Economic implications of different models of publishing scholarly electronic journals for professional societies and other small or specialist publishers

Report to the Joint Information Systems Committee Electronic Libraries Programme

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EXECUTIVE SUMMARY

This report aims to address the problems which have beset the academic publishing industry for a number of years, namely, escalating output of journal titles and articles, together with spiralling prices as purchasers (mostly university libraries) have attempted to keep pace within tightening financial constraints. The authors examine some of the economic implications of the recent strategies adopted by libraries to try and tackle these issues.

The advent of electronic full-text journals affords the opportunity to take a fresh approach, recognising that any risk to publishers in the new electronic age is likely to fall on the small players in the sector, particularly learned societies which are operating on restricted budgets. The report examines the cost implications of moving to an electronic format, as well as describing the advantages to the end user in terms of an enhanced product delivered on demand. Pricing models for electronic journals are reviewed, with recognition that electronic media present opportunities for new pricing mechanisms, covering pay-as-you-view, site licence and subscription. The authors conclude by recommending that electronic journals be made available through a combination of payment by usage and subscription.

Far from posing a threat to learned societies and small publishers, offering individual as well as bundles of articles to a world-wide academic community linked to the Internet may well increase demand. However, some form of intervention will be necessary to support the publication and archiving of quality articles with limited current demand in the interests of strengthening scholarship in the future.

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Thanks are also extended to those university librarians who assisted in the study, either by taking part in another meeting at Cranfield, representing mainly local HEIs, or at a SCONUL Committee meeting at which some interim findings were presented.

John Kelleher of the Tavistock Institute gave useful guidance at the outset of the project and also commented on the draft report at the Cranfield seminar. Chris Rusbridge, Director of the Electronic Libraries Programme, provided much helpful advice on our earlier draft of the final report.

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TABLE OF CONTENTS

1. Terms of reference and research method

The terms of reference for this study, supported by JISC as part of its Electronic Libraries Programme, were

a) to provide better understanding of the economics of traditional and new forms of journal publishing particularly as these affect smaller and specialist journal publishers;

b) to identify and propose some practical models by which electronic publication can be developed and access increased, while protecting and encouraging the role of the publisher.

Collection of evidence has involved a mix of both quantitative and qualitative methods. At the initial stage, senior representatives of four major publishers acting on behalf of learned societies were interviewed. A number of societies prefer to undertake their own publishing activity, although final printing and distribution are usually outsourced. Managers of three societies of this type were interviewed, selected to cover different disciplines and membership size.

The professional body representing the sector is the Association of Learned and Professional Society Publishers (ALPSP) and we spoke at length with the Chairman.

All the interviews were semi-structured and conducted by two of the authors.

The qualitative research was supplemented by a larger sample survey, in the form of a questionnaire distributed by post to 166 societies. The survey produced 50 usable responses.

Since intermediaries are likely to play a role in the emerging electronic publishing scene, Bath Information & Data Service (BIDS) were asked for their vision of the future.

The views of the user community were also considered. Senior academic librarians from universities in Bedfordshire and Buckinghamshire attended a seminar and shared their thoughts on the likely impact on libraries. Dr Fishwick had a similar consultation with the SCONUL Advisory Committee on Scholarly Communication.

Finally, a consultative seminar held at Cranfield brought together the publishers and society representatives previously interviewed. Opinions were sought collectively, based on a discussion document summarising the authors' preliminary findings.

While we refer throughout this report to the useful evidence and informed opinion gathered from the interviews, the survey and the consultations on earlier drafts, it should be emphasised that the conclusions are those of the authors alone. They are derived by placing the research evidence into the context of previous literature on this topic.

2. Problems affecting the economics of learned journals

In 1996, the prices of learned and professional journals (the Blackwell Periodicals Price Index) were on average more than three times those in 1985, a rise nearly double that of the general Retail Prices Index over the same period.[1] While higher educational institutions (HEIs) have been increasing real expenditure on journals (after correction for general inflation), they have been unable to keep pace with the increased subscription charges[2] and the numbers of subscriptions have fallen sharply. This becomes a vicious circle: reduced circulation forces up average costs for publishers. The problem has been

[1] The Blackwell International Periodicals Price Index stood at 311.47 in 1996 compared with 100.81 in 1985 (*Library Association Record*, quoted in *LISU Annual Library Statistics 1996*, Loughborough University, p. 10). Over the same 11 years the all-items RPI rose from 100.0 to 161.2.

[2] Total spending on periodicals by institutions with university status for 1994-95 was 2.24 times that for the same institutions in 1984-85. After adjustment for general inflation (RPI), this represented a real increase of 43 per cent, but when adjusted by the Blackwell Periodicals Price Index it implied a **decline** of 25 per cent in the number of journal subscriptions. This contrasts with increases of over 40 per cent and 70 per cent respectively in numbers of academic staff and students. (All data taken from *LISU*, p. 123.)

aggravated by an increase in the number of titles overall, for reasons explained in the next section.

The market for academic journals is unusual in not displaying the normal features of demand and supply.

(a) Demand

In an analysis of the US market for academic journals, Noll and Steinmueller (1992) found that demand does not come primarily from readers but from authors eager to get their work published, particularly because publication in quality refereed journals is a major criterion for gaining secure tenure or promotion. A similar situation may be observed in the UK, particularly with the emphasis on journal articles in the Research Assessment Exercise.

Noll and Steinmueller (1992) go on to argue that one consequence of the competition to get articles published in journals of quality has been the creation of new, more specialised journals, with a number of adverse effects on both publishers and users:

- Highly specialised journals appeal only to small minorities of academics.

- Because of their low circulation, they have high unit cost and high price.

- For the same reason, neither the highly specialised journals nor the more general titles outside the "quality" range make profits for their publishers, the latter because they are regarded as inferior.

- Many secondary journals, both highly specialised and "lower-league", "tend to publish many unimportant articles", together with the occasional seminal contribution. This means that "libraries pay a high price to add a few useful articles per year". (Noll and Steinmueller, 1992).

Our own discussions with learned societies and publishers revealed that in assessing articles for inclusion in prestige journals, quality rather than readership size is the essential criterion. The use of publications records to measure research quality, not only of individual academics but also of universities, depends on this priority. This has implications for the application of the principles of market economics to this product.

Pressure on libraries to stock journals not widely consulted comes from staff with research interests in the specific area. The journal may occasionally contain their own contributions or have frequent citations of their own or their institution's work. They may wish to ensure that the journal will remain readily accessible so that they see an interesting article as soon as it appears, the "just in case" principle. As Stoller (1996) notes, the key problem here is that journals are paid for by a third party - the library - and not the academic reader.

(b) Supply

The economics of supply (cost structure) of learned journal publishing are also unusual in that labour-intensive editorial work, the major element of origination or "first copy" costs of general publishing, is at least partly provided at zero expense. In the case of most top-quality journals, authors are not paid, which reflects their situation as the effective customers of the publication. Even referees and members of editorial boards often provide their services free or at a nominal charge, perhaps partly because this role is considered to be a privilege or recognition of a reputation. It also facilitates contact with other academics in the same field and participation in networks which again may benefit career progress. Fierce critics of the current practices of commercial publishers, such as Stevan Harnad, point to the anomaly of the current situation. In what Harnad (1995, 1997a, 1997b) calls the 'Faustian Bargain' between authors and publishers, authors have handed over copyright in return for seeing their work published and widely distributed. Indeed, he believes that the electronic era gives authors the chance to take greater control over their relationship with publishers. We would argue that electronic publishing is a

value-adding activity and that time is a scare resource for academics. As Bennett (1996) states:

> "...the essential task before the academic community is not to construct an orderly economic transition between print and electronic publication. It is rather to construct an orderly intellectual and organisational transition for the certification and filtering of scholarship."[3]

(c) Implications

It is the combination of these unusual features of demand and supply that have led to the vicious circle of lower circulation, rising costs and higher prices. In considering "practical models by which electronic publication can be encouraged and access increased" (part of the terms of reference of this study), the authors believe it desirable that certain norms established within journal publishing should be challenged:

(i) Since the major demand for the refereeing and publication of many articles arises from the authors or their institutions/organisations, it may be argued that they should bear at least part of the cost of review/refereeing. This would reduce the element of cross-subsidy which arises because subscribers pay for batches of articles (journals) in which some are read widely and others hardly at all.

(ii) Electronic delivery may, in many cases, imply transactions for individual articles rather than for composite batches (journals). If and when this occurs, the normal market mechanism would imply some form of royalty to the author/originating institution. This model implies simply that the author would pay to get an article refereed and, if it were of acceptable standard, published. They would then receive some compensating income each time that article were consulted.

(iii) It would probably be more efficient in economic terms if work by academics and others acting as referees and/or editors were recompensed. One reason for this view is the opportunity cost of time and effort devoted to this task. Another

reason is that the unpaid refereeing process is often very slow and may not always be thorough. Payment would facilitate more rigorous control over the refereeing/editorial process.

These fairly radical changes could be implemented only if related arrangements for access to electronic material were to emerge from the current process of development. As is reported later, this process is expected by many within journal publishing to be slow. However these changes would be consistent with a move towards a more normal market-oriented economic model.

3. Document delivery as an alternative to subscription

Before considering how electronic distribution will affect the economics of academic periodicals, it is useful to examine briefly a solution adopted by many academic libraries to tackle their inability to subscribe on a "just-in-case" basis to all of the increasing number of journals potentially relevant to their users' interests: document delivery. Document delivery (the supply of a photocopy from a store of holdings) is the main method whereby British academic libraries obtain copies of articles in journals which they do not themselves stock.

