

How much does it cost, and who pays? The global costs of scholarly communication and the UK contribution

Communicating the results of research is integral to expanding the frontiers of knowledge and understanding. How it is done has changed dramatically over the past few years, creating tension as the various groups involved in the process have come to terms with, and developed ways to exploit new technologies to maximize access to information resources. One of the difficulties in looking at this process has been the lack of reliable evidence about key features of the entire scholarly communications system. Therefore the Research Information Network (RIN) set out, in partnership with other key agents, to investigate the costs incurred at each stage. Since journal articles are by far the most important information outputs produced and read by researchers, the study *Activities, costs and funding flows in scholarly communications* (May 2008) examines the components of the process that relate to scholarly journals on both a global level and within the UK.



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Introduction

Communicating the results of research is integral to expanding the frontiers of knowledge and understanding. The scholarly communication system has undergone a number of fundamental changes over the past few years, as researchers, publishers and librarians have embraced new technologies, and novel developments associated with the Internet, such as Web 2.0, will only reinforce this trend for the future. In this context, tensions have arisen as the various groups involved in the scholarly communications system strive to come to terms with new technologies and how to exploit them; each and every one of them has signalled their commitment to maximizing access to information resources. However, current debates have often revealed and exacerbated uncertainties and focused on issues such as the pricing structure of journals or the effect that open access publishing will have on publishing companies. A major stumbling block that analysts of the scholarly communication system need to circumvent, however, is the lack of reliable evidence about the key features of the scholarly communications system as a whole. Therefore the RIN set out, in partnership with other key agents,

to investigate the costs incurred in every stage of the process. The aim of the study was to utilize the best available sources of information, both published and non-published, on the cost and funding flows of the discrete components of the scholarly communications system. This information subsequently enabled the development of a model that allowed us to construct estimates covering the system as a whole. A complete list of the key secondary (published) sources of information used are listed in full at the end of the original report, but a list of some of the key articles is given at the end of this paper. Articles in scholarly journals are by far the most important element in the scholarly communications process, and estimates suggest that journals account for roughly half of the global revenue of the academic and scientific information industry which also includes monographs, conference proceedings and secondary publications. Hence they are the focus of the RIN report: *Activities, costs and funding flows in scholarly communications* (May 2008)¹, on which this paper is based. All sources and calculations for the figures here are discussed in detail in the original report.

Global cost of the scholarly communications system

Some 1.59m articles are currently produced globally each year, by roughly 1.92m researchers. They are published in over 23,700 journal titles, and our estimate of the global annual systemic cost is £174.6bn (Figure 1).

These incurred costs fall within two categories, cash and non-cash, with non-cash costs defined as the cost of the time spent, typically by academics, in activities such as peer review and the reading of articles. It is also important to stress the distinction between the costs incurred in the scholarly communication process such as publishing and distribution, access provision, user search and print cost, and the time spent by researchers and others in reading articles, with the prices that libraries and others meet in subscribing to and acquiring journals. In order to avoid double counting, subscription prices have been excluded from our estimates of the costs of access provision, but are included as a source revenue to meet the costs of publishing and distribution.

Figure 1 shows that the production of research outputs is the single most expensive component of the system, both in time and money, and accounts for 66% (£115.8bn) of the total cost, followed by the cost of the time that researchers spend in reading these outputs (£33.9bn). The estimate of reading cost reflects the total global researcher base, the survey results on the number of readings per researcher and the average time spent reading the article.

The business of publishing, disseminating and providing access to articles is clearly the essential link between the activities of producing and reading them. As shown in Figure 1, we estimate the global cost of publishing and dissemination to be £6.4bn, and of the access services provided through libraries to be £2.1bn, making a total of £8.5bn. Peer review is a key component of those costs. It is a cornerstone of both scholarly publishing and research assessment and is widely recognized as a critical mechanism to maintain research standards, and yet it is often overlooked in discussions of the cost of scholarly communications.

As illustrated in Figure 2, our report (RIN 2008) estimates that peer review accounts for roughly

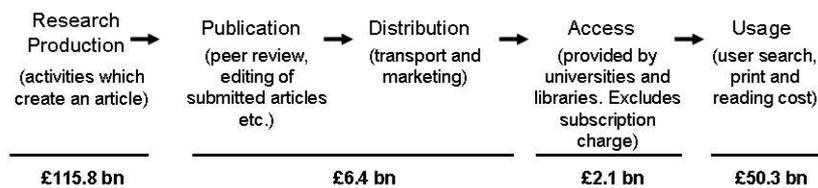


Figure 1. Overview of the activities and costs (cash and non-cash) of the global scholarly communications system

The detailed modelling of the report has focused on the publication, distribution and access components of the research value chain. The research production activities and the usage activities have also been modeled, but based on a smaller number of assumptions drawn from the literature. See RIN report for more detail (RIN 2008). Activities which are typically undertaken by academics such as peer review and reading are not remunerated as part of the scholarly communication cost and are considered non-cash costs.

