

The Publishing Imperative: the pervasive influence of publication metrics

Colin Steele, Linda Butler and Danny Kingsley

Abstract

This article summarises the effects of the increasing global trend towards measuring research quality and effectiveness through, in particular, publication-based metrics, and its effects on scholarly communication. Such metrics are increasingly influencing the behaviour patterns of administrators, publishers, librarians and researchers. Impact and citation measures, which often rely solely on Thomson Scientific data, are examined in the context of university league tables and research assessment exercises. The need to establish alternate metrics, particularly for the social sciences and humanities, is emphasised, as is an holistic approach to scholarly communication agendas.

Introduction

New technologies have unprecedented potential for direct and less expensive dissemination of research outputs. Sulston, the 2002 Nobel Laureate in Physiology and Medicine, has noted, however,

at this very time when the intellectual commons is most needed, we see vigorous attempts at enclosure and the establishment of new barriers to communication. This culture impedes research and innovation, throttles ethical decision making, widens the gap between rich and poor...Electronic technology provides the means to communicate freely, cheaply and easily, but equally can provide powerful locks that prevent communication. The balance is not a matter of technology but of policy. The information commons does not exist by chance, but by wise management that looks to long term good as well as short term reward. (Sulston, 2005)

The University of California's Academic Senate has addressed the issues of scholarly communications and publications in a number of white papers in 2005 and 2006. The California overview states:

The current model for many publications is that faculty write articles and books, referee them, edit them and then give them to a publisher with the assignment of copyright. The publisher then sells them back to the faculty and their universities, particularly to university research libraries. While there clearly are costs of publication, a number of publishers (particularly, but not always, for-profit corporations) earn munificent profits for their shareholders and owners. However, maximizing profits for these latter groups may work to the detriment of faculty, educational institutions and the public. Meanwhile, opportunities to reduce production and distribution costs and to create innovative forms of publication and dissemination are increasingly manifest, and enabled by networked digital technologies, new business models, and new partnerships. (University of California, 2005)

Striving to measure research excellence, metrics and the rise of league tables

Measurement of research excellence and quality is an issue which has increasingly interested governments, universities and funding bodies as measures of accountability and quality are sought. This desire for accountability by governments and administrators has arguably resulted in a distortion of the research process in terms of scholarly publishing submissions, distribution and access.

Publication metrics are seen as one of the most significant indicators for assessment, thus distorting an original purpose, that of the effective dissemination of researcher output. Where a researcher publishes and how he/she is cited can often be perceived as more important than the actual content of the article.

In research evaluation discussions it is rare, moreover, for the very significant scholarly communication and publishing implications and their costs for libraries and institutions to be taken into account. Mulligan and Mabe, reporting on a survey of 6,344 globally based researchers in all subjects, note that the primary motivation for publication remains to disseminate results of research. (Mulligan and Mabe, 2006) An almost equal motivation, however, is the desire for career advancement and an ability to obtain future funding.

Roberts, Chair of the UK 2008 Research Assessment Exercise (RAE) and Chair of the initial Australian Expert Advisory Group for the Research Quality Framework (RQF) in 2008, has indicated that the purposes of such exercises are: to allow funding bodies to assess the quality of research arising from the investment of public money; to enable the academic sector to assess its success; to inform the academic sector's future strategy; and perhaps most importantly, to inform a funding model. (Roberts, 2004)

University league tables and research assessment exercises have proliferated in the last three years and grown in perceived importance with institutions scrambling to follow new ranking systems. Usher and Savino have surveyed global league tables and found, however, no agreement amongst them as to what constitutes quality. (Usher and Savino, 2006) They identify that the “world’s main ranking systems bear little if any relationship to one another” in terms of what they measure, how they measure and how they define quality. This lack of international league table consistency explains the understandable, but undesirable, reliance on easily available publication metrics.

Marginson in a speech to the 2006 *Australian Financial Review* Higher Education Forum noted that, “global university rankings are all too simple and utterly visible. They cannot be evaded or escaped. Ranking is perhaps *the* decisive move in norming higher education as a global competition of nations and universities”. (Marginson, 2006) Marginson believes that the “genie is out of the bottle forever”, and that global rankings are now “as inevitable as death and taxes”.