One aspect of this arrangement is that the documents concerned are normally delivered through the library to the individual user, rather than placed into stock available for wider consultation. Where there would otherwise be a possibility of multiple purchases over a period of time of the same articles through document delivery (for example, a key article of interest to all members of a large taught course), a library might in principle buy via this route, then put the article into stock. To be acceptable to publishers, document delivery for this purpose would require a commercial royalty payment.

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[3] *op. cit.*, p. 192

It is argued by some observers that lack of a sufficient incremental payment to the publisher distorts the economics of the choice between subscription and document delivery in most cases under the present system. DJB Associates (1996)[4] produced estimates implying that if publishers were compensated for all document delivery and inter-library loans at the rates paid by commercial document delivery suppliers they would increase revenue from journals (and articles) by 25 per cent.[5]

So far, the main provider of document delivery in the UK, BLDSC, has exploited the principle of "fair dealing" by paying royalties only on a minority of the material reproduced. A grant towards operating costs from the Department of National Heritage further distorts the economics towards document delivery.

Expansion of document delivery in the UK has been less marked than might have been expected with subscription cancellations. Requests to BLDSC rose only from 2.51 million in 1988-89 to 2.99 million in 1995-96. One reason for this suggested by DJB Associates (1996)[6] may be increased charges (to cover operating costs rather than royalties) which have been implemented during a period of financial stringency for universities. It should be noted here that BLDSC still dominates the document delivery market: Parry (1997) maintains that 91% of all requests for articles supplied via the regional library systems are provided by the BLDSC.

Many journal publishers seem to feel threatened by a pent-up demand for more document delivery, supported by the facility for electronic ordering of full-text articles from contents pages, and rather confusingly described as "electronic document delivery" (*edocdel*). DJB Associates (1996) used extreme language to report the feelings of some publishers:

> "...some of the larger publishers in particular see the edocdel business as being an unwelcome carbuncle or leach on the journal publication system."[7]

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[4] *op. cit.*, pp. 100-101

[5] If such rates were to be applied, this extra revenue would not, of course, be realised, because there would be some reduction of demand in response to the rise in charges.

[6] *op. cit.*, p. 105

[7] *op. cit.*, p. 164

and

> "It can be claimed (though not proven) that electronic document delivery is a parasite on the mother journal, draining out its life blood with every cancelled subscription it facilitates.[8]

Antipathy towards document delivery and inter-library loans has also been expressed by some of the publishers interviewed by the authors of this report. Of course, library managers may respond that such policies have been introduced to tackle the current impasse on journal prices.

DJB Associates (1996) quote estimates that to compensate fully for loss of journal subscriptions through document delivery, a charge of $20 per article in royalty would be needed. Support for this view is provided by the charges for document delivery by CoDAS, a joint venture of the Institute of Physics and Elsevier established in 1994: at that date an annual subscription for access to the service of $85 accompanied a fee of $19.50 per document delivered.[9] In a paper to an ALPSP seminar in 1993, Deborah Kahn, publisher of 50 periodical titles at Routledge, Chapman and Hall, lamented the "artificially low" pricing for document delivery[10]. Another publisher's plea (from Blackwell Science) for greater compensation for document delivery appears in Campbell *et al* (1996), who argue that:

> "Buying by the glass should be more expensive than buying by the bottle."[11]

The fallacy in the arguments for minimal-cost document delivery from a central source, or an equivalent system of subscriptions to periodicals by consortia who then arrange reproduction on demand, lies in the cost structure of journals. As Ms Kahn pointed out, if origination ("first copy") costs have to be recovered from a smaller number of subscriptions, then the subscription price must rise. In other words, a system of document delivery to replace subscriptions will provide a satisfactory solution to the economic problems of journals (affecting both publishers and purchasers) only if the publisher gets sufficient compensation for lost sales of the bound journals.

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[8] *ibid.*, p. 176
[9] Pearce (1994), p. 156.
[10] Anonymous report in *Learned Publishing* Vol. 6 (3), July 1993, p. 42

While a document delivery system which does not contribute a proportionate share of publishers' costs is questionable on economic grounds, experiments replacing subscriptions with a document delivery service have shown that mismatch may arise between the published material which users wish to consult and existing journal subscriptions.

The BIODOC experiment at Cranfield University provides a striking illustration of this. In 1994, Cranfield Library cancelled all the hard-copy journals to which it had subscribed on behalf of the university's Biotechnology Centre, relying instead on a current awareness service backed by document delivery.

A large majority (80%) of the academic staff and students of the Centre was found to prefer a service offering electronic access to current contents information on a wider range of journals, which could then by ordered via computer, rather than a limited physical collection maintained in-house (Nicholls, 1995)[12]. Furthermore, it soon became apparent that requests for journals to which the Library had previously subscribed accounted for an extremely small proportion of the total: 3.4% in year 1, 7% in year 2 (results awaiting publication).

New research currently being conducted with academic staff in the Cranfield School of Management shows a similar pattern beginning to emerge, pointing to a small number of 'core' journals, with a very wide range of information needs beyond this. In other words, establishing what is 'core' is an extremely difficult task and 'core', even if the leading titles can be correctly identified, may well account for only a small percentage of total information needs of universities, particularly those with a large research focus.

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[11] *op. cit.*, p. 5

[12] It may be noted that the material supplied via BIODOC goes to individual users and is not placed into library stock for multiple access. The experiment took place within the context of research-driven needs.

These experiments highlight the potential economic inefficiency which may arise from subscription to batches of articles (journals) compared with purchase of individual items, if this latter option is available.

More studies in the USA and Australia demonstrate that the supply of articles on a just-in-time basis can be far more financial attractive to the library than subscribing to these journals for use within the library. Beardman (1996) has demonstrated that 36% of titles subscribed to in biological sciences were cheaper to borrow than to buy. The cost savings are dramatic when calculated on a cost per use basis - A$1,683 per use in the library compared with A$22 (author's emphasis) per use if these had been obtained through a document supplier.

Similarly, Gossen and Irving (1995) quote savings of US$100,000 if document delivery agencies are used as a substitute source of articles from low-use journals currently contained in the library. This evidence makes it even more curious that at the moment in the UK there is little sign of a switch from local holding to inter-library loans. According to the current SCONUL statistics, the percentage of inter-library loans as a percentage of total loans is 2.2 per cent and has been around this level for some time now.

Although the arguments for greater reliance by universities on external document delivery are overwhelming in financial terms, much attention has been focused on the fact that document delivery does not cover full costs and that this free-riding is reinforcing the vicious circle of higher prices and dwindling numbers of subscriptions.

Kingma (1996), however, argues:

> "It is difficult for the library director at a single library which has a trivial influence on the price of a journal subscription to estimate and incorporate the possible price increase that other libraries may suffer."

It is normally the objective of the management of an individual library to optimise beneficial outcomes for their own staff and students at lowest possible cost. However, it may be argued that the price charged for each document delivered should include sufficient compensation to the publisher to avoid the need for price increases to those

libraries that continue to subscribe to these journals. This amounts to a national policy in which all universities participate for the good of the sector. Most of those who have contributed to the discussion appear to agree that, if users of document delivery were prepared to pay a more economic fee, payment for journal contents on demand might be a more efficient means of meeting information needs than subscription.

The savings to libraries reported from cost comparisons of document delivery versus just-in-case subscriptions suggest that these might be sufficient to cover the cost of royalty payments acceptable to publishers. However, the slowness with which document delivery has been growing recently casts some doubt on the degree of enthusiasm for change within the academic community.

The benefits of using document deliverers rather than local holding may cease to be the issue in the medium and longer terms. As more and more publishers offer full-text access to their journals, the role of such suppliers as the Document Supply Centre (DSC) may become less dominant as libraries use publishers (or their agents) as the main delivery option. Rather, therefore, than seeing electronic publishing as a threat to revenues, it could well become an opportunity for publishers. For example, currently the DSC generates some £7.1 million per annum on the sale of photocopies to UK libraries. Furthermore, electronic access should also increase awareness and visibility which could also be a source of additional revenue, rather than merely gaining revenues that accrue to the DSC and other document suppliers. Indeed, despite the earlier negative references to electronic document delivery, DJB Associates (1996) concluded the argument as follows:

> "Electronic document delivery...points the way to 'on demand' publishing as being the way of the future, rather than packaging a great deal of material within a book or journal most of which is never consulted. Buying information as and when needed is a logical extension of the changed library management policies."[13]

This conclusion overlooks the distinctive feature of learned journals which we described in Section 2. The most prestigious of these exist not primarily to supply a short-term

[13] *op. cit.*, p. 177

demand or need for information on the part of potential readers, but, as DJB Associates themselves put it,

> "more essentially as a vehicle whereby researchers gain international esteem, recognition and, in some cases, financial reward for their work."[14]

All the learned societies and publishers whom we interviewed stated that editors of leading journals currently include any article, even if its appeal to readers may be limited, provided that it is deemed acceptable by referees on grounds of quality. Devotion of individual issues to single topics is one example of editorial direction of subject content. Another factor which may influence the subject-content of journals is the selection of topics for support by research councils and other funders. It may be argued that, even though the present system permits the cross-subsidisation of articles of minimal interest by those which induce libraries to maintain their subscriptions, there must be enough of the latter to ensure the journal's survival. At present, the paying customers are the personal or institutional subscribers.

If payments for delivery of individual articles were to replace subscriptions as the main source of revenue for journal publishers, cross-subsidisation of those articles which attract few readers would no longer be possible. This might create a threat to the dissemination of research. Currently, academic journals provide a record of research undertaken globally and may play a significant role in the development of specialist knowledge. The importance of seminal work may not be appreciated until some time in the future when it is developed further. If research evidence of high quality were to be left unpublished because of contemporary lack of interest in a topic, this might seriously affect the development of science.