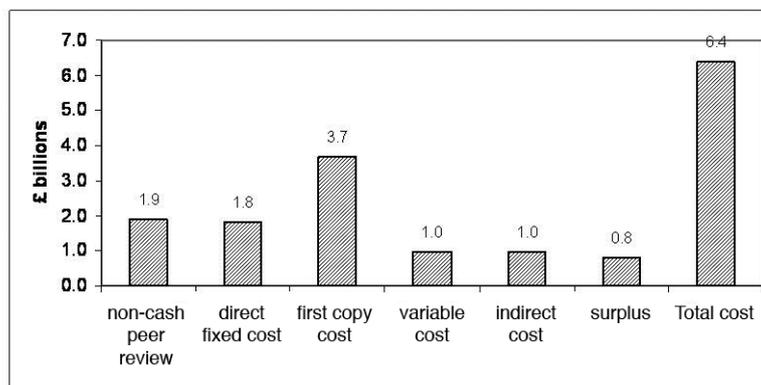


Figure 2. Total publishing and distribution cost incurred in the global scholarly communication process by activity

A component of the detailed modelling undertaken in the RIN report (RIN 2008) focusing on the total publication distribution cost by activity, of journal articles in the global scholarly communications process. The non-cash costs are generally incurred by academics such as peer review and are not remunerated as part of the scholarly communication cost. First copy costs is a combination of unit costs and activities that generate a fixed (first copy) cost of each article. Most of the costs are cash costs incurred by the publisher, and also included non-cash cost of peer review. The assumptions and key inputs are discussed in detail in the original report (RIN 2008).

30% of the total cost of publishing and distributing scholarly articles and approximately 50% of the first-copy cost of £3.7bn. This is based on the relatively conservative assumption that an average 2.5 reviewers per article spend on average 4hrs at an hourly cost of £40.50. Other costs associated with publication and distribution include those that vary according to the volume of subscriptions and the format in which the article is made available (estimated to be about £0.97bn); indirect costs associated with marketing, online hosting, customer service, management and administration (£0.96bn); and profits (for commercial publishers) or surpluses (for non-commercial publishers), estimated to be about £0.82bn. Taking all these costs into account (Figure 3), we estimate the average global cost per article published and distributed at £4,057,

which is in line with previous studies when allowance is made for £1,194 in peer review costs; but, as we show in detail in the full report, there are significant variations around this average for different journal types.

Sources of funding for publishing and distribution

The report also seeks to identify the sources of funding called upon to cover these costs, in particular the £6.4bn spent on publishing and distribution. Academic library subscriptions provide 53% of the revenue (Figure 4), with the remainder covered by other subscriptions (mainly from commercial organizations), author-side payments including page

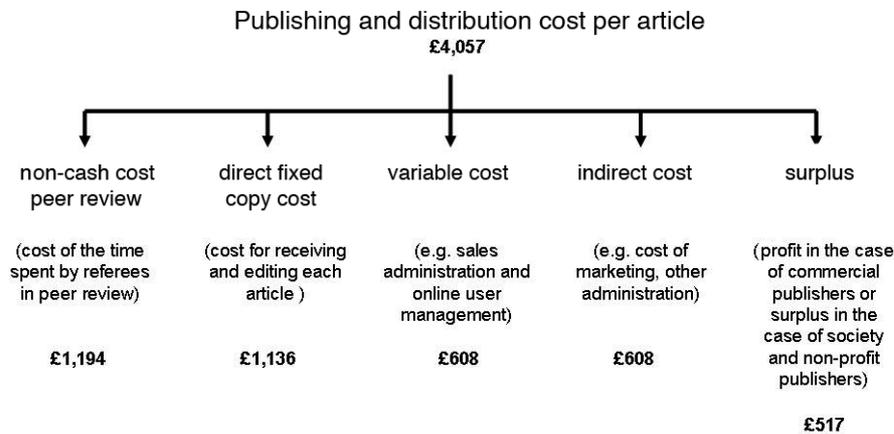


Figure 3. Global publishing and distribution cost by activity per journal article

A component of the detailed modelling undertaken in the RIN report (RIN 2008) focusing on the total publication distribution cost of journal articles in the global scholarly communications process. The non-cash costs are generally incurred by academics and are not remunerated as part of the scholarly communication cost. The assumptions and key inputs are discussed in detail in the original report (RIN 2008).

