher, the American Institute of Physics (AIP), of Melville, New York, USA. The ACMP publishes the *Journal of Applied Clinical Medical Physics* (JACMP) with Multimed, Inc. of Milton, Ontario, Canada. Although these journals do not compete directly, there is some overlap of content and both journals serve the same professional and academic community.

Cost, revenue and profit information is reported in United States dollars throughout this article. Reporting of cost and revenue is approximate, but within 20 percent of actual dollar values and serves to illustrate the model. Medical Physics and the JACMP experience almost identical publication costs. A copy editor will charge \$30 – \$50 per hour, or \$150 - \$300 per article. A layout editor will charge \$800 - \$1,200 per issue while a proofreader will cost \$600 - \$1,000 per issue. For a large journal, there may be some cost to support the office of the Editor-in-Chief; for Medical Physics that cost approaches \$100 per article. For a smaller journal such as the JACMP, this cost may be donated by the university. While production costs dominate the cost model for the open-access JACMP, they represent only a fraction of the total cost of the traditional print journal, Medical Physics.

Revenue for Medical Physics includes \$800 K for advertising, \$800 K for library subscriptions, \$200 K for member subscriptions, and \$200 K for other revenue, such as reprints, royalties, and etc. Total revenue for Medical Physics is approximately \$2 million. Total revenue for the JACMP is two orders of magnitude lower, at \$24 K, from online banner advertising.

The expense model for Medical physics includes \$200 K for editorial and business management, \$100 K for society overhead and taxes, \$300 K for printing and mailing, \$300 K for printing and mailing, \$300 K in paid advertising commissioning to the American Institute of Physics Publishing, \$200 K in publisher expenses (print), and \$100 K for publisher expenses (online). Profit for medical Physics is \$800K. For the JACMP, the expense model includes \$20 K for online publisher expenses with a resulting profit of \$4 K.

Medical Physics published 450 articles in 2006, while the JACMP published 40 articles. Medical Physics enjoyed \$4500 in revenue per article, a \$2,700 cost per article and a profit of \$1,800 per article, last year. The JACMP experienced revenue of \$500 per article, a cost of \$400 per article and a profit of \$100 per article in 2006.

By analyzing the scholar publication process and accounting for additional costs in the system, we may be able to predict the future direction of academic publishing. If the analysis is correct, it may indicate a viable alternative to the traditional publication model. The Tetradic Network Technique, developed by Judah Thornewell, is used for analysis.

The Tetradic Network Technique views the world as a tetrahedral (four component) complex adaptive network (TCAN). Each component can also be analyzed as a TCAN – four components making up one component of a larger TCAN. The process can continue indefinitely, until the level of precision is reached for the analysis to have the desired result: 4X, 16X, 64X and 256X...

Starting at the top and reading clockwise, the Tetradic Network Technique model begins with Purpose, Inputs, Processes, and Outputs. For the scholarly publication model, the nodes become Libraries (dissemination of scholarly information), Scholars (input research), Societies (process and validate research), and Publishers (output research). It is important to understand at this point that each of these entities interacts with one-another and that costs are associated with these interactions. Transaction costs increase the cost of distribution of scholarly information. If these costs could be lowered, everyone would win.

The stakeholders in this endeavor include libraries, scholars, scientific societies, not-for-profit publishers, for-profit publishers, universities and advertisers. The shared purpose of all these is the dissemination of scholarly information, but clearly there is basic disagreement on what model best serves the public interest. The key is to begin with the scholars. Scholarly work drives the process, and their interests and visions, to advance scientific knowledge and disseminate that knowledge, are most closely aligned with the public interest. Scientific societies also exist for the same reason, but have interests to preserve their role as the gatekeeper for that knowledge that matters. As such, it is often in their interest to restrict access to publication and to discount any knowledge that bypasses their purview. However, scientific societies are far from ideal entities in this respect. Any type of scientific revolution, by definition, is a significant shift from the existing paradigm. It is clearly in the public interest for revolutionary scientific perspectives to be debated in open forum. Equally clear is that dissent from traditional perspectives should not be dismissed without vigorous debate. Perspectives that are not revolutionary, but do not follow an accepted line of interpretation may also find barriers to publication. The real question is that if open access publishing became the norm, would the role of scientific societies change. The answer is most likely that scientific societies would need to do their work more carefully and honestly to maintain status, as dismissed or rejected scholarly work will not be so easily controlled. However, the stream of money that flows back to societies from publishers would likely dry up; herein lays the most important conflict with the public interest.

