

# The Crisis in Scholarly Communication: an Economic Analysis

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***Abstract:***

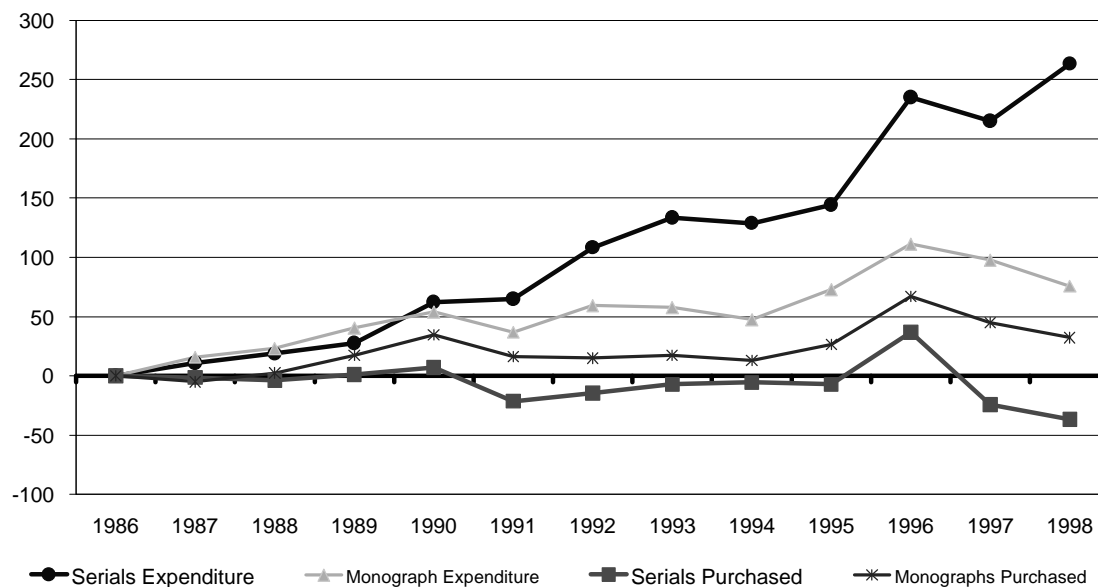
*This paper takes a systems approach to describing and scoping the system of scholarly communication in Australia and exploring the economics that govern it. It examines: the relationships between players in the system; the scope of activities within Australia; the cost and incentive structures underpinning the creation, production and distribution of scholarly content; and the underlying economics of scholarly communication. Brief analyses of some alternative publishing initiatives are included.*

## Background and Context

In the context of the emerging knowledge-based economy, innovation and the capacity of the national innovation system to create *and* disseminate information are becoming increasingly fundamental determinants of national prosperity. Indeed, the OECD observed that prosperity in a knowledge economy depends as much on the knowledge distribution power of the system as its knowledge production power (OECD, 1997). Therefore, an efficient and effective system for scholarly communication is of enormous economic importance.

But there is a 'crisis' in scholarly communication – a 'crisis' born of a combination of fundamental technological change and system dysfunction. Universities and research organisations are under increasing funding pressures, and there is greater focus on the efficient allocation of resources and on achieving demonstrable return on investment in those resources. Not only does this make the cost of access a major issues, it also increases the significance that the producers of the content (eg. authors) and their employers (eg. universities) place on performance indicators (eg. publication and citation). At the same time, the IT revolution is fundamentally changing the ways in which scholarly content can be, and is being created, communicated, packaged, accessed and disseminated.

Figure 1 Australian Academic and Research Libraries' content purchases and expenditures, 1986-98 (Indexed)



Source: CAUL Statistics ([www.caul.edu.au](http://www.caul.edu.au))

Recent years have seen rapid increases in the price of scholarly content – especially journals in the science, technology and medical areas (STM). These increases are significantly above the underlying rate of inflation, and they are exacerbated by the increase in publication output and trend depreciation of the Australian dollar against currencies in which scholarly information resources must be purchased.<sup>1</sup>

Across the sample of Australian Academic and Research Libraries reporting to CAUL, the total number of serials subscriptions declined by around 36 per cent between 1986 and 1998, while total serials expenditures increased by more than 250 per cent. Over that period, the unit cost of serials titles increased by more than 470 per cent (Figure 1). Recent subscriptions

to electronic aggregations has seen a rapid increase in the number of serials titles purchased, but how many would have been purchased individually is unclear. What is clear is that serials expenditures continue to rise, having increased by 15 per cent since 1998 and by more than 300 per cent since 1986 (CAUL Statistics).

The literature examining the issue of journal prices appears divided as to its causes. Some say that commercial publishers have increased their market power and are pushing up prices – ie. abusing their monopoly power (Wyly, 1998) (Hunter, 1998) (Odlyzko, 1998). Others say that the increase in the number of new titles over time lowers the average circulation of journals and thereby raises fixed costs (first copy costs) as a proportion of total costs (King and Tenopir, 2000) (Lieberman and Steinmuller, 1992). In his analysis of biomedical journal titles, Mark McCabe suggested that both might be true. He found that after controlling for the suggested scale economies exhibited by individual titles there remains an unexplained inflation residual, which he attributed to the monopoly power of the large commercial publishers (McCabe, 1998 and 1999).<sup>2</sup>