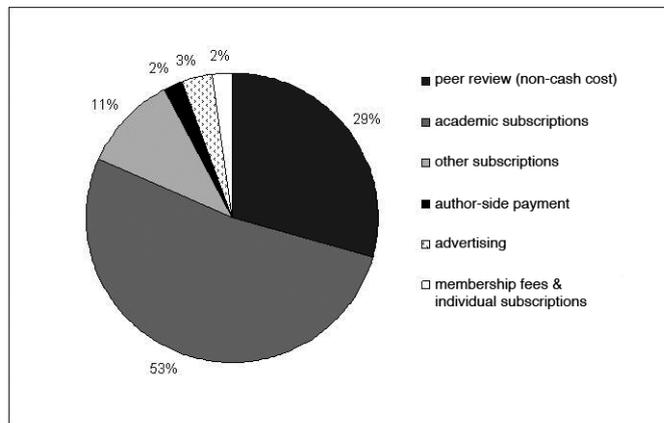


Figure 4. Funding contributions to meet global publishing and distribution costs

The sources and amount of funding for the total estimated system cost of global publication and distribution of journals reflects assumptions made about the sources which provide funding for the different journal types and assumed article allocation. These assumptions are discussed in length in the original report (RIN 2008).

charges and fees for open access articles, membership fees, individual subscriptions, and by researchers and their funders who cover the non-cash cost of peer review. Advertising accounts for only a small percentage (~3%) of the total funding: it makes a major contribution only to the large popular hybrid-type journals such as *Nature*, and a much smaller contribution to most other journals.

Globally, publishing and distribution funding differs according to journal type and article allocation, but in general, for a major discipline journal such as *Physical Review*, the funding sources include subscriptions (£211,479 annually), other subscriptions (£52,870), the non-cash cost of peer review (£140,621), author-side payments (£10,437), membership fees and individual subscriptions (£15,442) and advertising (£18,606) (Figure 5).

Funding source assumptions for popular hybrid and niche journals are also presented in the RIN report (RIN 2008)

UK contribution to costs and funding of the global publication and distribution

One of the major goals of the report was to establish how much the costs of the global scholarly communications process can be attributed to UK researchers, libraries and readers, as well as how much the UK contributes to meeting these costs. It is widely recognized that the UK research base is highly productive, as well as attracting a high proportion of citations. Our report indicates that with an overall global share of 3.3% of researchers and 4.1% of total R&D expenditure, the UK produces 6.6% of all articles. Thus the UK accounts for roughly £428m of the global costs of publishing

and distribution, and in return provides £172m in subscription fees, and other payments including author-side payments, representing 4.1% of the global total of such fees. However, the UK is a significant net contributor to the peer-review process as UK researchers provide 8.7% of the global total of £165m. Therefore the UK contribution to meeting the costs of publication and distribution amounts to the sum of £337m, or 5.2% of the global total, significantly less than the costs attributable to the UK (\$428m), of which UK academic institutions themselves contribute about £258m (4.0% of the global total).

Access and usage costs incurred by the UK

The report also examines the costs incurred in providing access (Figure 6) to scholarly journals. The bulk of the access cost (86%) is actually borne not by libraries but by researchers themselves in the time they spend in locating, downloading and browsing the articles before they read them (£530.3m). This estimate is based on survey results indicating that it takes an average of 12.5min to search for an article, with UK-based researchers reading ~ 44m articles a year. Reading of the article also may also entail a printing cost for the researcher of approximately £12m.

The costs for libraries in providing access amounts to £72m, or 12% of the total cost of access. These costs vary according to library type, as they are dependent on the total number of journals to which the library subscribes as well as the total number of library users. Hence on the whole those with large journal portfolios and high usage have higher overall costs, but relatively lower unit costs per title and per reader. The model hence assumes

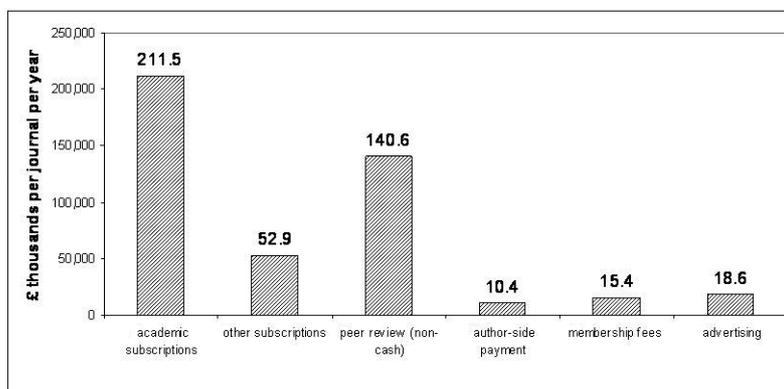


Figure 5. Funding source assumptions for a major discipline journal

Funding source assumptions for popular hybrid and niche journals are also presented in the RIN report (RIN 2008).