To the extent that published articles are primarily a vehicle for the advancement of the authors and their institutions and that these are the publishers' real customers, it may be argued that they should contribute towards the cost of publication. This is already practice in the case of some US journals. It would compensate publishers for costs associated with those potentially important articles which were not likely to raise much

[14] *ibid.*, p. 156. The "financial reward" we interpret to mean job promotion rather any royalty.

revenue from readers in the short term. This would encourage the continued publication of such articles under a transactions-based arrangement. However, it would not guarantee the publication of a seminal article of outstanding quality by an impoverished author.

We have discussed the choice between subscription and document delivery at some length, because adoption of electronic rather than paper delivery makes the latter more attractive than it is at present. Whereas a subscriber to a printed journal can get almost immediate access, except when a library copy is being used by someone else, current document delivery services impose a delay, even when using premium services such as faxed delivery. With electronic full-text systems, document delivery will be instantaneous and direct to the user's desk-top. The issues discussed in this section are therefore highly relevant to the choice of pricing mechanism to be used for electronic journals.

4. Advantages of electronic publishing and some unresolved problems

The following advantages are claimed for the production of journals in electronic form:

a) Lower cost

Since much of the labour-intensive editorial work which precedes the production of the "first copy" is provided free of charge or at much less than commercial rates, physical print on paper accounts for a large proportion of total cost, particularly now that text is initially created in electronic form.[15] It has been difficult to obtain estimates of the saving in costs from conversion to production and delivery in electronic form. Published estimates have varied widely, partly because of the way in which some authors have presented their calculations, discussing only unit costs without making it clear how many units are assumed to be produced and sold.

[15] Getz (1992) describes electronics as the "native medium".

King and Griffiths (1995) adopted the only approach which can logically be applied to journals with different subscription numbers: separate computation of origination or first-copy costs and of incremental production and delivery cost per copy (the latter could be described as "marginal cost" in economic terms).[16] However, their estimates include some extrapolations (in line with general inflation) from research evidence produced in 1977; the revolutionary changes in printing technology during recent years have reduced some costs significantly in real terms. Our own estimates in Table 1 are derived from King and Griffiths (1995) corrected for some of these changes on the basis of evidence presented in Fishwick (1995).

Table 1 Illustrative annual costs of quarterly journal (£) 200 pp 23.5 x 15.5 cm

	All print on paper	All electronic	50 % split
Origination or first copy costs (fixed)			
Editorial work	55,000	55,000	55,000
Composition	35,000	40,000	40,000
Marketing, promotion and sales overheads	15,000	20,000	20,000
Total	105,000	115,000	115,000
Incremental costs (average per copy)			
Physical distribution	8.00	1.00	4.50
Physical reprint	8.00		4.00
Total cost at subscription numbers			
1,000	121,000	116,000	123,500
2,000	137,000	117,000	132,000
5,000	185,000	120,000	157,500
10,000	265,000	125,000	200,000

These estimates are reasonably consistent with those of other authors. For example, R.H. Marks, Director of the Publishing Division of the American Chemical Society, writing in Duranceau (1995), calculates that first-copy costs account for between 82 and 86 per cent of total costs of paper journals, excluding delivery. If both the overhead element of delivery and the cost of £8.00 per subscription are excluded, the estimates in Table 1 imply that first-copy costs account for 86 per cent (£100k out of £116k) of a journal with

[16] Olivieri (1996) uses the same approach but does not include any numbers.

2,000 subscriptions.[17] On the other hand, Kutz (1992) estimated that if a journal were not transformed into paper copy at all but distributed only electronically, savings of 30 to 35 per cent of sales price could be achieved. On our estimates, the Kutz figure would require annual subscriptions of 4,000 or more. Some authors claim that much larger savings can be achieved: Stevan Harnad, also writing in Duranceau (1995), claims as much as 70 per cent, but his analysis assumes that authors' institutions themselves will take over much of the editorial and marketing work and assigns zero cost to this. The difference between all these authors is explained by assumed circulation. For the average journal, the recent CHEMS report (1997) suggested that 80% of publishers' costs are in acquisition, reviewing and sub-editing.

Olivieri (1996)[18] shows an increase in origination costs with the change to electronic format. The increase in composition costs reflects a need to store the material in a form compatible with a number of different electronic access systems.

An increase in marketing costs is assumed because there may be less immediate serendipity in electronic access than when printed pages are displayed on "recently received" shelves. The issue of serendipity remains open to question. Beardman (1996) reports that in 9 per cent of some 709 cases of physical casual browsing in the library a useful reference was identified. It should also be noted that most of these serendipitous acts occurred when core journals in high demand were used. Nicholls (1995), on the other hand, reports some preference for electronic browsing. This may be encouraged by the add-on features of the electronic versions of articles, described in the next sub-section.

The overall impact is to make parallel publishing in both printed and electronic format more costly than printed-copy only for journals with very small circulation. The calculations in Table 1 imply that publication in electronic form only is the least expensive option for any journal with more than about 670 subscriptions[19].

[17] This percentage is, however, more sensitive to subscription numbers than Marks' calculations suggest.
[18] R Olivieri is the managing director of Blackwell Publishers
[19] The difference in origination costs between print-only and electronic-only is estimated to be £10,000. Since the marginal cost of the electronic-only option is £15 lower, this option has lower total cost provided that circulation exceeds (10,000/17=667).

This explains Olivieri's comment:

> "It is in everyone's interest to move to a fully electronic environment as quickly as possible."[20]

It should be noted that the difference in costs between the print-on-paper and electronic versions of the same journal cannot be reflected fully in the price charged to subscribers, because only the former is zero-rated for purposes of VAT; in the UK the latter must bear 17.5 per cent and universities can reclaim VAT only to a limited degree. This distortion of the market in favour of the print-on-paper version will continue, because the removal of VAT from the electronic version would require action at the EU level and if VAT were to be applied to print-on-paper this would affect a wide range of printed educational and cultural products, including all books.

b) Add-on features

One of the big advantages of the electronic medium is the chance to enhance and facilitate scholarly communication. Practical examples include links to bibliographic and statistical databases and facility for comments to be appended and/or easy update by the author or others. Quotations and statistical evidence can also be directly downloaded into other documents; cross-references can be checked and evidence from statistical sources updated. These add-on features may eliminate the cost-savings from straight reproduction of the same material in electronic rather than paper form, but the savings to the user in both cost and time may be substantial. Certainly the librarians we consulted indicated that if they are asked to pay the same price for electronic journals as for hard copy, they would expect an improved, value-added product.

Economic efficiency arguments would suggest that these enhanced services should be made optional and should be paid for by the user. Such an arrangement would give publishers and/or intermediary distributors of electronic information a financial incentive

to provide the added features which are potentially a major advantage of electronic journals.

It should be noted here that the user may still prefer paper output and facility to print on paper is highly desirable. Most libraries, according to CHEMS (1997), charge for this reproduction, conforming to the basic principle that the ultimate user should bear the cost of whatever combination of forms of delivery and add-on facilities he/she wants. If electronic formats become the main delivery mode, end-user printing may escalate and if the cost is passed on to students there may be some resistance to these charges, particularly with the imposition of tuition fees. Further encouragement to download may be a possible solution here, persuading students to further filter their information before final printing. This will, of course, be influenced by charges applied by publishers for this facility.

c) Wider and more rapid access

Even if a journal is stocked locally in paper form, the only available copy may be in use. In the absence of access to a paper copy, use of a networked remote source is quicker and more cost-effective than alternatives such as BLDSC or travel to a library stocking the particular title. Electronic access is also more economic than "just-in-case" subscription to any journal which is rarely consulted.

The main advantages of the paper version of an article are its portability and durability. However, these advantages can be retained by printing of the electronic version, if the reader thinks that the contents of an article merit the extra cost of printing all or part of the text on paper.

There are some obstacles to a general shift from paper to electronics. Because the latter medium has developed so rapidly, users still encounter technical problems or slow

[20] Olivieri (1996), p. 140.

transmission. While one would expect these difficulties to be resolved within a reasonably short period in Europe and North America, a large proportion of journal production is exported to other markets. Once the necessary equipment and infrastructure are in place, electronic delivery to third world markets in particular will be less costly than paper[21], but the timing of the required investment is uncertain. There is a prospect that print-on-paper will continue for several years, at increasing unit cost as electronic sales grow.

Despite these obstacles, it is difficult to dispute the conclusion that electronic production and distribution offer a method of communicating academic and professional material that is both less costly and more effective than print-on-paper.

Other problems of electronic delivery are still to be resolved. Among these are:

- arrangements for archiving and for access to material covered by subscription if that subscription is terminated;

- the need for agreed standards in compatible hardware and software;

- an appropriate pricing mechanism to meet the needs of users, librarians, publishers and professional societies, as well as intermediaries.

In Section 5 we concentrate on this last problem and, in particular the implications of an economically efficient pricing mechanism for smaller learned societies and publishers.

5. The economic efficiency of different pricing models

(a) Implications of electronic access to individual articles

[21] Despite the distortion due to differential application of VAT.