Publishers, even so called not-for-profit publishers, are in business for the bottom line. They profit by marketing the scholarly work and selling it back to the scholars that produced it. Usually some portion of the dues for membership supports the society's journal, even if the journal is highly profitable. Library subscriptions may run in the thousands. Advertising for drugs, devices or scientific apparatus may also contribute to the journal's bottom line. The society and publisher are at the focal point of restricting transactions and driving up the cost: (a) restriction of some scholarly work from publication, (b) restriction of public access to scholarly work that is published, (c)

restriction of advertisers to their market of scholars, and (d) restriction of open-access publishing alternatives through intimidation, value depreciation, and economic warfare.

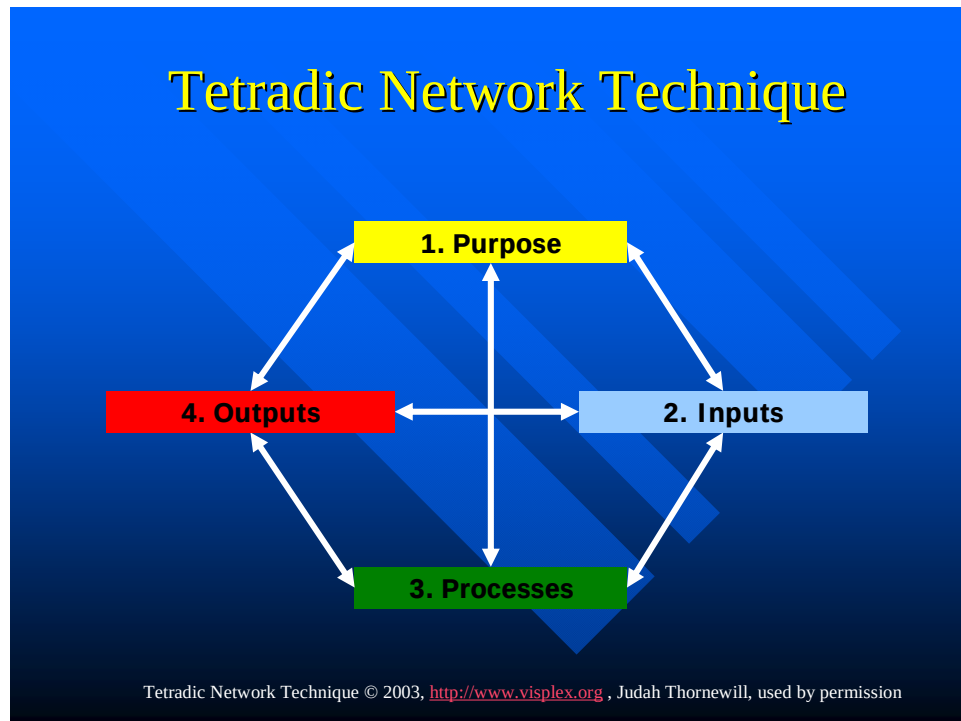


Figure 1 Scholarly Publishing Transactions

Assume a typical traditional print journal publishes 200 articles per year while a typical open-access journal publishes 200 articles per year. Assume an average scientific society has a membership of 2,000 scholars, each reading 10% of the articles. Assume 500 libraries each serving 10,000 scholars subscribe to the print journal and each library copy is read by four scholars, who also read 10% of the articles.

For this analysis, the transaction is normalized to one article-reader, i.e., the transaction cost associated with a single reader reading one article. This cost will vary with venue: the scholar has access to a university library where the article is archived; the scholar is a member of a scientific society which publishes the journal article received by the scholar; the scholar must acquire the journal article directly from the publisher.

Transaction costs for print versus open access electronic articles may be estimated as follows:

T 1-2 Print – The Library pays \$ 1000 to subscribe to the journal. If the Library serves four scholars that read the journal but do not subscribe to it, that is equivalent to a cost of \$ 250.00 per scholar. Each article-reader “pays” \$250.00 to read 20 articles. This transaction could be viewed as a “benefit” of employment by the University. This cost might be reflected in lower salaries to scholars in order to support the library. Each

scholar therefore “pays” \$12.50 to read an article in the Library, so the transaction cost is \$12.50 per article-reader.

T 1-2 Open-access – A library must provide electronic access for scholars to research articles. Space, computers, and Internet access are required for scholars to access open-access articles. This cost may be estimated at \$10 per year per scholar. The open-access scholarly journal publishes 200 articles per year. Four scholars access the journal and read 20 articles per year in the journal. The transaction cost is \$ 0.50 per article reader.