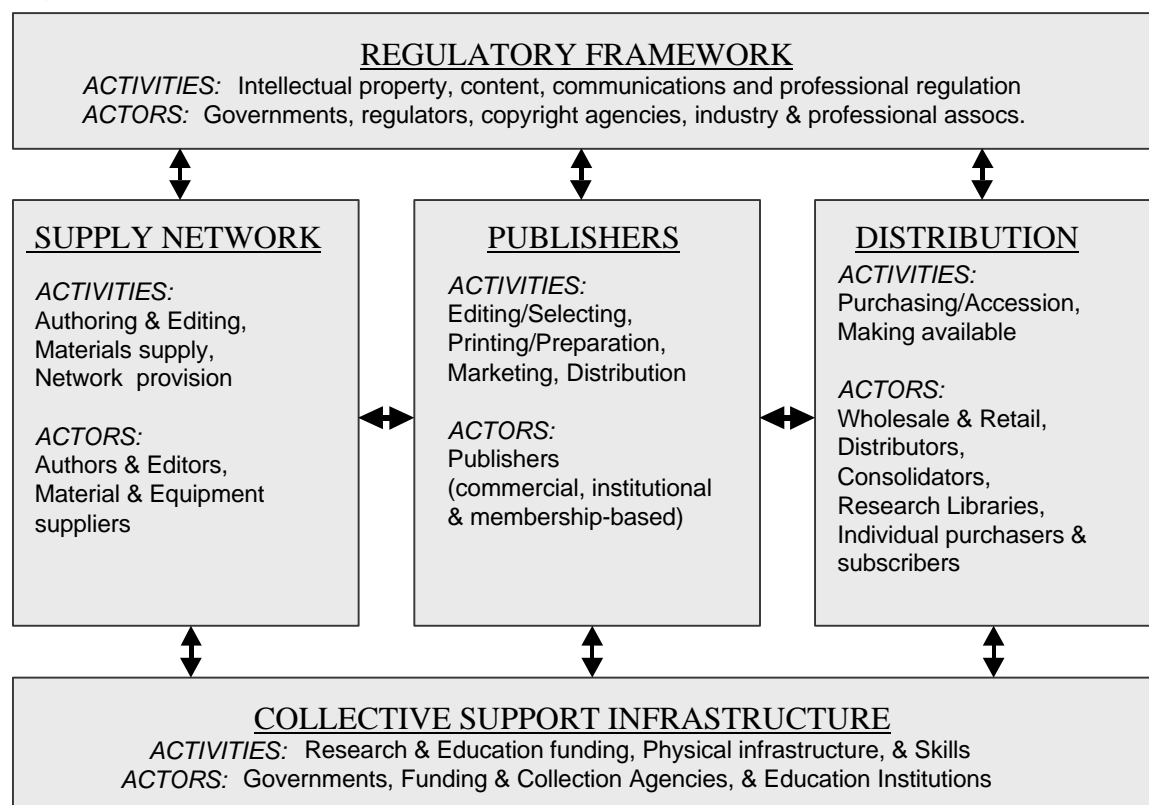
## The Product System Approach

To describe the scholarly communication system we have adopted a 'product system' approach – a recent form of the systems perspective. In the late 1970s, Donald King undertook a number of studies for the United States' National Science Foundation which focused on scientific scholarly journals. These studies pioneered systems analysis in the field of scholarly communication. They identified and characterised the principal functions performed and the participants involved in the scientific journals system, and attempted to quantify the outputs produced and resources used in the system (King et al, 1976) (King and Roderer, 1978) (King and Tenopir, 2000). Our product system approach has many similarities. It is an approach that focuses on linkages between actors in a complex system that affects the transformation of materials and activities into goods and services through the processes of creation, production and distribution. Importantly, it is an approach that enables us to distinguish between, rather than confuse, the economics of each of the key stages in the process (namely, creation, production and distribution) while, at the same time, keeping the entire system in view.

The scholarly communication product system includes five major elements. At the centre are the *publishers* engaged in the production of content-based products and services. These include commercial, institutional and membership-based publishers – such as professional associations. To their left is the *supply network*, which includes the creators of content – authors and editors, and the suppliers of materials and equipment to the printing and publishing industries; and to their right is the *distribution network*, which includes all the clients of publishers, including:

- 'the channel' – wholesalers, retailers, consolidators, aggregators, distribution and subscription agents;
- public and private research libraries, state and national libraries, and document suppliers; and
- individual institutional purchasers and subscribers.

Figure 2 The Scholarly Communication Product System



Source: Houghton, J.W. (2000) *Economics of Scholarly Communication: A Discussion Paper*, prepared for the Coalition for Innovation in Scholarly Communication, Canberra. Available [www.caul.edu.au/cisc](http://www.caul.edu.au/cisc)

These three groups form the core value chain of creation, production and distribution. Their activities are underpinned by a collective support infrastructure, and are subject to an overarching regulatory framework. The *collective support infrastructure* includes: the research and education funding agencies which support the research and education activities that both create and consume scholarly content; and various kinds of infrastructure, including:

- research, education and library infrastructure – such as buildings and equipment,
- information technology infrastructure – including internet, network equipment and services, and
- reproduction rights and collection agencies – such as CAL in Australia; and
- education and training infrastructure – including a range of technical and professional training institutions (eg. library schools).

The *regulatory framework* for scholarly communication includes: intellectual property regulation – such as copyright and licensing; content regulation – such as censorship and privacy; telecommunications and broadcasting regulation; and professional regulation – including professional qualification standards, regulated access to practice as a professional, and professional codes of conduct. Hence, the scholarly communication product system includes all the activities and actors (stakeholders) involved in the creation, production and distribution of scholarly content.

## **The Scholarly Communication 'Industry'**

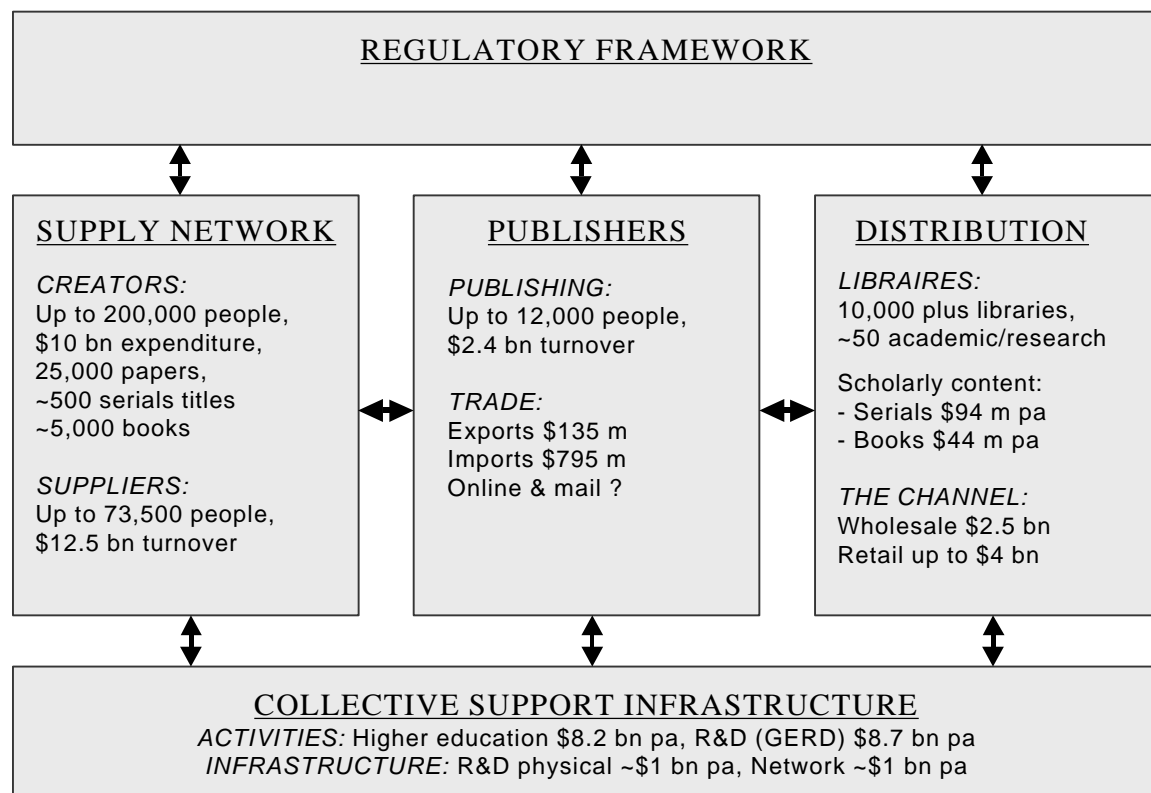
A review of scholarly communication activities undertaken in 2000 suggested that scholarly content creation involves up to 200,000 Australians, whose activities are supported by annual expenditures well in excess of \$10 billion – the vast majority of which comes from government (Houghton, 2000). They produce around 25,000 journal papers and perhaps as many as 5,000 book titles a year. The network of specialist suppliers to the publishing and printing industries in Australia, employs a further 73,500 people and realises annual turnovers in excess of \$12 billion.