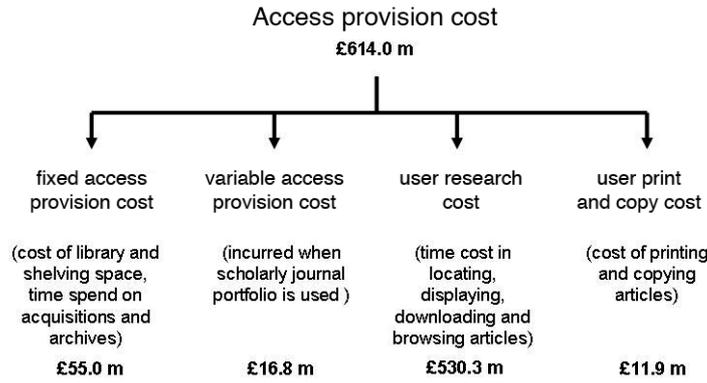


Figure 6. Annual access provision and usage cost incurred by the UK

A component of the RIN report (RIN 2008) focus on the access and usage costs incurred in the UK scholarly communications process. The access provision costs are incurred by libraries and are assumed to differ across different delivery formats such as print only and electronic only journals, as well as depending on the number of journals in a library portfolio and number of library users (RIN 2008). Usage costs are incurred by the individual researcher based on assumptions on the number of researchers using (requesting) articles held by library (RIN 2008).

some elasticity in cost structures with fixed access costs such as library and shelving space, staff time for processing and registration of acquisitions and archiving, accompanied by variable costs determined by the volumes of holdings and usage.

The access provision costs per library (described in Figure 7) depend on delivery format, the number of journals and number of researcher per library. Library expenditure includes subscription expenditure, VAT expenditure, access provision

and usage expenditures, details of which can be found in Annex C of *Activities, costs and funding flows in scholarly communications* (RIN 2008). Library classification follows SCONUL's classification: RLUK (members of Research Libraries UK), OLD (non-RLUK library members), NEW (post 1992 universities), and Higher Education Colleges (HEC).

The distribution of cost (Table 1) across the different types of libraries, based on the SCONUL classification of Research Libraries, i.e. Research

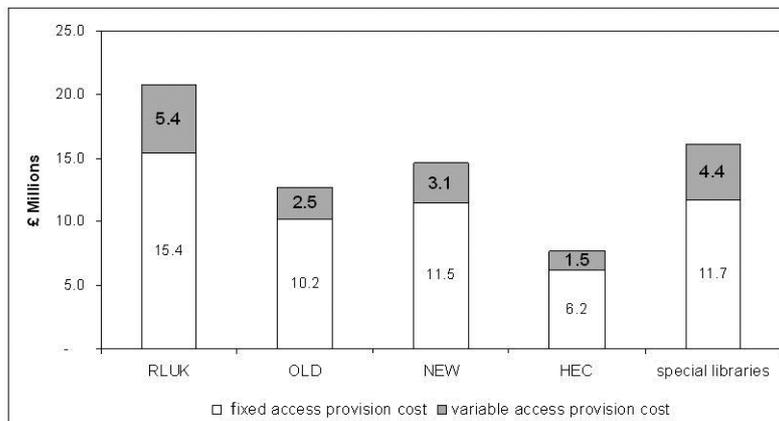


Figure 7. Total access cost incurred by the UK across different library types

The total access cost for each library type including special libraries. The costs reflect the number of libraries in each category, the different journal portfolios, and the different level of usage per library type. Library classification follows SCONUL's classification: RLUK (members of Research Libraries UK), OLD (non-RLUK library members), NEW (post 1992 universities), and Higher Education Colleges (HEC). The graph also includes special libraries which consist of corporate, government departmental and public libraries.