T 2-3 Print – Scholars are members of scientific societies, and pay dues to that society that publishes papers in which they are most interested. Typically the journal will publish 200 articles per year and charge the scholar \$200.00 for a one year mailed print subscription. The scholar reads 10% or 20 articles per year. This works out to \$ 10.00 per article-reader.

T 2-3 Open-access – Scholars have open access to the articles published by the society. The scholar may use his own computer, a library computer or a commercial computer. There is a cost of \$10.00 per year for a scholar to read 20 open-access articles. This works out to \$ 0.50 per article-reader.

T 3-4 Print – A typical print journal of 200 articles per year, with revenue from advertisers, subscribers and libraries, will generate approximately \$500,000 per year in revenue. This represents revenue of approximately \$ 2,500 per new article. Assume 2000 subscribers, 500 libraries and $4 \times 500 = 2,000$ library-readers for a total readership of 4000, each reading 20 articles per year. Advertising cost is $\$ 500,000 / 4000 \times 20$, or \$6.25 per article-reader.

T 3-4 Open access – Advertising revenue from banner ads is a small fraction of print advertising, while subscription revenue does not exist. Revenue to the society may be \$100,000 or \$500 per new article. Assuming that article is read by 4000 scholars, the cost is $\$ 100,000 / 4000 \times 20 = \1.25 per article-reader.

T 4-1 Print – Publishers will pay \$50,000 per year to print and mail 200 articles to 500 libraries and $4 \times 500 = 2000$ scholars. Each scholar reads 20 articles. Total cost per article-reader is $\$ 50,000 / 2000 \times 20 = \1.25

T 4-1 Open-access – Libraries receive open access articles without cost, except for the cost of providing on-site Internet access to the articles. Publishers and libraries must provide internet access for 2000 scholars, each reading 20 articles per year. Assume the total cost of this is \$10.00 per scholar per year, or \$20,000; this equates to a transaction cost of \$ 0.50 per article-reader.

T 2-4 Print – Publishers will pay \$ 200,000 to print and mail 200 articles to 2000 scholars each year. Each scholar reads 20 articles. The transaction cost per article-reader is $\$ 200,000 / 2000 \times 20 = \$ 5.00$

T 2-4 Open-access – Scholars that do not subscribe to the journal and do not have library access will need to rent time on a computer to print out an article. That cost is estimated at \$1.00 per article-reader.

T 1-3 Print – Scientific societies sell subscriptions directly to libraries. Assume the Library pays \$ 1000 per year to acquire 200 articles and that four scholars read 10% of these articles. The transaction cost is $\$ 1000 / 4 \times 20 = \$ 12.50$ per article-reader.

T 1-3 Open-access – Scientific societies make scholarly publications available without cost, except for the University's cost to provide Internet access to the articles. Assume the cost to connect to the Internet and access the Society is \$10.00 per scholar per year. Assume 4 scholars each read 20 articles per year from the open-access journal. The Transaction cost is \$0.50 per article-reader.

These transaction costs are summarized in Figures 2 and 3.