On-line access to individual articles increases the comparative attraction of "just-in-time" reference as opposed to the in-house store of batches of articles in journals. If the electronic format were to predominate, this may raise questions about the continuation of periodicals as such. The regular periodical of a learned society typically contains a collection of articles which meet a quality standard set by the society and concern subjects within its sphere of interest. The same criteria of quality and of subject interest could still be applied to articles published in electronic format with the (now metaphorical) *imprimatur* of the society without the limitations of a physical journal itself. This has two major advantages: first, there would be less delay in the publication of good articles which under the present system have to wait in a queue and secondly, there would be no space limitation - the quality standard could be absolute rather than relative. At this point, the 'journal' has become part of a broader communication forum for scholars sharing similar interests. As Ginsparg (1996) states:

> "In principle, the new electronic medium gives us the opportunity to reconsider many aspects of our current research communication"[22]

In economic terms, the abandonment of the traditional periodical would not be fundamental. Access to articles published directly by learned societies, by other publishers acting on their behalf or by other independent publishers could be by: (i) subscription (to a complete batch or to specified sections of it) or by (ii) payment per access to the individual article ("pay-as-you view"). Subscriptions could be to a composite batch of articles provided by a number of different publishers, grouped according to subject interest and providing access to a critical mass of information. The latter is already being implemented experimentally under such projects as SuperJournal and BioMed/Net and through third party aggregators.

It has already been suggested that the printed journal may not disappear for some time. In the rest of this report, the batch of articles produced by learned society publishers will continue to be described as a "journal" or "periodical", because that is what it is likely to remain for the most part in the short term. However, the principles discussed are

[22] *op. cit.*, no fixed pagination

intended to be applied also to the different forms in which collections of articles may ultimately appear.

(a) Transactions based charges ("pay as you view")

Economists and others have urged that electronic distribution be used to accelerate the trend, already established by document delivery services and inter-library loans, towards a pricing system based on payments for access to individual articles.

For example, Stoller *et al* (1996):

> "The advent of the electronic journal, with the possibility that its pricing will be based strictly according to usage, may lead to the most equitable pricing system, as well as the most efficient use of society's resources. Subscribers will be charged for and will receive only the articles they plan to read, saving resources for both producer and consumer."[23]

Sairamesh *et al* (1996) and DJB Associates[24] produce similar arguments.

In practical terms, under a transactions-based financing system journal publishers, whether the learned societies themselves, commercial publishers acting on their behalf or other intermediaries, would derive the bulk of revenue from the sale of individual items of material. This might comprise the full text of complete articles, abstracts or extracts. Prices could be on the basis of a complete article, a page or connect-time basis and might vary between different journals. There may also be differential charges for browsing versus downloading. Stoller *et al* (1996) argue for a flat-rate system on the grounds that price differences between journals in different academic disciplines, particularly the higher prices for those in natural sciences and engineering, appear to be based on price discrimination rather than differences in production costs.[25] For a pay-as-you-go system to work efficiently in the purely economic sense there should be no distortion to the

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[23] *op. cit.*, p. 13

[24] See quotation on p. 11 above.

[25] *op. cit.*, p. 15. Particularly in the USA, scientific and engineering research attracts more government and business funding.

market from free-riding on the basis of "fair-dealing", as under some document delivery schemes, nor from any subsidies which are not neutral in their effect on users' choice[26]

A corollary to this "demand-based" system is the operation of an internal market within higher education institutions. Stoller *et al* (1996) compare academics' use of journals to people's use of prescribed medicines paid for (in the USA) by insurance companies. They comment:

> "Demand for a product will always be greater when the user is spending someone else's money."

and later:

> "Give the researchers who request and use the journals an economic incentive to care about the prices and the library expenditures in this area. Force them to deal with the library's budget problems by providing a budget for journals in their disciplines and supplying them with a list of subscriptions and prices."[27]

In the case of electronic journals, this last principle can be implemented by introducing, alongside transactions-based payments between libraries and publishers/distributors, a system of allocating access to ultimate users. The traditional approach of university libraries has been to allow students and staff to access many library services 'free' at the point of delivery. However, access to electronic journals, particularly under the pay-as-you-view system, imposes an incremental cost. Increasingly, such costs are being passed on to the university's customers (research sponsors and students)

Access to recorded knowledge is essential to the academic community and, for this reason, it is desirable that such users be given a quota of access (in units, time or expenditure), which might be made transferable. All these requirements could be met by the issue of "smart cards" to all users; each would contain a library-financed quota (where appropriate) and could be "topped-up" either by academic departments, through libraries and/or by cash.

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[26] The principle of "fair-dealing" in an electronic environment is a subject of much debate between publishers and libraries.

[27] *ibid.*, pp. 13-14 and 17

Some academics and librarians see the prospect of a limit on "access to knowledge" as a radical change in the role of the university and the library, but the principle of payment for use of services (sometimes beyond a free initial allowance) is normal for photocopying and often applies to certain services such as printing. It has the important merit of forcing users to consider priorities and secures the most efficient use of resources. It also enables the library to determine precisely its own maximum expenditure on journals. Since there will in practice be a maximum, it may be argued that this is better distributed on an equitable, rather than first-come-first-served basis.

It is not envisaged here that the system of allocation of access to electronic journals within universities would reduce their total investment in such access. Employment of such a system to reduce overall usage would ignore the substantial "public good" element in providing subsidised access. The aim is to allocate the subsidy fairly.

It should be stressed that the transition to an all-electronic environment is likely to be slow and, for this reason, it would be difficult to adopt a system based entirely on payments by ultimate users in the near future. It would hardly be fair to operate a system of limited access to electronic journals alongside free consultation of paper journals to which the library had decided to subscribe.

The mechanics of an infrastructure for "pay-as you-view" access are already under construction. While some publishers are concerned to avoid the cost of another tier in delivery to the user, others prefer to make journals also available to intermediaries, who carry a number of titles from different publishers and deliver material to institutions and/or individuals, on evidence of subscription or in return for usage payment. Some publishers are proposing both to offer material via their own servers and also through such hosts. Smaller learned societies in particular are considering the formation of consortia with common subject interests or needs, which will yield economies of scale and also simplify the installation and use of links to cited documentation, databases and other facilities. Within a 'virtual' environment, there is nothing to stop societies forming alliances with counterparts around the world to aid this process.

An advantage of payment by usage for publishers and, ultimately, the learned societies is that it would open up the demand for their journals to a wide range of occasional users. The same system could be used to allow access not only to all academic staff and students but also to other corporate and individual readers with occasional desire to consult material outside their prime area of specialism. In addition, distance is no longer a barrier to the distribution of information by learned societies. The great opportunity afforded by the Internet is the potential global reach of electronic knowledge bases.

The intuitive appeal of this principle, allowing market forces to determine what is published and at what price it is made available, masks a number of objections which may limit or delay the adoption of transactions-based financing of academic and scientific journals. Some of these objections relate to financial problems which transition to such a system would create for publishers and learned societies. Before examining these, we consider two more fundamental objections: (i) opposition to prices exceeding marginal cost and (ii) the inability of transactions-based financing to deal with the external benefit derived from publication of sound research which though currently of limited interest may prove seminal and of great value.

(i) Most of the costs associated with electronic transmission and reception are one-off capital costs, which become "sunk" and theoretically irrelevant to pricing. Once a journal has been stored in electronic form and access facilities established, additional use imposes negligible incremental cost. Should one deny access to knowledge when the cost of extra use is near-zero?

Although Noll and Steinmueller (1992) address this question, their analysis is inconclusive. By definition, journal articles are not perfect substitutes for each other and the owner of the copyright for each article has a degree of monopoly power. It could be argued theoretically that any price exceeding the marginal cost of supplying incremental access is due to this monopoly power. In a perfect market the excess would be competed away. However, pro-market economists might advance three reasons for rejecting arguments for near-zero price at the point of use:

- Each article is in principle a stand-alone product. In their view, whether or not it is published should depend on prospective revenue from all readers in comparison with the incremental costs of making it available, that is long-run marginal cost. To argue that prices should not exceed short-run marginal cost would imply that the stand-by fare on trans-Atlantic flights should not exceed the cost of free meals to the passenger plus a small amount of extra fuel, probably amounting to less than £20.

- Secondly, although each article is a separate product, there are often many articles on the same topic which are competing for the reader's time. Even if one paper unique in its field became a "money-spinner" then other authors would enter the "market", which in terms of economic jargon is *contestable*. If the article were so outstanding that it could not be matched, then a sustainable high price would be just reward for those involved in its publication. With pay-as-you-view models the beneficiaries would be the publisher and perhaps the intermediary providing the on-line service. The possibility that part of the benefit should be passed to the author is discussed further in Section 6 below.

- Finally, part of the excess of price over marginal cost is needed to finance continuing technical development in this medium.

These arguments are not universally accepted. For example, Lewis (1989) argued that, because an academic journal can be regarded as a natural monopoly product, then if price discrimination of the kind currently practised (high subscription prices for institutions and low ones for individuals) could no longer be maintained then some subsidy would be required to support prices close to marginal cost. With electronic delivery, this implies prices close to zero at point of use.

(ii) We have already pointed out[28], in the context of document delivery versus subscription, that selection of articles for publication on the basis of expected demand

[28] on p. 12 above

from readers would imply a significant change in the principles governing learned journal publishing. Current editorial policy for many leading journals is to select mainly on grounds of quality, with less attention to potential readership. If this policy is defended only on the grounds that the prime purpose of these journals is to act as a benchmark for assessment of individual academics or their institutions, then it may be challenged by arguing that those who benefit from these journals (i.e. authors and research institutions) are the customers. If so, they rather than the libraries where they are rarely read, should bear the cost of publication. This possibility is also discussed further in Section 6.