Publishing is a global industry. There are a relatively small number of large multinational commercial publishers with significant portfolios of titles, and a very large number of smaller, niche publishers. The publishing industries in Australia employ around 42,000 people, but most of these are in newspaper publishing. There are 6,750 people employed by periodical publishers, and a further 5,400 employed by book publishers. Combined annual periodical and book publishing turnover is around \$2.4 billion a year.

Australia is a net importer of printed materials. During 1999, exports of publications and printed matter from Australia amounted to \$135 million, while imports reached almost \$795 million. Forty per cent of these imports came from the United States, 37 per cent from the United Kingdom, 11 per cent from China (including Hong Kong), and 7 per cent from Singapore. Perhaps \$260 million of these imports could be considered part of the scholarly communication system.

Looking at the distribution network, we find that there are more than 10,000 libraries in Australia, with around 50 being university and other specialist research libraries. Australian university libraries spent \$106 million on journal subscriptions in 2000, and a further \$49 million on books. They pay an additional \$12 to \$15 million per year for photocopying. Specialist research centres, public and corporate research and law libraries may well have spent as much again.

Figure 3 Scholarly Communication in Australia, circa 1999



Source: Houghton, J.W. (2000) *Economics of Scholarly Communication: A Discussion Paper*, prepared for the Coalition for Innovation in Scholarly Communication, Canberra. Available [www.caul.edu.au/cisc](http://www.caul.edu.au/cisc)

Clearly, the scholarly communication product system involves a wide range of activities that are important to the Australian economy; both in terms of their sheer size (reflected in numbers of jobs, revenues realised and financial resources involved), and in terms of the importance of the scholarly communication system as an infrastructure for the knowledge economy (an infrastructure that plays a key role in the communication and dissemination of ideas).

## The Economics of Scholarly Communication

While exploring the economics of scholarly communication, we focus on the incentive and reward structures operating on the various stakeholders involved in the creation, production and distribution of scholarly content. First, some brief remarks on the nature of that content. It is common to draw a distinction between tacit and codified knowledge. Codified knowledge consists of information or ideas that can be written down and transmitted. Tacit knowledge consists of ideas and understandings that are more difficult to acquire and transmit – it resists codification, and remains inherently human. This simple distinction can be used to tease out a key difference between knowledge and information. *Knowledge* (tacit knowledge) is something that is held by people, and is developed through education and learning. *Information* (codified knowledge) is knowledge that has been ordered and written down and it can be transferred in that form. Hence, information can be seen as the product of the act of codification of knowledge. This information is produced by individuals in the

course of earning a living, and by organisations in the course of earning a profit or justifying continued public funding support. There is a cost of production, and (intellectual) property rights exist to give those who create information the opportunity to recoup those costs and thereby an incentive to produce in the first place. Therefore, while it can reasonably be argued that knowledge is a (pure) 'public good', typically, information is not.

Nevertheless, information is, basically, non-rivalrous in consumption. If one person consumes a cheese sandwich, it is gone. No one else can consume it. If, however, one person reads a journal article and gains knowledge from it, the information in the article remains. Any number of people can consume it again. This 'scarcity defying expansiveness of knowledge' (as John Kay has called it) is one of its most important defining features. It means that ideas and information exhibit very different characteristics from the goods and services of the industrial economy. The social value of ideas and information increases to the degree they can be shared with, and used by others. The more such items are communicated the greater the social return on investment in them. Therefore, the social returns on investment in information are maximised through expansion of access and wide dissemination, not by limiting access and exclusion.

It is important to understand what is being produced and where the value lies in the scholarly communication system. Many assume that the product is content. In one sense, of course, it is; but that is not the whole story. Information is an 'experience good'. Until you have bought and consumed the information you do not know its value, and once you have it is too late to decide not to buy it. So, the decision to buy is not made on the basis of the content, directly, but on the basis of other cues. For example, a researcher new to a field might make extensive use of abstracting and key word searching to identify articles to read. More experienced researchers might use other signals, such as: who the authors are, the institutional affiliation of the authors, knowing the work of the editor and editorial board members, the title of the journal, or the brand – the publisher and publishing stable. Because the decision to consume is made in these ways, these things become important sources of value. Content may be king, but authorship, quality control and branding are major determinants of value.<sup>3</sup>

## **The Economics of Content Creation**

There are important, and in some ways highly negative, institutional incentives underpinning the creation of scholarly content. Promotion, tenure, and funding allocations in universities and research institutions are often linked to publication in a few, leading, refereed journals. Scholarly communication and widespread dissemination of scholarship, on the one hand; and publishing in a few key refereed journals for the purposes of funding, promotion and tenure, on the other, are different and increasingly divergent, if not conflicting goals.

Some analysts argue that authors are not simply content originators, suggesting that they drive the information explosion by seeking the most prestigious outlets for their work (Halliday and Oppenheim, 1999). This has led to suggestions that journal subscription prices could be reduced if authors paid to have their work published. Harnad has been one champion of the idea of levying a charge on authors as a payment for the widespread distribution of their work – suggesting the recovery of costs through author submission fees (Harnad, 1996) (Harnad and Hemus, 1997). Variations suggest payments for papers published, or for papers submitted regardless of whether or not they are published, and various mixes of cost recovery through submission and subscription fees (Halliday and Oppenheim, 1999, p.11). For example, the Public Library of Science initiative involves author payments of around \$US300 per published paper to cover handling and refereeing costs.<sup>4</sup>

There are a number of issues arising from the underlying economics of such approaches. Firstly, the public goal in a knowledge-based economy must be to encourage and facilitate the dissemination of information. Clearly, any disincentive to publish goes against that aim. Secondly, it is a fundamental principle of the scholarly publication system that publication should be on the basis of merit alone. Introducing an author payment system introduces the possibility that younger, less established scholars will be disadvantaged relative to those from prestigious institutions who can afford to pay for publication. Any move away from a merit-based system towards even the most selective form of vanity publishing should be treated with caution.