It is therefore now imperative that the underlying assumptions of the league tables, particularly those significantly based on publishing metrics, are critically examined. In particular, the publication of “Academic Ranking of World Universities” by the Institute of Higher Education of Shanghai Jiao Tong University, and the “World University Ranking” by *The Times Higher Education Supplement* have captured world attention. (SJTU, 2004; THES, 2005)

Two thirds of the Shanghai index is constructed from metrics based on publications and citations in core discipline journals. (Marginson, 2006) Van Raan has said “rankings such as the Shanghai one are part of a larger problem in the science evaluation circus. Quite often I am confronted with the situation that responsible science administrators in national governments and in institutions request the application of bibliometric indicators that are not advanced enough. They ... want to

have it 'fast', in 'main lines', and not 'too expensive' ... the fault of these leading scientists and administrators is asking too much and offering too little". (Van Raan, 2005a)

Van Raan in a paper presented at the First International Conference on World Class Universities has cast severe doubts on the reliability of expert score based rankings and believes that new approaches are needed on the basis of advanced bibliometric methods. (Van Raan, 2005b)

Can national research performance be derived from citations?

The use of metrics has allegedly assisted the leverage of additional funding from governments. "Bibliometric data of the world's most cited papers influenced the UK Treasury to increase its investment in science and research". (Roberts, 2006) Roberts believes that the UK RAE's have made a major contribution to maintaining national economic growth and international competitiveness.

Evidence Ltd, using Thomson Scientific publication citation indexes to benchmark countries around the world, has found that "British research performance was 'highly competitive and had measurably improved against world baselines' since the RAE was introduced in 1986". (Adams and MacLeod, 2002)

Professor Julia Goodfellow, speaking at the release of a subsequent Evidence Ltd report in March 2006, on behalf of the Research Councils UK, stated she was "very pleased to see that the impact of UK research is not only very high but in terms of our proportion of global citations, it is also rising. Biology and medicine are both outstanding highlights but across the board UK research is delivering high impact results for the investment being made". (Goodfellow, 2006)

The implication therefore is that because of the high citation rate of UK authored papers, in terms of the number of papers per researcher, the UK is 'punching above its weight'. The importance of citations in research evaluation is thus becoming increasingly evident

Lambert and Butler, noting Shanghai data, have extrapolated from bibliometrics that Europe's higher education institutions are "slow moving and underfunded". (Lambert and Butler, 2006) But do increased citations necessarily reflect improved national R & D performance? Other commentators have argued that bibliometric rises in citations have arisen from RAE 'game playing', rather than any R & D productivity.

The influence of Thomson Scientific

Bibliometric indicators are often used to measure the quantity and impact of publications as a proxy for the overall output of research. Together with patent indicators and research grants, they are the most frequently used indicators of R & D output. (UNESCO, 2005) Care, however, should be taken in national comparisons as even in the experimental sciences, where Thomson Scientific data gains most acceptance, there are concerns about the uneven coverage of national or regional journals, and those written in languages other than English.

Within university league tables and research assessment exercises, bibliometrics play an important part, and within that, Thomson Scientific metrics are the dominant factor. Garfield, the creator of the *Science Citation Index* (SCI), currently part of Thomson Scientific, has argued that impact factors in scientific literature are now used in a way that was scarcely envisaged when they were developed. Garfield believes, “like nuclear energy, the impact factor is a mixed blessing. I expected it to be used constructively while recognising that in the wrong hands it might be abused ... we never predicted that people would turn this into an evaluation tool for giving out grants and funding”. (Garfield, 2005)

Since the purchase of the SCI and its companion citation indexes by Thomson Scientific in the early 1990s there has been a marked change in the marketing and commercialisation of the products. One commentator has called the pre-Thomson period, the SCI’s “Romantic Period”, when specialists in the field were also allowed greater freedom to scrutinise the data. (Braun quoted in Adam, 2002) The significant rise in the influence of Thomson Scientific has resulted from a combination of increased market dominance, as well as an acceptance by administrators of, what appears to them, ready made tools for analysis of research performance.

Thomson Scientific is a significant multinational company with an understandable brief to increase profits and returns to shareholders. In 2005 the Thomson Scientific Web of Knowledge reported a 62% leap in usage. More than 54 million user sessions were recorded with a 27% increase in the average number of sessions per customer. In the UK more than one million user sessions were recorded in January 2006. These sessions are increasing at an average of 20% a month, with an average of over three searches each visit. (Caldwell, 2006) Each session clearly underpins financial returns.

The Thomson Scientific citation data is invaluable to bodies seeking to assess research, as they allegedly “provide a quick and easy yard stick for measuring research quality”. (Adam, 2002) It is clear, that in the search for accountability and rankings of research excellence, that the Thomson Scientific Citation Indexes have assumed an importance which has not been tempered by an understanding of the faultlines inherent in the system. Policy makers are often unaware of the problems in the use of the data, for example, inherent country and language biases, the difference in citation patterns between disciplines, the lack of coverage of certain subjects, the need for bibliographical cleansing, author self-citation patterns, etc.