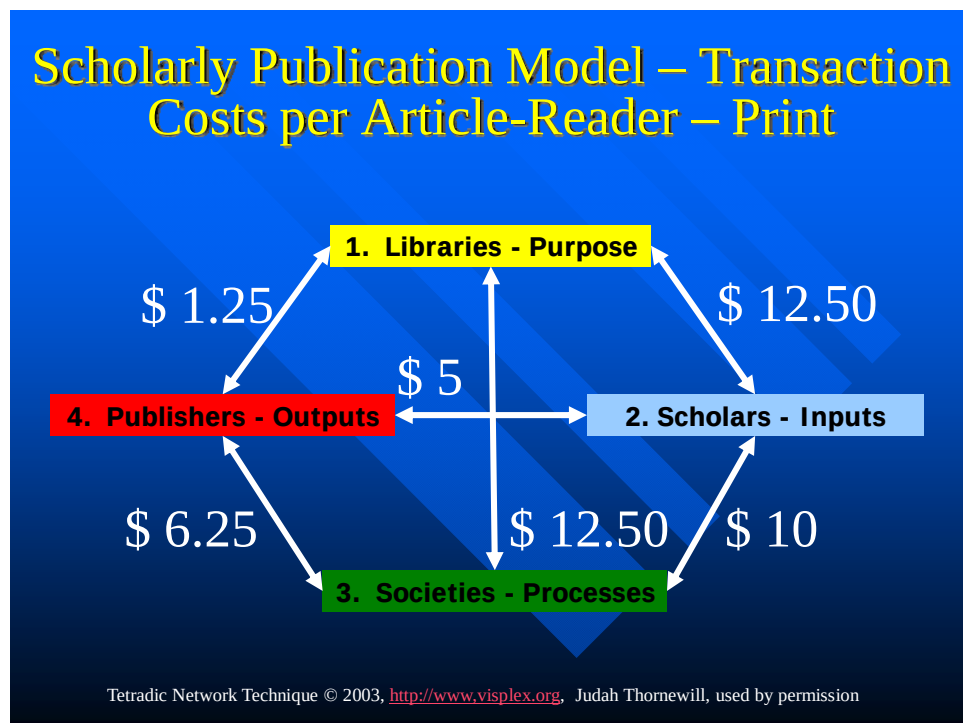


Figure 2 Scholarly Publication Model – Transaction Costs per Article-Reader – Print

Scholarly Publication Model – Transaction Costs per Article-Reader – Open-Access

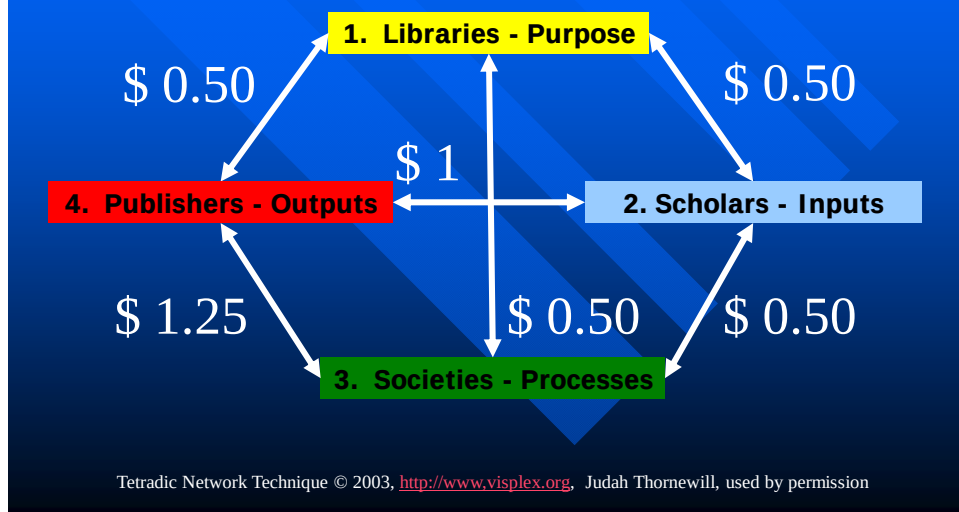


Figure 3 Scholarly Publication Model – Transaction Costs per Article-Reader – Open-Access

Transaction	Cost/Article Print	Cost/Article Open-Access	Factor
Libraries – Scholars	\$ 12.50	\$ 0.50	25
Scholars – Societies	\$ 10.00	\$ 0.50	20
Societies – Publishers	\$ 6.25	\$ 1.25	5
Publishers – Libraries	\$ 1.25	\$ 0.50	2.5
Publishers – Scholars	\$ 5.00	\$ 1.00	5
Libraries – Societies	\$ 12.50	\$ 0.50	25

Table I Transaction Cost per Article-Reader

Transaction	Scholars	Articles	Cost	Total
T 1-2	2000	20	\$12.50	\$ 500 K
T 2-3	2000	20	\$10.00	\$ 400 K
T 3-4	4000	20	\$6.25	\$ 500 K
T 1-4	2000	20	\$1.25	\$ 50 K
T 2-4	2000	20	\$5.00	\$ 200 K
T 1-3	2000	20	\$12.50	\$ 500 K
Total Transaction Cost – 250 Print Articles				\$ 2.15 M

Table II – Total Transaction Cost - Print

The factor reduction in transaction costs by transaction is reported in Table I. Tables II and III report total estimated transaction costs for the print and open-access models, respectively.

Transactions	Scholars	Articles	Cost	Total
T 1-2	2000	20	\$ 0.50	\$ 20 K
T 2-3	2000	20	\$ 0.50	\$ 20 K
T 3-4	4000	20	\$ 1.25	\$ 100 K
T 1-4	2000	20	\$ 0.50	\$ 20 K
T 2-4	2000	20	\$ 1.00	\$ 20 K
T 1-3	2000	20	\$ 0.50	\$ 20 K
Total Transaction Cost - 100 Open-Access articles				\$ 200 K

Table III – Total Transaction Cost – Open-Access

The transaction cost per article – print model = \$ 2.15 M / 200 articles = \$ 10,750 per article. The transaction cost per article – open-access = \$ 200K / 200 articles = \$ 1,000 per article.