Thirdly, the money payments involved would incur considerable transaction costs. The process might involve individual authors or their employing institutions (who derive status from the publications) raising cheques, commonly in a foreign currency; and publishers collecting, recording, and accounting for all the thousands of relatively small payments. Notwithstanding the growth of collection agencies and systems for micro payments, it is likely that the transaction costs involved would reduce the potential cost savings, and may prove prohibitive.

Fourthly, the implicit assumption that reduced costs would be passed on by publishers in the form of reduced prices to distributors and consumers is dubious (except, perhaps, where the model involves alternative publishing mechanisms). *If* major publishers wield monopoly power, and the work of McCabe and others suggests that some may (McCabe, 1999), then a reduction in serials prices would be unlikely to automatically follow a reduction in costs. Publishers would simply pocket the gain.

Moreover, there are very different patterns to publication in the arts and humanities on the one hand, and the natural sciences on the other. It is typical for the majority of papers submitted to science journals to be published, whereas only a minority of those submitted to humanities journals are published. Where the model relies on payment for publication, the publishers of a humanities journal would confront an economic incentive to accept a higher proportion of papers for publication than they do under the current system. It would be possible for a publisher to increase revenue by lowering the bar of scholarship. Moving from the current situation where revenue can be increased through increased circulation and wider dissemination, to one where revenue can be increased by lowering the standard of scholarship clearly has its dangers.

Making payments to authors, editors and reviewers in exchange for their work and intellectual property appears to be a somewhat fairer system. After all, their work is funded by education and research grants and/or by private investors, so why should multinational publishing companies get the content derived from it for free? However, given the eagerness of many scholars to publish, and the existing institutionalised incentive system that rewards them for doing so, it is unlikely that publishers would be willing to, or be required to pay very much. Small payments raise the same transaction cost problems noted above (ie. the cost of small payments is relatively high).

Then there would be questions as to the rightful recipients of the payments; authors, their employing institutions, or the many public and private funders of the work. These questions could prove highly controversial and disruptive, with some funders insisting on their rights to payments, some institutions using payments to attract staff, and some senior staff able to negotiate individual arrangements that junior staff could not. In the end, the economic incentives may work against the underlying principles of scholarship. Institutions that could afford to pass payments to authors and editors could attract more senior staff and thereby increased funding support; whereas those that could not afford to pass on the payments would tend to lose staff and funding support. Individuals might also be polarised into the haves and have-nots, with junior staff unable to keep the payments that might support their early work.



And, of course, payments by publishers to authors would simply raise input costs for the publishers, which *if* they are operating in a competitive market on low margins they will be obliged to pass on to their customers in higher subscription prices, and *if* they wield monopoly power they can pass on at will, regardless of the margins they enjoy, having a perfectly logical and reasonable argument for doing so. In their modelling of a system involving author and editor payments, Halliday and Oppenheim suggest that such a system does not compare well with the traditional or alternative models for journal production, being relatively expensive due to the internalisation of creation costs (Halliday and Oppenheim, 1999, p.94). This, even though they largely ignored transaction costs.

## Alternative publishing models

Some suggest that academics and researchers should withdraw their editorial services from publishers that are charging high prices and seek to develop alternative titles, as a way of forcing some of the larger commercial publishers into more reasonable pricing strategies. However, given the existing incentive structure facing academics and researchers it is unlikely that many will do so. Without significant reform of the institutional arrangements operating within the present system, it is simply not in their interest (Halliday and Oppenheim, 1999, p.25). Those that do are likely to be easily replaced (Guédon, 2001). Moreover, there is little to stop commercial publishers taking over the more successful of the new and emerging independent titles as they grow, thus simply restarting the cycle. In the meantime, starting alternative titles aggravates the problem by multiplying the number of titles to purchase and pushing up aggregate fixed costs.

Among major avenues for change, are a wide range of alternative paths for publication that seek to bypass existing mechanisms and existing commercial publishers. Some analysts have suggested that the advent of more or less ubiquitous information and communication technology among education and research scholars provides an opportunity for them to bypass the major commercial publishers and publish at much lower cost – breaking free of what Harnad has called the 'Faustian Bargain' (Harnad, 1995, pp285-91 and elsewhere) (Duranceau, 1995) (Varian, 1998). A number of organisations, such as SPARC (Scholarly Publishing and Academic Resources Coalition) and the Public Library of Science, offer support and encouragement for alternative and self-publishing initiatives, while others, such as the OAI (Open Archive Initiative), are developing the 'tools' to make self-publishing work. Electronic publishing is bringing new opportunities for innovation in terms of both the institutional and cost structures of the scholarly communication industry. What is less clear is who the most economically efficient electronic publishers may turn out to be – the scholars themselves, scholarly and professional associations, employing universities and research institutions, the commercial publishers that dominate the print media, new players entering the frame (such as the ICT services or equipment companies that provide the information 'highway') or new forms of public or private consortia built from combinations of these groups.

Alternative mechanisms for dissemination that are often discussed include the use of open archives, pre- and post-print servers and simple direct internet publication. The critical thing is to ensure that the alternative mechanisms incorporate the key elements of the print system.<sup>5</sup> Communication of findings is but one, and by no means the most important of these. Other key elements of journal publication include quality control through peer review, the evaluation of academic performance, the nurturing of schools of thought and the development of research communities and networks.

Although quality control features in most alternative approaches to varying degrees, it remains a critical issue. As more and more information becomes available, reliable filtering is

increasingly valuable. There is a growing need for the consumer of scholarly content to know what to read – or more importantly, what not to read. The opportunity cost of consuming scholarly content is high. One of the great strengths of the current system of scholarly communication for both authors and consumers is the filtering process involving reliable, consistent, open and trusted peer review and selection.

Launching papers onto pre-print servers at a relatively early stage of the selection process will tend to undermine the value of selection.<sup>6</sup> For example, it has been reported that physicists reading material from the Ginsparg archive tend to read only articles by authors whose work they know (Lesk, 1997), suggesting that they apply substitute filtering strategies to pre-print server materials. These may have some negative consequences for scholarship – eg. making it harder for new authors to gain recognition and increasing the chances of readers missing important new developments. In the natural sciences, where the majority of papers submitted are published, the selection out of the remainder is of limited, or at least marginal value. In the humanities, however, where the majority of papers submitted are rejected, the selection is much more important. This would suggest that while pre-print servers may work well in the natural sciences (eg. Ginsparg's Physics Archive), they are less likely to be successful in the humanities.

Taking a finer-grained view, it may well be that there are significant differences between the disciplines *within* the natural and other sciences. Work tracing industries to their 'science base' and discussion of the nature of industrial innovation suggests that some sciences are fundamentally theoretical while others are fundamentally experimental, and that the theoretical sciences are typically pursued in public sector institutions, while experimental science that has been commercialised tends to be pursued in private sector organisations. For example, theoretical physics is typically pursued in universities and other public sector institutions, whereas the leading edge of semiconductor electronics is often to be found in private companies (eg. IBM, Intel, etc.). The organisation of these activities implies very different dissemination behaviours, likely to require very different publication strategies – eg. widespread distribution of pre-prints in physics à la Ginsparg, versus much more guarded circulation of results in electronics.