However, payment by the author for refereeing/editorial work does not guarantee the publication of all good research articles. It would not secure the contribution made to knowledge by the publication by an independent author of limited means of a seminal paper or one introducing a new perspective in which short-term interest may be limited. Research funding may tend to be focused on what is currently fashionable or deemed politically important. Many developments in a wide range of academic disciplines have sprung from work by independent researchers on very tight budgets.

Contributions of this kind are currently financed by cross-subsidy from subscriptions by libraries to journals containing articles consulted by current users, but this system is, as we have seen, under threat. Electronic access makes document delivery as an alternative to subscriptions much more attractive than under the present methods of delivery. Can current editorial policy be maintained?

One method of doing so would be to continue the current system of cross-subsidy by including in electronic form articles of quality for which the current readership is likely to be small. It may be argued that journal editors cannot with any certainty predict the "commercial" success of individual articles; by adhering to current policy they would be presuming no predictive ability at all. This is unrealistic. Under the present bound paper format, the cross-subsidy is borne by the subscriber, who buys a bundle of products. With a completely transactions-based system, the prices of those articles which were "bought" in large quantity would need to be raised to cover the costs of those that few people read. The publisher could not afford to ignore the price-sensitivity of demand for

all articles. It would not make commercial sense to publish the article of limited interest if that meant increasing transaction charges all round and losing total sales.

There is no easy solution to this problem as things stand. As indicated in Table 1, a major element of first copy cost is editorial work, in spite of the volume of this provided free of charge by academics themselves. Administrative and preliminary editorial work on articles rejected on grounds of quality cannot be avoided and are currently recovered from revenues attributable to those which are published. The rejection rate on quality journals is at least 70 per cent, according to the publishers and society representatives we interviewed. If, however, the subject of an article appears to the publisher to be of limited interest, what incentive does he/she have to submit it to assessment, given that it is unlikely to generate revenue under a pay-as-you view system?
Payment for refereeing and other editorial work by the author or his/her employing institution would help to relieve this problem, particularly if the adoption of this arrangement were accompanied by the introduction of royalties payable in respect of subsequent "purchases" of the article. Fees payable by authors might be based on per-page charges as recommended by Harnad (1995, 1997a, 1997b) but this formula may be too simple. However, even 'author pays' would not eliminate the problem completely. If academic journals were ever to derive most of their supporting revenues from transactions charges for individual articles, some kind of subsidy might be necessary to reflect society's potential benefit from publication of high-quality articles with small short-term readership produced by authors with limited resources.

A system of recovery entirely through usage charge would be unacceptable currently to many publishers because they could not predict income and have very little knowledge about the price-sensitivity of demand for articles in different journals. Another problem would be the delay in receipt of income, compared with the current system of up-front subscriptions. For these reasons, it is likely that many titles would continue to be available on a subscription (season ticket) basis at a discount price compared with the alternative of payment by usage.

(b) Subscriptions and site licences

Alternatives to pay-as-you-view, all variants of arrangements similar to subscriptions to bound paper journals, may be very difficult to retain in an electronic environment. For practical purposes, a subscription to a journal in electronic form implies some kind of "site licence".

Elimination of transaction/monitoring costs is one of the advantages perceived by Olivieri (1996) of a site licence for unlimited reproduction. He regards this as a solution with many benefits to all parties, but writes of electronic site licences being "geared to the technological infrastructure and the size of the customer's universe", which presumably means charges varying according to potential usage at each site. Usage may be difficult to estimate: for example, a teaching hospital library may want occasional access to accounting and economics journals; a site licence fee based on student or staff numbers would be unrealistically high in this case.

However, unless subscription prices are related to potential usage, site licences for electronic journals will lead to a significant decline in subscriptions. If electronic journals are generally sold on subscription accompanied by site licences, this must logically imply fewer subscriptions per "site" than was the case until recently with bound paper versions. One subscription to the electronic version of a leading journal could replace multiple purchases of the bound paper version. If the publisher responded to this fall in sales by a uniform price increase, this would cause loss of subscriptions elsewhere.

Decline in subscriptions when electronic journals are combined with site licences may be further accelerated by either or both of two developments. The first of these is combined purchase by consortia, who can then network the journals; the second is the bundling of journals by publishers, offering free access to all journals for those higher educational institutions (HEIs) that subscribe to a qualifying threshold number.

Consortium purchasing is an obvious method of sharing costs and providing users at a number of HEIs with a wider range of titles than would be possible if each were to

purchase independently. Some publishers appear to welcome this development. For example, Olivieri (1996) writes optimistically:

> "There is nothing to stop small institutions banding together to get better terms and increase their holdings where none might have subscribed before."[29]

This points to the situation most favourable to publishers: extra subscriptions. One of the objectives of libraries in forming a consortium of this kind is to reduce total subscriptions, or at least to reduce the number of separate subscriptions to the same journals. In particular, subscriptions on a 'just in case' basis will be confined to core journals with high local demand.

An example of bundling of journals for electronic access is provided by the arrangement operated by two of the four publishers participating in the HEFCE's National Pilot Site Licence Initiative (PSLI). Under this arrangement, subscribers to any of the two publishers' journals in paper have free access to all the journals (most titles) which are available in electronic form. Because of the subsidy from the funding councils, the two publishers are taking little risk in this model. However, despite (subsidised) price reductions for paper subscriptions, one of the publishers reports a fall in circulation because of electronic access.[30] Hitchcock *et al* (1997) highlight the dangers of phase 1 of the PSLI in perpetuating the serials crisis.

An alternative to the bundling of all journals from one publisher is a collection of journals by subject. For users and for librarians this option would probably be more attractive. Again, it would be economic only if the licence fee could be adjusted for likely usage. This may be possible in some cases, for example in the case of a university whose research and teaching extended across a wide range of subjects or a consortium of diverse HEIs, but a consistent formula for determination of fees would be difficult.

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[29] *op. cit.*, p. 141

[30] See CHEMS (Commonwealth Higher Education Management Service) (1997), para. 2.50

CHEMS (1997)[31] points to the risk that access to journals free of charge via site licences may deter individuals from joining learned societies, if one of the incentives of membership is a free or reduced-price subscription to one or more journals. Some of the societies and publishers interviewed were concerned about this and about the economic distortion caused by subsidy of site licence schemes.

In a completely electronic environment, were a library to subscribe to some journals and access others on a pay-as -you-view basis and at the same time ration usage by a system of rechargeable "smart cards", it would be desirable for users to continue to be debited on a transactions basis for all journals. Otherwise, the establishment of priorities on the basis of willingness to pay from finite resources would be impossible. How would the library know it was subscribing to the right periodicals? In the longer term, internal charges could be adjusted to reflect costs to the library; in the short term, a process of trial and error is unavoidable.

In summary, continuation of the present system of payment for journals via subscription will be more difficult in an electronic environment because instant reproduction will be more feasible and difficult to monitor. Site licences eliminate the costs of monitoring and recovery of royalties but, unless licence fees can effectively be related to potential demand, may imply further loss of revenue for publishers. Arrangements for consortium purchasing or bundling of journals, either by publisher or by subject group, while making administration easier, seem almost certain to reduce subscriptions even more. If the application of site licences to electronic journals does lead to fewer subscriptions, then, since the costs of the electronic journal are almost all fixed, this means that subscription prices will need to rise even more rapidly than those of paper journals in recent years. Many journals would not survive a price increase of the magnitude required, given the likely continuation of financial stringency within higher education. If the switch to electronic publishing is accompanied by a continuation of the existing subscription system, it is possible that the cost savings (limited anyway because of the need to continue print-

[31] *ibid.*, para. 2.46

on-paper for some years[32]) will be swamped by the need to recover first copy costs from a greatly reduced number of subscriptions.

Another disadvantage of the subscription system, particularly with a site licence allowing free access to a range of journals, is that unless usage is monitored, no market signals will be provided to either users or suppliers. CHEMS (1997) state:

> "...if usage were monitored, one advantage to librarians would be that they would know how much usage there was of journals and could cancel unused journals and save money."[33]

In economic terms, a season ticket for access to any product can be justified only when both the buyer and the seller choose it rather than a pay-as-you-go system. A railway analogy was suggested by librarians at a consultative seminar. If one could travel by train on a particular occasion only by buying a more expensive season ticket covering journeys one would never pay for, this would be obviously inefficient. This is equivalent to the present system of journal subscriptions. If the season ticket also covered other routes, it would be even worse. If our imagined traveller made extra journeys because they were free, what lessons could we learn about the economic viability of individual services? This worst case is equivalent to those forms of site licence which, for a composite fee, allow access to all titles from one or more publishers.

c) Conclusion on relative merits of payment models

We regard a transactions based ("pay as you view") as the most efficient economically and one which is likely to emerge from the interplay of market forces in the absence of intervention. However, the transition to such a system from the present subscription-based arrangements is fraught with difficulties. Experiments such as BIODOC in which subscriptions to a limited range of journals have been replaced with access facilities to a much wider range have shown substantial divergence between actual usage and previously perceived priorities. A sudden switch, even if this were practically feasible, might cause severe difficulties. None of the parties involved has experience of price-elasticity of

[32] p. 18 above
[33] *op. cit.*, para. 2.41

demand for individual published articles and the pattern of usage after a rapid and universal change-over might simply reflect misjudgements in pricing.

A policy of non-intervention on the part of outside funding bodies would enable a usage-related system of charging to emerge gradually, ensuring that mistakes in pricing etc. have limited effect and can be used to guide improvements. Non-intervention does not rule out collective purchasing nor the application of top-sliced funds, provided that these are not directed towards any particular option and do not distort the market mechanism. The use of subsidy from public funds to cushion publishers against possible loss of revenue carries a particular risk of impeding progress towards a long-term sustainable pricing mechanism.