	No of libraries per library type	No of researchers per library type	Access provision costs per library type (£)	Total library expenditures per library type (£)
RLUK	29	2,000	714,245	2,252,788
OLD	38	700	332,780	1,239,648
NEW	51	650	286,381	1,165,821
NEC	32	500	241,749	496,876

Table 1. Variations in the number of researchers, access provision costs and expenditure per library type

libraries UK (RLUK)-member universities, OLD universities (non-RLUK members), NEW (post 1992 universities, and higher education colleges) is of some interest in this respect. RLUK libraries have the largest access cost of £20.8m, of which ~74% are fixed and ~26% variable costs. This is not surprising since they hold the largest number of journal titles, and provide for the highest numbers of research users. However, the large number of users also means that on a per journal basis their subscription expenditures are the lowest, as is their per researcher expenditure. For both old and new university libraries, ~80% of their access costs (Figure 7) are fixed and ~20% variable costs, amounting in total to £12.7m and £14.6m respectively. Higher Education Colleges (HEC) libraries have the lowest total cost of £7.7m, with relatively low numbers of researchers and journal titles.

The UK contribution to the cost of scholarly communications

At a global level it currently costs some £25bn a year to publish and distribute, provide access to, and search for and print out scholarly journal articles. In total the UK contributes £951m of those global costs, including a disproportionate contribution towards the costs of peer review. 78% of the UK’s contribution can be attributed to academic institutions (Figure 8).

Conclusion

The scholarly communications system is undergoing a number of fundamental changes, as researchers,

publishers and librarians embrace new technologies. A major stumbling block, when examining the system, has been the lack of coherent and reliable information regarding the scholarly communications system as a whole, including the identification of the structural elements and the key agents. It is in this context that the RIN set out in partnership to investigate the full process of scholarly communication, including all elements of the production and use of a scholarly journal article, and to determine the costs involved, as well as the nature and scale of the funding provided to meet those costs on a global and UK level.

The report, *Activities, costs and funding flows in scholarly communications* (May 2008), estimates that the total global cost of the scholarly communications system is £174.6bn, comprising £115.8 in research production costs, £6.4bn in publication and distribution costs (non-cash cost of peer review, direct fixed first copy cost, variable cost, indirect cost, surplus/profit), £2.1bn in access provision (the fixed and variable costs incurred by libraries in providing access to readers), £16.4bn for usage (user search and print costs) and £33.9bn in reading costs. The sources for funding for the system are distributed between those that fund the research and who employ researchers, the agents involved in publication and distribution, those that provide access to the journals (libraries) and the users/readers of the articles themselves. The UK’s contribution of over 5% of the costs of global publication and distribution and of nearly 9% of the costs of peer review is significant and far in excess of its proportion of the global research community.

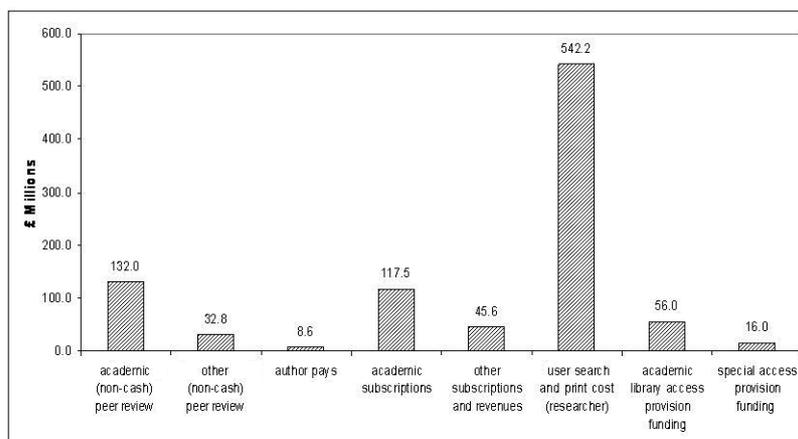


Figure 8. UK funding contribution to the total cost of global scholarly communications

UK percentage of peer review, subscriptions, library access provision, and user non-cash costs per article searching and printing contribute to the UK’s proportion of the funding for the global scholarly communications system.

This kind of analysis is important in a context of continuing and rapid change in the scholarly communication system. Moves towards author-side payments for publication of open access articles, and moves towards e-only publication, have the potential to bring significant changes to the current cost and funding structures. The report uses its modelling of the current structures to analyse the possible scale of such changes. Those who are interested in these analyses can find out more by reading the report, which is available at <http://www.rin.ac.uk/costs-funding-flows>.

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For a more complete list please refer to the original report (RIN 2008)

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1. The original report on which this article is based and to which it refers throughout: Research Information Network, *Activities, costs and funding flows in scholarly communications*, May 2008, London, Research Information Network, <http://www.rin.ac.uk/costs-funding-flows> (Accessed 9 October 2008).

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