Other, crosscutting dimensions include the extent to which the authors and readers overlap, and the pure and applied dichotomy. Where there is a strong overlap between authors and readers (eg. theoretical physics) critical appraisal is built into the reading. Where there is much wider readership than authorship, and wider potential application of findings (eg. medicine or engineering), there tends to be less critical appraisal in the reading and greater need for expert external review. There may also be public welfare considerations. There are widespread concerns about the potential for health information on internet to mislead, and John Cox cites the example of a pre-refereed paper on the potential side-effects of the MMR (measles, mumps and rubella) vaccine leading to reports in the popular press and eventually to a 30 per cent drop in infant vaccination and a consequent re-emergence of rubella in the United Kingdom (Cox, 2000).

Nevertheless, there are some very important and seemingly successful initiatives underway that are beginning to have an impact and may, in time, prove crucial avenues for addressing the 'serials crisis'. SPARC is one of the initiatives tackling the problem of journal prices head-on. SPARC aims to challenge major publishers by encouraging authors and editors to establish alternative titles and publishers to compete where prices are highest and competition is needed most. 'SPARC alternatives' have been successfully established at significantly lower subscription costs than major publisher titles, and there is some evidence to suggest that this challenge is resulting in some moderation of subscription prices (Guédon, 2001). SPARC also supports the development of non-profit portals that serve specific research communities. One of the weaknesses of electronic publication of papers to archives and

servers has been the loss of the thematic unity represented by the journal (title) and the thematic bundling of articles under titles. By aggregating peer-reviewed content, the SPARC supported portals provide an alternative / replacement thematic bundling. However, there may also be some danger in the loss of flexibility in creating new journal titles if the portals use automated aggregating techniques that are too rigid. The progress of science depends, in part, on the development of new hypotheses, new frameworks and new ways of (re)interpreting results. Too rigid a framework of categorisation risks making the portal not only less useful, but a positive barrier to progress if it slows the identification of new areas, the establishment of new communities of research and the (re)interpretation of findings.

Another major development that promises to deliver the tools necessary to turn internet publication from a 'shot in the dark' to targeted communication is the Open Archive Initiative (OAI). The agreement on metadata tagging standards will enable papers on many disparate archives and servers to be searched and retrieved by everyone. This answers the need for communication. The missing link is how to evolve these initiatives into a system that also, simultaneously answers the needs of authors for recognition of performance (eg. publication and citation) and of readers for quality control and filtering (eg. peer review).

## **The Economics of Production**

Looking at the economics of production or publication, we focus on the incentives facing publishers, production costs, various publishing business models and the issues of competition and concentration in the scholarly publishing industry.

Books and journals are typical information content products in that 'first copy costs' are high while the marginal costs of (re)production are low – often virtually zero when in digital form. Such products are subject to increasing returns, rather than the decreasing returns characteristic in resource-based economies or the constant returns assumed in the neoclassical economic paradigm. It is widely believed that the outcome of increasing returns, in the absence of countervailing forces, is industry concentration – ie. fewer, larger firms. It is not, therefore, surprising that commercial publishers have grown through mergers and acquisitions and developed ever larger portfolios of titles. It is the natural consequence of being in the industry they are in. The key question is, are these 'monopolies' sustainable? If they are, then it is possible that monopoly power will be exercised in the market place. If not, monopoly power is less likely to be a long-term problem.

Swimming somewhat against the tide of mainstream economic analysis, John Kay suggests that the fear of concentration and the development of winner-takes-all markets in the knowledge economy is exaggerated (Kay, 1999). Kay contends that the expansion of the knowledge economy will create a proliferation of materials, firms and activities at all points and at all levels – suggesting that no one can expect to enjoy continued control of these markets. Kay suggests that it is misconceived to think that the key lies in being at the point of delivery of the product, the low cost and ease of access to the delivery mechanism (the internet) mean that rents are driven down at the delivery level, and instead migrate back up the value chain to those with genuinely scarce factors and competitive advantages.

If these 'genuinely scarce factors and advantages' rest with the content creators (authors), then electronic publishing promises to deliver scholarly communication from the hands of commercial publishers into those of the creators. If, on the other hand, they rest with brand holders, who turn the quality control and selection processes into key dimensions of value in their products, then electronic publishing may not revolutionise the structure of the scholarly publishing industry as much as most people seem to expect. Either way, if Kay is right, commercial publishers can expect competition from a wider range of players in the scholarly

communication system than is currently the case, and from new emerging players that are not yet a part of the system.

## **Production costs and business models**

The key features of journal publishing costs in the print environment are:

- high first copy costs, low marginal costs;
- high article processing costs – approximately 45 per cent of total production costs;
- high marketing and administration costs – approximately 28 per cent of total; and
- low physical distribution costs (King and Tenopir, 1998).

Significant cost savings could be made by streamlining or obliterating journal article processing activities and some marketing and administrative activities, but because distribution costs are a relatively small part of total costs electronic distribution (of itself) is unlikely to lead to major publisher cost savings. By implication, unless the whole process is geared to purely electronic publication cost savings may be relatively modest: dual mode publication (print *and* electronic) simply increases costs. Moreover, there are significant infrastructure and transitional costs involved in shifting from a print to an online environment.

An understanding of the economics of subscription purchasing, bundling and price discrimination helps shed light on how the publishing business works. The traditional pricing mechanism for journal publishing (annual subscription per title) is good for publishers because it creates a very low risk market, with consumers paying subscriptions in advance (Halliday and Oppenheim, 1999, p.15).

Bundling is crucial. An issue of a journal is a bundle of articles, a journal title is a bundle of issues, and publishers are increasingly bundling titles into lists or portfolios and selling subscriptions to the entire list. This not only ensures payment in advance and revenue maximisation through bundling, it also secures payment for marginal and low use journal titles which the subscribing institutions might otherwise cancel – thus perpetuating the production of what might otherwise be non-viable titles, and aggravating the 'serials crisis' by increasing the number of products on the market and thereby increasing aggregate fixed (first copy) costs. Bundling lists and selling on subscription also tends to increase monopoly power by reducing divisibility and substitutability, and maximise revenue by pricing at the average willingness to pay.<sup>7</sup>