The search for a solution through the market is already taking place: some major publishers, frankly admitting that they are unsure of the way ahead are offering access to journals via a variety of different routes: subscriptions in paper only, electronic only (generally at lower rates) and paper plus electronic; site licences and payment by use. It is our view, based on the literature and on discussions with all parties that the last option will ultimately become regarded as the most efficient. This is strongly supported by the data emerging from the 'just in time' studies such as BIODOC, to which reference has already been made.

We would expect that the desire of publishers for some guarantee of income and for up-front payment, which has been a characteristic of journal publishing, will be reflected in subscriptions as an alternative alongside payment by usage, analogous to a season ticket on railways. Continuing the analogy, it is possible also to envisage two-part tariffs (equivalent to regional network cards on trains) giving a discount on usage-payments to those who pay an advance instalment.

In the next section, we outline a possible model which would overcome some of the difficulties of a transactions-based access system, in particular the danger that the charges for successful articles might be raised to cover the costs not only of published articles with lower usage but also those of articles which do not survive the editorial process. Again,

this is not intended as a prescription, but rather an outline of a market-oriented model towards which we recommend that journal (or article) publishing should move.

In summary, it is our view that payment by usage is probably the most efficient model for electronic journals but that it should be left to market forces to determine whether this is the case and, if so, what detailed modifications are needed to the simple direct payment model.

We recognise that conversion of the market for academic periodicals to the more commercial model of supply and demand implies a change in emphasis on the part of some learned journals, whose editors have until now regarded their function as one of publishing articles of quality, irrespective of readership size. We were reminded of the general rule at several interviews. We have argued above that, in so far as the journal is perceived as a vehicle for exposure/reputation for researchers, then the market mechanism would imply some payment by these real "customers" of the service. This is built into the more detailed hypothetical model outlined in the next section. As will be re-emphasised, this may not guarantee the publication of all those articles which may ultimately be of benefit to the development of knowledge and would have been published under the present system of cross-subsidy through subscriptions. Some form of public support may be needed in this respect.

The view that the evolution of pricing for electronic journals should be left to market forces does imply some questioning of the value of site licensing of large combinations of publications. When the user of the information distributed by this method faces no restriction in access or reproduction, this can lead to waste of resources. It is not clear how such arrangements can be financed in the absence of external subsidies or cross-subsidies from paper subscriptions, both of which are unlikely to continue. Moreover, subsidised site licensing may retard the extension of the more efficient market-related solution of usage-related charging.

One of the reasons for site licences is, of course, the difficulty of controlling reproduction of copyright material. However, computer software currently being developed is

designed to monitor or prevent electronic storage or reproduction. There is no obvious technical way of preventing photocopying of text printed on paper from an electronic source, but this applies equally to the printed version of the journal itself. If licensees had to pay the full cost of site licences, the benefits of illegal photocopying would be attractive.

6. Outline of a possible transactions model

The operational aspects of this model are based on electronic publishing services described by Ginsparg (1996), Harnad (1991, 1995, 1996) and others[34]. It is not a prescription but rather a description of a how access to articles in electronic form might be financed if the publishing of such articles were organised in a way consistent with normal market economics. It has the advantage of establishing a long-term relationship between authors, publishers and learned societies centred on using the Internet (or its future equivalent) as a base for scholarly communication.

The "publisher", who might in practice be a learned society, a consortium of such societies or a commercial publisher, would organise a process of refereeing, selection and editing and would maintain a stock (A) of articles which had survived this process. This could be accessed in one of three ways: (i) by subscription, either to the entirety of the stock or to selected items within it (particular subjects, "titles" etc) (ii) by direct payment, by account-holders or via debit or credit cards or (iii) a combination of the first two: a two-part tariff of a reduced subscription plus a reduced transactions charge. Special rates for members might be applied. Competition between different publishers of this kind would keep charges down. The market is also contestable: there are few barriers to entry by new providers of services of this kind.

The same publisher, particularly if it were a learned society might also wish to make available a "one-stop" shop for deposition by members or other authors meeting some

[34] There are several E-Lib projects offering pre-print services such as CogPrints and Education-Line.

preliminary screening condition of working papers on which they wanted comments. The inclusion in this informal depository (B) of articles submitted for formal publication in (A) would provide an informal complement to the formal refereeing/editorial process. Each draft paper would normally be placed in (B) at the time of submission, unless the author and the publisher agreed that this might adversely affect both parties by reducing future sales of a refereed and edited version[35]. On approval for publication it would be removed from (B) and transferred to (A). The editor of an electronic journal may add peer comments alongside the final published version (Harnad, 1995). There would be no charge for access to (B), though some societies might wish to restrict this to members.

Referees and editorial boards would be paid fees and in return would be expected to conform to standards laid down by the publisher relating both to the quality of their work and the time deadlines. These fees would be the same both for accepted and rejected articles, with a repeat fee for re-submissions.

These, fees plus a further contribution to the costs/profits of the publisher, would be paid by the author or organisation acting on his/her behalf. This charge would be forced downwards by competition between publishers to attract quality articles and would be the same for every submission, irrespective of whether the article were accepted, rejected or referred back for amendment. On the other hand, the fee would be forced up if scholars were competing to publish in the best journals.

Authors would receive royalties based on the number of accesses to their articles. This would mean recovery of at least part of their submission fees and, in the case of a very successful paper might lead to a substantial surplus. One advantage of this arrangement is that it would encourage authors to submit only those articles which they themselves deemed to be of sufficient quality and potential interest.[36]

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[35] Physicists, for example, have shown that they are quite prepared to work with pre-print at the Los Alamos site (Ginsparg, 1996)

[36] Availability of abstracts, peer comments and differential charging for browsing all reduce the risk that authors might attract potential customers by misleading titles and/or flawed articles which survive the refereeing process.

Some articles will survive the refereeing/editorial process but be deemed unlikely to attract sufficient interest to provide for recovery of the author's submission fee and any further costs of subsequent publication by the publisher. In such cases, the author and publisher could apply for a grant from a publicly-financed research fund to cover these two elements. This research fund would consider both the referees' comments on the article and the ability of the author to secure alternative financial support. Any revenues subsequently received from the sale of the article, including revenues imputed to it by usage by subscribers to database (A), would be returnable to the research fund.

This model has been included here to demonstrate that some of the difficulties which may arise with a change to a transactions-based system can be overcome.

7. Implications for professional societies and small or specialist publishers

The analysis and conclusions above are based mainly on a review of the literature and on a series of semi-structured interviews with representatives of three societies, the Association of Learned and Professional Society Publishers and four major publishers of learned society journals. Having identified what were perceived as the key issues, we then distributed a questionnaire by post to 166 societies. This survey produced 50 usable responses.

The survey revealed wide variation in the degree of adoption of electronic publishing. Of the 50, 15 societies have at least one journal accessible now in full text either through their own or their publisher's web site, six of them with unrestricted access (in some cases temporarily, as a recently introduced experiment), seven restricted to subscribers and one offering access by subscription or pay-as-you-go. A further eight societies plan to make such access available soon: two unrestricted, five by subscription only and one by subscription or pay-as-you-go.

Two societies not among these 23 already supply one or more journals to a third party host for pay-as-you-go access. A further two propose to follow suit soon. Five of those

already providing or planning to provide access by subscription through their own site also propose to use a third-party host for access by occasional users.

These responses show that 22 of the 50 societies have no plans to provide any form of electronic access. Of these 22, 17 are in the lower half of the sample in terms of membership size. This correlation between electronic provision and size is statistically significant.

Survey findings confirmed the view put to us in some of the interviews that any apprehension on the part of societies about the consequences of conversion to electronic access, particularly on a usage-related payment basis, was not focused on loss of members' subscriptions but more on loss of income from institutional subscribers. The run-on cost of extra copies, plus the costs of physical delivery and administration were believed in many cases to be not much less than income derived from members' journal subscriptions or, in the case of journals distributed free, from a notionally attributable part of the membership fee.

The following table shows, for 106 journals produced by 43 societies, a comparison between the subscription rate to society members (or the lowest individual rate) and that to institutions (mainly academic libraries). For example, of the 20 journals with a member's subscription between £50 and £99, one had an institutional price within the same range, ten had a price between £100 and £199 and nine had an institutional price within the £200-£499 band. None of the 106 journals was available to members and institutions at the same price.

Table 2: Comparison between journal prices for members and institutions

	Number of journals with institutional price (£) in range stated					
Members' rate (£)	10-49	50-99	100-99	200-499	500 +	TOTAL
Free to members	13	5	11	6	1	36
10-49	12	10	9	5		36
50-99		1	10	10	8	29
100-99			1	2	1	4

200-499					1	1
500 +						0
TOTAL	25	16	31	23	11	106

For those 57 journals to which individual subscriptions applied, the mean ratio of the institutional to individual price was 3.70.

While the main concern of societies may well be the loss of institutional subscriptions, some also feel that with electronic access, one of the main benefits of society membership will be lost. This seems to ignore the continuing feasibility of subscription as an alternative to pay-as-you-go access - one person interviewed also saw this as the equivalent of a season-ticket for railway travel or entertainment.

There are, moreover, much greater opportunities to enhance the value of the journal when it is delivered in electronic form: for example the society's web site could be used as a members' forum for discussion of recently published papers. The hypothetical model outlined in Section 6 showed the opportunity for learned societies to provide a forum for discussion of working papers. Given such opportunities, the view that membership of learned societies is seriously threatened by electronic publishing and facility for occasional access seems unduly pessimistic.