The transaction cost represents the total cost flow from Scholars and Library subscribers and advertisers to Society, to Publisher and to traditional mail and Internet service providers. The transaction cost per article is greater than the total cost per article because the same dollar is counted several times as it moves through the system.

Transaction costs are lowered across the board for open-access journals by factors between 5 and 10. However, scientific societies profit more from traditional journals with high transaction costs and are resisting the open-access alternative. The system has not responded because Universities, scholars and advertisers are not insisting on open-access scholarly exchange and because the benefits of lowered transaction costs are not immediately apparent.

IV Recommendations and Conclusions: Support for an economic model for open access journals

Between the years 2000 and 2003, a highly respected traditional journal publisher provided publishing services for the JACMP. Beginning in 2000, the Editors found there were problems with the model for the JACMP other than cost. Articles were reviewed in PDF format, so tools in Microsoft Word could not be used to mark up or edit articles. In addition, when the article was published, it was available only in PDF format at the Web site. Only the abstract appeared as the result of a Medline search, not the full article. The JACMP was registered in PubMed as a print journal, not an online journal. HTML markup of the full article was not provided by the publisher.

The JACMP left the traditional publisher when the contract expired at the end of 2003 and contracted with a publisher familiar with and friendly to the open-access revolution,

Multimed, Inc. of Milton, Ontario. The change in the cost model moving from the traditional publisher to Multimed is illustrated in Table IV.

Cost Center	Traditional Publisher 2003	Multimed 2006
Editor-in-Chief	\$ 35,000	\$ 0
Platform	25,000	3,000
Markup / Layout	20,000	14,000
QA	5,000	3,000
TOTAL	\$ 85,000	\$ 20,000

Table IV Why Did the ACMP Change the JACMP Publishing Partner?

The current platform for Medical Physics is eJournal Press software running on an Oracle database and Microsoft Windows NT servers. This software requires substantial funds for license fees and support. The lower cost platform identified for the JACMP is Public Knowledge Project (PKP) document peer-review exchange and archiving software, which uses the PHP scripting language and My SQL database running on Linux-Intel servers. All of this software is open source, available without license and freely available for use. In addition, copy-editing will be contracted directly by the ACMP. The ideal model for open access publishing of the JACMP is shown in Table V.

Platform	Independent of
Server (Intel workstation)	Operating system (Linux)
Operating system (Linux)	Application Software (PHP, MySQL, PKP tool)
Application Software	Publishing Partner
Publishing Partner	Scientific Society
Scientific Society	Intellectual property of Scholars

Table V What is the ideal model for open access publishing?

The Public Knowledge Project (PKP) is an initiative of the University of British Columbia, funded by the Canadian Government, to facilitate scholarly exchange of information. The PKP has developed a tool to manage the peer exchange and archive of an online academic journal. The PKP tools are free of cost and fully transportable, if the need arises to change publishers. The PKP is widely known and highly regarded within the open-access publishing community.

There are some lessons that may be learned from the JACMP experience. Commercial publishers may have reasons to offer an incomplete model – one that falls short of a true open-access initiative. If the publisher has or collaborates with a competing product that could be hurt, it may offer a high price along with an incomplete model to protect that competing product. However, low cost methods and publishers are available to provide a quality product at a competitive price. The open-access publication model is a disruptive innovation because of the reduction in transaction costs.

There are several conclusions one may draw from this investigation. Universities pay for scholarly research, and then pay again to obtain access to published results. University libraries, always a significant cost center, are now in financial crisis. Open-access online journals can be completely funded for the cost of several library subscriptions. Scientific societies gain under the traditional scholarly publication model. The copyright is the key – the one that holds the copyright holds the power in scholarly publishing. Modern open-access initiatives state that scholars should retain copyright and publish online in open-access journals. Open-access journals can be completely funded for only a little more than the cost of several library subscriptions and physical storage. Universities should require Promotion and Tenure Committees to give equal weight to open-access publications. Universities should go into the publishing business with scientific societies and control dissemination of scholarly knowledge for the public good. Universities should expect to engage a professional publisher to produce a quality product.

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¹ Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities. Retrieved November 17, 2003. <http://www.zim.mpg.de/openaccess-berlin/berlindeclaration.html>