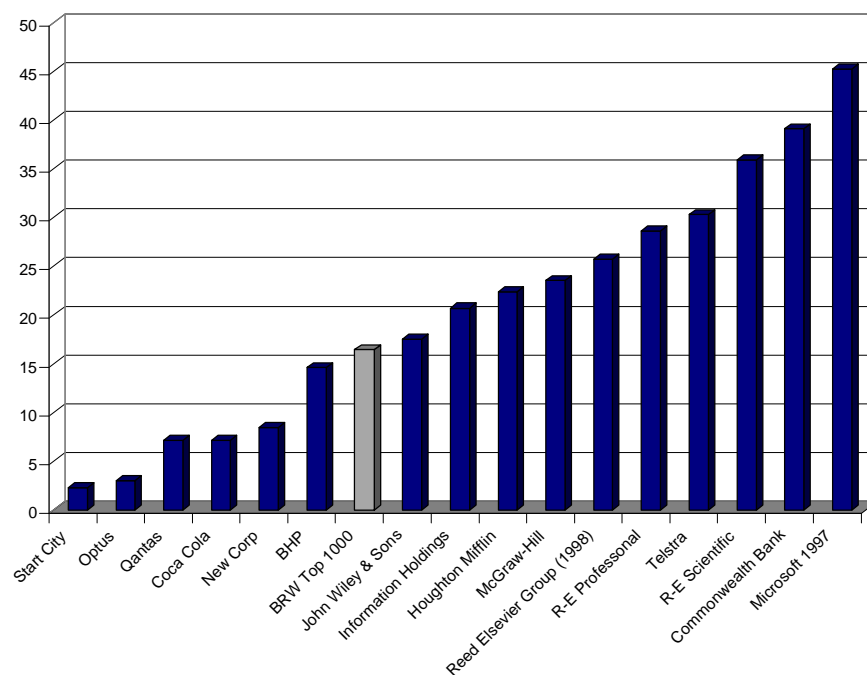
On a more sinister note, Jean-Claude Guédon has suggested that publishers may reap a further advantage from aggregating titles into the electronic 'Big Deal'. Namely, potential control over citation data and the ability to influence citation patterns, thereby making their journals the leading titles in given fields. Guédon points out that simply because of their numerical dominance of titles, around 68 per cent of all articles downloaded from OhioLINK's Electronic Journals Center came from Elsevier, even though it controls only about 20 per cent of the core journals. Over time, and generalised across research and education activities, such a phenomenon would influence citations indexes and alter the pecking order of journal titles in favour of the publisher(s) with the largest aggregations (Guédon, 2001).

## Do publishers wield monopoly power?

Perhaps the best summary on the profitability of major commercial publishers is that of Brendan Wyly (Wyly, 1998). He has shown that in 1997 Reed Elsevier enjoyed a higher net profit margin than 473 of the S&P 500 listed companies, Wolters Kluwer provided higher return on equity than 482 of the S&P 500, and margins generated in the science, technical and medical publishing areas of the companies tend to be even higher than aggregate margins.<sup>8</sup> For example, Reed Elsevier's scientific sales were only 17 per cent of total sales in 1997, but accounted for 26 per cent of total operating income.

During 1998, Reed Elsevier's operating margin in its professional publishing division was 28.6 per cent, and in its scientific publishing division, it was 35.9 per cent (Reed Elsevier, 1999, pp 23-24). Their scientific margin was down from 40.28 per cent in 1997, 41.77 per cent in 1996 and 39.66 per cent in 1995 (Wyly, 1998). To put these margins into perspective: the average gross operating margin of the BRW Top 1000 companies in Australia in 1999 was 16.4 per cent: a margin exceeded by most international publishers. In Australia, it is only companies like Telstra with an operating margin of 30.3 per cent and the Commonwealth Bank at 39.1 per cent that have margins like those enjoyed by the major commercial publishers (*BRW Top 1000*, Reed Elsevier, 1999) (Wyly, 1998).

Figure 4 Operating margins of selected companies, circa 1998-99



Notes: Operating margin calculated as revenue from sales after expenses.

Source: Houghton, J.W. (2000) *Economics of Scholarly Communication: A Discussion Paper*, prepared for the Coalition for Innovation in Scholarly Communication, Canberra. Available [www.caul.edu.au/cisc](http://www.caul.edu.au/cisc)

## Economics of Distribution

Turning to the economics of distribution we look at library distribution costs and how common library purchasing practices in the print environment have interacted with, and reinforced, publisher business models.

Odlyzko suggests that the journals 'crisis' is really a library costs crisis, claiming that for every \$1 spent on journals a further \$2 is spent on library processing and storage costs (Odlyzko, 1998). However, he based this calculation on the ratio of serials subscription costs to total costs. If one distributes total non-content library costs across serials and non-serials for Australian academic libraries in 1998, then serials related library costs amount to \$1.77 for every \$1 spent on serials, ie. approximately \$166 million (AARL Statistics). Nevertheless, Odlyzko raises an important issue, highlighting the significance of library and other distribution costs in overall system costs. Clearly, we need to consider distribution costs in order to address *whole of system costs*.

There are a number of things to note about the print purchasing practices of research libraries over recent years. Namely:

- journal titles and books have competed with each other as substitutes across broad fields, rather than being considered separately;
- the budget for purchasing in each field has been determined by the strategic priorities of the institution, such that titles across fields do not compete on cost per use;
- the budget for each field has been determined largely independently of price information, and largely independently of demand or usage information;
- the budget allocations to each field have taken little or no account of price per use across fields; and
- price signals have rarely reached end users.

These features of the print acquisition system add up to two related things. First, an almost complete failure of market signals – especially of price signals to the end users. Second, very low price elasticity of demand – with large price changes having relatively little effect on demand. In general, wherever one sees low price elasticity of demand, one sees high prices; and wherever one sees high price elasticity of demand, one sees low prices. The system might be good at delivering scholarly content, but it is extraordinarily bad at the transmission of market signals.

## A Vicious Circle

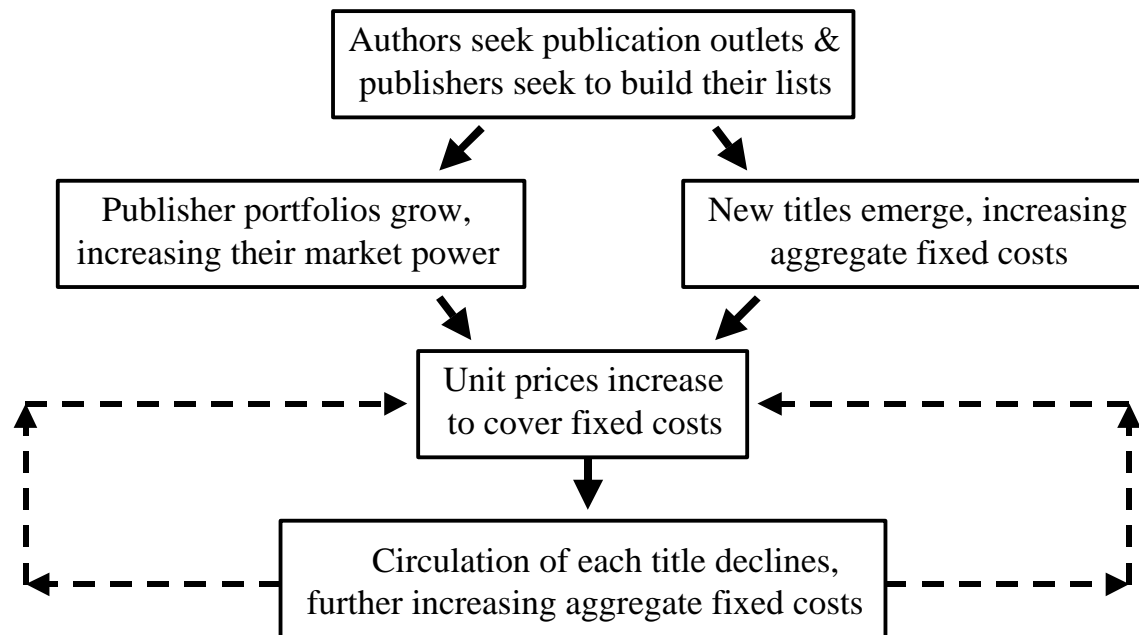
There are a number of key economic features of the scholarly communication product system that go a long way towards explaining its operation.