Publishers have been warning societies that they must not continue to rely on journal subscriptions to fund other activities and societies appear to be heeding this advice and considering more innovative approaches. Mention was made in interviews about electronic discussion groups and alliances with other societies to offer members access to a broader range of services such as large electronic subject gateways and on-line libraries. As Ginsparg (1996) points out, learned societies have treated publishing as a substantial revenue-earner and he argues that this should not continue in the electronic era. Lynch (1994) notes that the mission of a learned society is to support the development of knowledge within a discipline and to look after its members. Instead of imposing high costs on libraries via journal subscriptions, societies have the opportunity to generate income through a broad range of value-added activities: for example, providing new

electronic information services, conferences and continuing education (see Bennett, 1996). Rowe (1996) supports the idea of subject 'knowledge centres' and believes that societies are in the best position to perform this role. As Hitchcock *et al* (1997) express it:

> "On the Web information providers want positively to encourage users to their information rather appearing to deny it as journals pricing does at present. So those services that command user support will be those that provide the best-tailored services, the optimum means of discovering information the user needs and, in the era of non-exclusivity, perhaps the best version of that information as well."[37]

and Lyman (1997) states:

> "Digital services must adapt to the communitarian nature of the network, building relationships with users"[38]

However, as societies recognise, going-it-alone on such ventures will require substantial investment in technology and skilled personnel to create value-added products. Some employees of societies appear to be putting in considerable time and effort to launch Web-based services. For others, partnerships with others offering these skills and technology are appropriate.

8. The views of the societies themselves

Those filling in the questionnaire for societies were asked whether they agreed or disagreed with each of six attitudinal statements. The results confirm the existence of some apprehension and also lack of consensus about a possible change to electronic delivery.

[37] *op. cit.*, no fixed pagination

Table 3: Results of survey of attitudes of learned societies (50 responses)

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
In five years' time electronic delivery will predominate for most of our journals	8	16	16	10	0
Full text access to electronic journals poses potential problems for us	3	9	7	23	8
Benefits of parallel publishing in electronic and printed form outweigh extra cost	3	12	19	13	3
Main advantage of electronic publishing is opportunity to link to other facilities	2	5	19	19	4
Pay-as-you-go is a better way of financing an electronic journal than subscription	7	15	22	6	0
We see electronic journals as a threat rather than an opportunity	9	15	20	6	0

The first observation on this table is that only ten of the 50 respondents expect electronic delivery to predominate for most of their journals in five years' time, though 16 were unsure. This confirms our expectation that the conversion to electronic access will be more gradual than some observers appear to expect.

Secondly, 31 of the 50 societies state that full text access to electronic journals poses potential problems. This finding could be interpreted more positively: 19 of the 50 do not foresee major difficulties ahead with conversion to electronic form.

The next statement may appear ambiguous: the 15 who consider that parallel publishing in paper and electronic form is not cost-effective might wish to see the paper version discontinued. However, when these responses are matched with those to other statements, it becomes clear that the view communicated is opposition to electronic publishing *per se*.

The 23 societies agreeing with the statement that that the main advantage of electronic publishing is linking to other facilities were predominantly those already providing

[38] *op. cit.*, no fixed pagination

electronic access. The seven who disagreed with the statement were not yet active in this field. Once again this suggests some antipathy towards the electronic format.

Disappointing in the light of our own conclusion on the economics of electronic delivery (a conclusion common to all economic analysis of the subject found in the literature) is the strong opposition to pay-as-you-view access, expressed even by two of the societies planning to provide this through a third-party host. Opposition to pay-as-you-view was stronger among those societies already providing this access through an intermediate host. While we still believe that this arrangement will ultimately become widespread, it is clear that there is currently little pressure from the suppliers of the material to bring this about. One possible reason for this is fear of loss of guaranteed income and also concern about delay in receiving the income, in contrast to the current predominance of income in advance.

Given the rather negative attitudes implied by responses to earlier questions, it is a little surprising that only six of the 50 respondents admitted to seeing electronic journals as a threat rather than an opportunity. Perhaps it was perceived as rather shameful to state this explicitly. On the other hand, only 24 of the 50 were prepared to refute the statement that electronic journals were seen as a threat rather than an opportunity.

No significant relationships were found between responses to these statements and membership size; nor were the figures such to suggest that significance might be achieved by increased sample size.

9. Conclusions

Our main conclusion is that the optimal method of delivering journal articles in electronic form is a combination of payment by usage and subscription, with the option available to all users. Such an arrangement may be expected to evolve spontaneously through market forces. Attempts to plan a changeover would be difficult to implement because of transitional problems, particularly lack of knowledge of customer priorities and of price-

sensitivity of demand. Both of these result from an inherently inefficient system isolated from the normal interaction of supply and demand. The process of change will be gradual and this is good, because users, librarians, publishers, learned societies and writers can all learn and adapt.

The *laissez-faire* strategy which we recommend implies a more critical look at subsidised initiatives such as the national pilot site licence, which in its current design may impede usage-related payment systems.

There is evidently much concern among learned and professional societies about loss of library subscription income with at least part of income becoming dependent on payment for à la carte use of electronic access. Perhaps there is too much pessimism here. The vicious circle of rising journal prices and diminishing subscriptions offers a poor alternative. By making information available in smaller portions to a much wider potential readership, electronic delivery may well increase total demand for it.

Electronic delivery provides an opportunity to enhance the service provided to members of learned societies. If a potential member's use of journal material is so rare that he/she would be satisfied with access as and when required, so that the "season-ticket" would not be economic, this might dissuade him/her from joining. Such considerations, along with accumulated experience of price-sensitivity of demand, will determine the level of charging for occasional access, subscription rates and the nature of services available. There are no evident grounds for expecting a normal market mechanism to fail in this case.

The one exception, which may at some future date require public intervention, is the need to ensure future availability of articles of high quality but small current readership. Under the existing subscription-based system, editors of leading journals normally regard it as their function to publish such articles, but if a system of charges for individual articles were to predominate, there would be a commercial incentive to prefer material likely to be purchased. The introduction of charges to authors to recover the costs of the refereeing/editorial process would mitigate this problem to some degree. It would also help to put the refereeing process on a more efficient footing, with payment for the

services of those involved. However, in the case of authors with limited means, some form of public support to secure the benefit for society from research of seminal or innovative nature, but not of current interest, can be justified even within the context of market economics. This function may be combined with action to ensure the archiving of all articles which are published, to enable continued access when commercial provision is no longer profitable.

Bibliography

Bailey, Charles W. Scholarly electronic publishing bibliography. Houston: University of Houston Libraries, 1997
http://info.lib.uh.edu/sepb/sepb.pdf

Beardman, Sue. The cost-effectiveness of access versus ownership: a report on the virtual library project at the University of Western Australia Library, *Australian Library Review*, Vol. 13 (2), 1996, pp. 173-181

Bennett, Scott. Re-engineering scholarly communication: thoughts addressed to authors, *Journal of Scholarly Communication*, 27 (July 1996), pp. 185-196

Braman, Sandra. Scholarly publishing in the information economy in Okerson, Ann (ed.), *Filling the pipeline and paying the piper: proceedings of the fourth symposium*, pp. 39-49. Washington DC: Office of Scientific & Academic Publishing, 1995

Cochrane, Tom. The economics of scholarly information: a dissolving triangle? *Australian & New Zealand Journal of Serials Librarianship*, Vol. 3 (2), 1992, pp. 17-30

Commonwealth Higher Education Management Service. *Report on phase 1 of the evaluation of the UK Pilot Site Licence Initiative*, London: CHEMS, 1997

Cox, John E. Publishers, publishing and the Internet: how journal publishing will survive and prosper in the electronic age, *The Electronic Library*, Vol. 15 (2), 1997, pp. 125-131

Creaser, C. *Electronic publishing: statistics of supply and library use*, Loughborough: Library & Information Statistics Unit, 1996

Davenport, E. Perception of economics in a digital publishing environment, *Interlending and Document Supply*, Vol. 22 (4), 1994, pp. 8-18

Day, Colin. The economics of electronic publishing: some preliminary thoughts in Okerson, Ann & Mogge, Dru (eds.), *Gateways, gatekeepers and roles in the information omniverse: proceedings of the third symposium*, pp. 77-84. Washington DC: Office of Scientific and Academic Publishing, Association of Research Libraries, 1994
http://arl.cni.org/symp3/day.html

Day, Colin. Pricing electronic products in Okerson, Ann (ed.), *Filling the pipeline and paying the piper: proceedings of the fourth symposium*, pp. 51-56. Washington DC: Office of Scientific & Academic Publishing, 1995

DJB Associates. *The future of electronic information intermediaries*. [s.l.]: DJB Associates, 1996

Drake, M.A. Buying articles in the future, *Serials Review*, Vol. 18 (1&2), 1992, pp. 75-77

Duranceau, Ellen Finnie (ed.), The economics of electronic publishing, *Serials Review*, Spring 1995, pp. 77-90

Evans, J., Harrington, J. & Bevan, S.J. BIODOC: access versus holdings in a university library, *Interlending and Document Supply,* Vol. 24 (4), 1996, pp. 5-11

Fisher, Janet H. Comparing electronic journals to print journals: are there savings? in *Scholarly communication and technology: conference organised by the Andrew W. Mellon Foundation*. Emory University, 1997
http://arl.cni.org/scomm/scat/fisher.html

Fishwick, F. The costs facing publishers in Baum, L. (ed.), *Book publishing in Britain*, London: Whitaker, 1995

Getz, M. Electronic publishing: an economic view, *Serials Review*, Vol. 18 (1&2), 1992, pp. 25-31