- High first copy costs and low marginal costs of production mean that unit prices must be high enough to cover first copy costs, and cannot be set at marginal cost unless an alternative cost recovery mechanism is in place.
- Circulation is critical, with extending circulation essential to reducing unit costs. Smaller circulation journals and lower demand books tend to be more expensive. Lack of information about circulation *ex ante* makes price setting difficult.
- Limited substitutability of products, with purchasers unable to easily swap to alternative titles.
- Inelastic demand (low price elasticity of demand) with sales relatively unresponsive to price changes.<sup>9</sup>

- New entrants increase aggregate fixed costs, because each new title has high first copy costs.

As a result, there is a vicious circle: authors seek publication outlets, and publishers seek to build their lists; new titles emerge, increasing aggregate fixed costs, and publisher portfolios grow, increasing their market power; unit prices increase to cover fixed costs and, perhaps, because publishers wield monopoly power; the circulation of each title declines, further increasing aggregate fixed costs; and prices increase still further.

Figure 5 A vicious circle in scholarly communication



Source: Derived from Houghton, J.W. (2000) *Economics of Scholarly Communication: A Discussion Paper*, prepared for the Coalition for Innovation in Scholarly Communication, Canberra. Available [www.caul.edu.au/cisc](http://www.caul.edu.au/cisc)

## What Can Be done?

It is impossible in a short paper to reflect the complexity of the issues. There is certainly no obvious solution, but at the level of general principle, one can see broad avenues for action.

If the problem can simply be stated as stemming from high prices, then:

- if, on the one hand, we believe that prices reflect the costs, then we must reduce costs in order to reduce prices;
- if, on the other hand, we believe that prices reflect what the market will bear, then we must either ensure that what the market will bear reflects value in use, or reduce what the market will bear, in order to reduce prices.

Market conforming approaches involve pursuing avenues that improve the transmission of market signals throughout the scholarly communication product system, creating a coherent and effective structure of incentives throughout the system, and increasing avenues for scholarly publication.

Improving the transmission of market signals might be achieved by such means as:

- increasing the price elasticity of demand by sending price signals and devolving choice to the end consumer;
- increasing competition between titles by introducing greater flexibility in budget allocations; and
- increasing product divisibility by using mixed subscription and pay-per-view pricing models.

Creating an effective structure of incentives throughout the scholarly communication product system is essential. By tying promotion, pay, tenure, research funding and other basic rewards to publication in a few refereed journals in each field, universities and research institutions have created a dysfunctional system of incentives. Reform is required to the institutional incentives facing authors, in order to align the goals of publication and communication, and the interests of authors and readers.

Encouraging competition in the scholarly communication industry involves a variety of initiatives aimed at developing new mechanisms for communication, publication and dissemination, and encouraging new entrants to join the scholarly publishing industry. These might include:

- exploring a wider range of electronic communication, dissemination and publishing options;
- starting new published journals or collections;
- developing alternative win:win business models for publishers and their clients;
- exploring more radical bundling and/or price discrimination models;
- encouraging the entry of new players; and
- extending the use of archives and pre- and post-print server style publication.

It is clear that most of these avenues are being pursued – at least in experimental and exploratory ways, if not yet fully and commercially.

Market distorting approaches include consortial purchasing and national site licensing, which operate by confronting producer (publisher) power in the marketplace with increased purchaser power – ie. fighting monopoly with monopsony. A national site license approach, such as that adopted in Canada, implies government intervention and financial support. Consortial purchasing simply recognises the common needs, and funding sources of research libraries, and provides the opportunity for them to exercise their collective purchasing power in the market place. Both provide avenues for addressing the 'crisis', or at least turning the tide and buying time.

Perhaps the biggest disadvantage of a national site licensing approach is that it is, by definition, national. Given that consortial purchasing simply represents the use of countervailing market power, there is obvious advantage to making the consortia as large as possible. Notwithstanding the considerable coordination costs involved, there seems to be greater promise than has yet been realised through, for example, the development of



international consortia combining the purchasing power of a number of countries or even regions. It makes little sense to fight global publishers with national consortia.

The scholarly communication system is in the relatively early stages of a transition from print publishing to online communication and dissemination: a transition as fundamental as that facing any industry. This transition comes on top of a 'crisis' in prices and the related divergence of publication and communication. In the long run, online communication, publication and dissemination will provide the basis for a solution to the 'crisis' by fundamentally restructuring the scholarly communication 'industry'; but in the short term it is simply exacerbating it. Players throughout the scholarly communication product system, especially in publishing and distribution, must develop new skills and organisational competencies suitable for the online environment, implement new procedures and practices, develop new business models and build and/or call into being an online scholarly communication infrastructure and a new scholarly communication system; while at the same time maintaining the existing print paradigm. It is important to realise that despite the enormous promise, there are significant transitional costs involved.