Getz, M. Electronic publishing in academia: an economic perspective in *Scholarly communication and technology: conference organised by the Andrew W. Mellon Foundation*, Emory University, 1997
http://arl.cni.org/scomm/scat/getz.html

Ginsparg, P. Winners and losers in the global research village, *Serials Librarian,* Vol. 30 (3/4), 1997, pp. 83-95
http://xxx.lanl.gov/blurb/pg96unesco.html

Gossen, E.A. & Irving, S. Ownership versus access and low-use periodical titles, *Library Resources and Technical Services*, Vol. 39 (3), 1995, pp. 43-52

Grycz, Czeslaw Jan. Economic models for networked information, *Serials Review*, Vol. 18 (1&2), 1992, pp.11-18

Guedon, Jean-Claude. Electronic journals, libraries and university presses in Okerson, Ann (ed.), *Filling the pipeline and paying the piper: proceedings of the fourth symposium*, pp. 67-75. Washington DC: Office of Scientific & Academic Publishing, 1995

Guedon, Jean-Claude. Research libraries and electronic scholarly journals: challenges or opportunities? *Serials Librarian*, Vol. 26 (3/4), 1995, pp.1-20

Harnad, Stevan. How to fast-forward learned serials to the inevitable and the optimal for scholars and scientists, *Serials Librarian*, 30, 1997(b), pp. 73-81
http://www.cogsci.soton.ac.uk/~ha...nad/harnad97.learned.serials.html

Harnad, Stevan. Implementing peer review on the Net: scientific quality control in scholarly electronic journals in Peek, R. & Newby, G. (eds.), *Scholarly publication: the electronic frontier*, Cambridge, MA: MIT Press, 1996
http://cogsci.soton.ac.uk/~harnad.../Harnad/harnad96.peer.review.html

Harnad, S. The paper house of cards (and why it is taking so long to collapse), *Ariadne*, 8, 1997, pp. 6-7
http://www.ukoln.ac.uk/ariadne/issue8/harnad/

Harnad, Stevan. The post-Gutenberg galaxy: how to get there from here, *Information Society*, Vol. 11 (4), 1995, pp. 285-291
http://cogsci.soton.ac.uk/~harnad/THES/thes.html

Harnad, Stevan. Post-Gutenberg galaxy: the fourth revolution in the means of production of knowledge, *Public-access Computer Systems Review*, Vol. 2 (1), 1991, pp. 39-53
http://www.cogsci.soton.ac.uk/~ha...arnad/harnad91.postgutenberg.html

Harnad, Stevan & Hemus, Matt. All or none: no stable hybrid or half-way solutions for launching the learned periodical literature into the post-Gutenberg galaxy in Butterworth, I. (ed.), *The impact of electronic publishing on the academic community*, London: Portland Press, 1997(a)
http://cogsci.soton.ac.uk/~harnad...s/Harnad/harnad97.hybrid.pub.html

Harrington, J., Bevan, S.J. & Evans, J. BIODOC: a preliminary user analysis, *Serials*, Vol 9 (2), 1996, pp. 170-177

Hitchcock, Steve, Carr, Leslie & Hall, Wendy. Web journals publishing: a UK perspective, *Serials*, Vol. 10 (3), 1997, pp. 285-299
http://journals.ecs.soton.ac.uk/uksg.htm

Hunter, K. The national site licence model, *Serials Review*, Vol. 18 (1&2), 1992, pp. 71-72

Joint Funding Councils Libraries Review. *Report of the Group on a National Regional Strategy for Library Provision for Researchers*. The Anderson Report. Higher Education Funding Council for England Circular 17/94. Bristol: HEFCE, 1994

Keyhani, Andrea. Innovations in cost recovery in Okerson, Ann (ed.), *Filling the pipeline and paying the piper: proceedings of the fourth symposium*, pp. 57-65. Washington DC: Office of Scientific & Academic Publishing, 1995

King, Donald W. & Griffiths, Jose-Maria. Economic issues concerning electronic publishing and distribution of scholarly articles, *Library Trends*, Vol. 43 (4), 1995, pp. 713-740

Kingma, Bruce. *The costs and benefits of access to scholarly articles via interlibrary loan and journal subscriptions*. New York: Haworth Press, 1996

Kutz, M. Distributing the costs of scholarly journals: should readers contribute?, *Serials Review*, Vol. 18 (1&2), 1992, pp. 73-74

Langston, Lizbeth. Scholarly communication and electronic publication: implications for research, advancement and promotion in Duda, Andrea L. (ed.), *Untangling the Web: proceedings of the conference sponsored by the Librarians Association of the University*

of California, Santa Barbara and Friends of the UCSB Library, Santa Barbara: University of California, 1996
http://www.library.ucsb.edu/untangle/langston.html

Lesk, M. Pricing electronic information, *Serials Review*, Vol. 18 (1&2), 1992, pp. 38-40

Lewis, David W. Economics of the scholarly journal, *College & Research Libraries*, Vol. 50 (6), 1989, pp. 674-688

Lyman, Peter. Digital documents and the future of the academic community in *Scholarly communication and technology: conference organised by the Andrew W. Mellon Foundation*, Emory University, 1997
http://arl.cni.org/scomm/scat/lyman.html

Lynch, Clifford A. Scholarly communication in the networked environment: reconsidering economics and organisational missions, *Serials Review*, Vol. 20 (3), 1994, pp. 23-30

Machovec, George. *Electronic journal market overview - 1997*, Denver: Colorado Alliance of Research Libraries, 1997
http://www.coalliance.org/reports/ejournal.htm

Morton, Bruce. Is the journal as we know it an article of faith?: an open letter to the faculty, *The Public-Access Computer Systems Review*, Vol. 8 (2), 1997
http://info.lib.uh.edu/pr/v8/n2/mort8n2.html

Nicholls, E. *BIODOC: an interim evaluation of a rapid document delivery and electronic current awareness service*, Unpublished MSc Thesis, University of Sheffield, 1995

Noll, R. & Steinmueller, W.E. An economic analysis of scientific journal prices: preliminary results, *Serials Review*, Vol. 18 (1&2), 1992, pp. 32-37

Odlyzko, Andrew. The economics of electronic journals, *First Monday*, Vol. 2 (8), 1997
http://www.firstmonday.dk/issues/issue2_8/odlyzko/

Odlyzko, Andrew. On the road to electronic publishing, *Euromath Bulletin*, Vol. 2 (1), 1996, pp. 49-60
http://www.research.att.com/~amo/doc/tragic.loss.update

Okerson, Ann S. Buy or lease?: two models for scholarly information at the end (or the beginning) of an era, *Daedalus: Journal of the American Academy of Arts and Sciences*, Vol. 125 (4), 1996, pp. 55-76
http://www.library.yale.edu/~okerson/daedalus.html

Okerson, Ann. A librarian's view of some economic issues in electronic scientific publishing, *Paper presented at the UNESCO Invitational Meeting on the Future of Scientific Information, Paris, February 1996*
http://www.library.yale.edu/~okerson/unesco/html

Olivieri, R. Site licences: a new economic paradigm, *Serials*, Vol. 9 (2), 1996, pp. 137-142

Page, Gillian, Campbell, Robert L. & Meadows, Jack. *Journal publishing*, Cambridge: Cambridge University Press, 1997

Parry, David. *Why requests fail: interlibrary lending and document supply request failures in the UK and Ireland*, Newcastle-upon-Tyne: Information North, 1997

Pearce, Anthony. A learned society publisher's perspective of future opportunities, *Learned Publishing*, Vol. 7 (3), 1994, pp. 153-157

Peek, Robin P. & Newby, Gregory, B. (eds.), *Scholarly publishing: the electronic frontier*, Cambridge, MA: MIT Press, 1996

Rowe, Richard R. The transformation of scholarly communication and the future of journals, *Serials Review*, Vol. 22 (Summer 1996), pp. 33-43

Sairamesh, J. et al. Economic framework for pricing and charging in digital libraries, *D-Lib Magazine*, February 1996
http://www.ukoln.ac.uk/dlib/dlib/february96/forth/02sairamesh.html

Sosteric, Mike. Electronic journals: the grand information future? *Electronic Journal of Sociology*, Vol. 2 (2), 1996
http://www.sociology.org/vol002.002/Sosteric.article.1996.html

Stoller, M.A., Christopherson, R. & Miranda, M. The economics of professional journal pricing, *Journal of College & Research Libraries*, Vol. 57 (1), 1996, pp. 9-21

Thorn, Sue. Learned society publishing, *Serials*, Vol. 8 (1), 1995, pp. 65-68

Valauskas, Edward J. Waiting for Thomas Kuhn: First Monday and the evolution of electronic journals, *First Monday*, Vol. 2 (12), 1997
http://www.firstmonday.dk/issues/issue2_12/valauskas/

Varian, Hal R. The future of electronic journals in *Scholarly communication and technology: conference organised by the Andrew W. Mellon Foundation*, Emory University, 1997
http://arl.cni.org/scomm/scat/varian.html

Varian, Hal R. Pricing electronic journals, *D-Lib Magazine*, June 1996
http://www.ukoln.ac.uk/dlib/dlib/june96/06varian.html

Whisler, Sandra & Rosenblatt, Susan F. The library and the university press: two views of the costs and problems of the current system of scholarly publishing in *Scholarly communication and technology: conference organised by the Andrew W. Mellon Foundation*, Emory University, 1997
http://arl.cni.org/scomm/scat/rosenblatt.html

Zahray, W.P & Sirbu, M. The provision of scholarly journals by libraries via electronic technologies: an economic analysis, *Information Economics and Policy*, 4, 1989/90