## Bibliography

- AARL statistics. Available <http://www.caul.edu.au/stats/>
- BRW Top 1000*, Reed Elsevier (1999) *Annual Report 1998*, and Wyly, B.J. (1998) 'Competition in Scholarly Publishing? What Publisher Profits Reveal,' *ARL*, 200.
- CAUL Statistics. Available [www.caul.edu.au/stats/](http://www.caul.edu.au/stats/)
- Cox, J. (2000) 'Scholarly Communication in the Third Millennium: Making sense of economic, technical and management challenges,' presented at Sustainability in the Scholarly Communication Marketplace, Macquarie University Seminar, Sydney, May 2<sup>nd</sup> 2000. Available <http://www.lib.mq.edu.au/conference/sustainability/index.html>
- Duranceau, E.F. (ed.) (1995) The Economics of Electronic Publishing, *Serials Review*, 21(1)
- Guédon, J-C (2001) *In Oldenburg's Long Shadow: Librarians, Research Scientists, Publishers and the Control of Scientific Publishing*, Association of Research Libraries, Washington, D.C. Available [www.arl.org](http://www.arl.org)
- Halliday, L. and Oppenheim, C. (1999) *Economic Models of the Digital Library*, eLib, United Kingdom Office of Library and Information Networking, p15.
- Halliday, L. and Oppenheim, C. (1999) *Economic Models of the Digital Library*, eLib, United Kingdom Office of Library and Information Networking, p11.
- Halliday, L. and Oppenheim, C. (1999) *Economic Models of the Digital Library*, eLib, United Kingdom Office of Library and Information Networking, p12 citing Lesk, M. (1997) *Practical Digital Libraries: Books, Bytes and Bucks*, Morgan Kauffman, and Fishwick, F., Edwards, L. and Blagden, J. (1998) *Economic Implications of Different Models of Publishing Electronic Journals for Professional Societies and other small Specialist Publishers*, Report to the Joint Information Systems Committee, Electronic Libraries Program. Available [www.ukoln.ac.uk/services/elib/papers/supporting](http://www.ukoln.ac.uk/services/elib/papers/supporting)
- Harnad, S. 1995, 'The post-Gutenberg Galaxy: how to get there from here', *Information Society* 11(4). Available <http://www.cogsci.soton.ac.uk/~harnad>
- Harnad, S. (1996) 'Implementing peer review on the net: scientific quality control in scholarly electronic journals,' in Peek, R. and Newby, G. (1996) *Scholarly Publishing: The Electronic Frontier*, MIT Press, Cambridge
- Harnad, S. and Hemus, M. (1997) 'All or None: No stable hybrid or half-way solutions for launching the learned periodical literature into the post-Gutenberg galaxy,' in Butterworth, I. (1996) *The Impact of Electronic Publishing on the Academic Community*, Portland Press, London cited by Halliday, L. and Oppenheim, C. (1999) *Economic Models of the Digital Library*, eLib, United Kingdom Office of Library and Information Networking.
- Houghton, J.W. (2000) *Economics of Scholarly Communication: A Discussion Paper*, prepared for the Coalition for Innovation in Scholarly Communication, Canberra. Available [www.caul.edu.au/cisc](http://www.caul.edu.au/cisc)
- Hunter, (1998) 'Electronic Journal Publishing: Observations from the inside,' *D-Lib*. Available <http://www.dlib.org/dlib/July98/>
- Kay, J. (1999) 'Business Strategy in the Knowledge Driven Economy,' in *The Economics of the Knowledge Driven Economy*, Conference Paper, November 1999, Department of Trade and Industry, London. Available [www.dti.gov.uk](http://www.dti.gov.uk)
- King, D.W. and Roderer, N.K. (1978) *Systems Analysis of Scientific and Technical Communications in the US*, NTIS: PB281-847.
- King, D.W. and Tenopir, C. (1998) 'Economic Cost Models of Scientific Scholarly Journals,' *Proceedings of ISCU Workshop*, University of Oxford, 31 March to 2 April, 1998.
- King, D.W. and Tenopir, C. (2000) 'Scholarly Journal and Digital Database Pricing: Threat or Opportunity?', Paper presented at PEAK 2000, 23-24 March 2000.

- King, D.W. et al (1976) *Statistical Indicators of Scientific and Technical Communication, 1960-1980, Volume 1, A Summary Report*. GPO 083-000-00295-3.
- Lesk, M. (1997) *Practical Digital Libraries: Books, Bytes and Bucks*, Morgan Kauffman cited in Halliday, L. and Oppenheim, C. (1999) *Economic Models of the Digital Library*, eLib, United Kingdom Office of Library and Information Networking, p47.
- Lieberman, Noll, R. and Steinmuller, W.E. (1992) 'The Sources of Scientific Journal Price Increases', Centre for Economic Policy Research Working Paper, Stanford University cited by McCabe, M.J. (1999) 'Academic Journal Pricing and Market Power: A Portfolio Approach', Georgia Institute of Technology.
- McCabe, M.J. (1998) 'The Impact of Publisher Mergers on Journal Prices: A Preliminary Report,' *ARL 200*.
- McCabe, M.J. (1999) 'Academic Journal Pricing and Market Power: A Portfolio Approach', Georgia Institute of Technology.
- Odlyzko, A. (1998) 'The economics of electronic publishing,' *Journal of Electronic Publishing* 4(1). Available <http://www.press.umich.edu/jep/04-01>
- OECD (1997) *National Innovations Systems*, OECD, Paris.
- Reed Elsevier (1999) *Reed Elsevier Annual Report 1998*, pp23-24.
- Varian, H. (1998) The Future of Electronic Publishing, *Journal of Electronic Publishing* 4(1). Available <http://www.press.umich.edu/jep/04-01/>
- Wyly, B.J. (1998) 'Competition in Scholarly Publishing? What Publisher Profits Reveal,' *ARL 200*; and subsequent updates. Available <http://www.arl.org/newsltr/200/wyly.html>

## Notes

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- <sup>1</sup> In 1974, the Australian dollar was worth an average of almost \$1.44 US. During 1998, it was worth an average of less than 65c US, and is now worth only just over 50 cents. Therefore, since 1974 the Australian dollar has declined by more than 60 per cent against the US dollar.
- <sup>2</sup> A finding that is supported by the original analysis of Lieberman et al.
- <sup>3</sup> The communication of content is by no means the only purpose of the journal publishing system. Indeed, it may not even be a very important element, compared to authentication of research and performance measurement of researchers (See below).
- <sup>4</sup> See outline at [www.publiclibraryofscience.org/journals](http://www.publiclibraryofscience.org/journals)
- <sup>5</sup> The print journal system works well, except for two related flaws: rising serials prices and falling circulation. Indeed, as Harnad has suggested, "most refereed articles are inaccessible to most researchers". (See Harnad, S. 'The Self-Archiving Initiative,' *Nature*, 26 April 2001. Available [www.nature.com/nature/debates/e-access/](http://www.nature.com/nature/debates/e-access/)).
- <sup>6</sup> Some pre-print proposals involve launching papers onto the pre-print server once it is submitted, and then updating its status as it passes through the review process, others are a simple 'free-for-all'.
- <sup>7</sup> Indeed, McCabe found that in the field of medical journals over the decade 1988 to 1998 prices were positively related to firm portfolio size. See McCabe, M. (1998) *The Impact of Publisher Mergers on Journal Prices*, Georgia Institute of Technology.
- <sup>8</sup> There is no ideal indicator, but gross operating margin (return from sales after expenses), net operating margin (the same after tax) and return on equity (net shareholder reward to investment) are the most commonly used indicators.
- <sup>9</sup> However, with the advent of electronic publishing and dissemination radical extensions to circulation and access have become possible. It is not yet clear whether markets can be extended to marginal consumers, given the specialist nature of the content, and what effect those marginal consumers would have on price elasticity of demand. However, the situation is changing, with higher price elasticities likely.