Thomson Scientific have cautioned against using their data such as impact factors to evaluate individuals, “the scores were never designed by Thomson Scientific to be proxies for the influence of papers, or when aggregated, the work of individuals”. (Kipnis, 2002) Thomson Scientific in its own paper on impact factor notes that “the impact factor should not be used without careful attention to the many phenomena that influence citation rates, as for example the average number of references cited in the average article. The impact factor should be used with informed peer review”. (Thomson Scientific, 2006)

Nonetheless, how many researchers and administrators bother to access Thomson’s websites and read their background papers? While Thomson Scientific cannot control how its data is utilised or publicised, Thomson Scientific are understandably not

going to highlight limitations and lacunae of the data when marketing their citation products.

A major concern is that Thomson Scientific Citation Indexes cover less than half of the output of the peer review journals in *Ulrich's Periodical Index*, estimated to be around 22,000 titles. The aim of Thomson Scientific's selection process is to provide access to the "most important and influential scholarly journals", but there are very many fields in which important disciplinary journals are not covered. Geographical pre-eminence resides with North American and European journals in English, with many areas of the world under represented in terms of coverage.

A lack of coverage by Thomson Scientific databases can have a detrimental affect on certain disciplines. In a study of paleontological journals, Riedel and his colleagues have shown that in 2004 only 32 paleontology journals, in the broadest sense, were indexed by Thomson Scientific. They indicate "this is bad news for the field of paleontology" as from their figures, 85% of paleontology journals are not indexed and thus do not have easily accessible impact factors. (Riedel et al, 2006)

Similarly, Funkhouser's analysis of citations in 1996 of communication journals noted that Thomson Scientific missed three of the top 10 journals in communications and five of the top 15. (Funkhouser, 1996) There are only 25 women's studies journals in the Thomson Scientific database, thereby omitting some of the most significant feminist law journals. (Weisbard, 2002)

Hopkins in reviewing sport and exercise science journals notes a number of significant sports science journals are omitted from Thomson Scientific, quoting Robergs that "the Thomson Scientific system favors traditional publishers ... wouldn't a more valid method of impact-factor calculation be based on the number of times a journal article is read?". (Hopkins, 2004) Issues of quality and wider societal impact are relevant in this context.

Clarke has affirmed the lacunae in Thomson Scientific data in his analysis of citation counts of refereed articles for Australian information systems researchers and concludes that "citation analysis using currently available indexes is found to be fraught with many problems". (Clarke, 2006)

So if Thomson Scientific metrics alone are often used in research assessment exercises, and underpin the compilation of university league tables, then the selectivity of journals by them creates a significant issue for evaluation purposes.

Issues in social sciences and humanities

Notwithstanding the above limitations, Thomson Scientific bibliometrics can still be powerful tools to supplement peer review evaluations in certain science disciplines. The same cannot be said for the social sciences and humanities.

Moed notes that:

Thomson Scientific coverage tends to be excellent in physics, chemistry, molecular biology and biochemistry, biological sciences related to humans and clinical medicine; good, yet not excellent, in applied and engineering sciences, biological sciences related to animals and

plants, geosciences, mathematics, psychology and other social sciences related to medicine and health; and moderate in other social sciences including sociology, political science, anthropology and educational sciences, and particularly in humanities. A principal cause of non-excellent coverage is the importance of sources other than international journals, such as books and conference proceedings. In fields with a moderate Thomson Scientific coverage, language or national barriers play a much greater role than they do in other domains of science and scholarship. In addition, research activities may be fragmented into distinct schools of thought, each with their own 'paradigms', (Moed, 2005)

Reinforcing this, an analysis of RAE 2001 submissions revealed that while some 90% of research outputs listed by British researchers in the fields of Physics and Chemistry were mapped by Thomson Scientific, in Law the figure was below 10%. (Cliffe, 2006) Hicks has encapsulated these concerns by asserting that "to evaluate scholarly work in the social sciences and humanities, we are rudely forced to work outside this (science) comfort zone in a frankly messy set of literature". (Hicks, 2004)

Social sciences and humanities disciplines also suffer badly in the comparative global league tables. The compilers of the Shanghai rankings table concede that the criteria they have used focus predominantly on the 'hard' sciences, and not on social sciences. Williams noted "the most obvious manifestation of the bias towards the sciences in the Thomson Scientific data is the relatively lowly place occupied by the London School of Economics in the SJTU rankings, despite attempts to allow for its distinctive specialisation in the social sciences". (Williams, 2005)

Suitable measurements for international ranking in the social sciences and humanities need to be developed, particularly in relation to monographs and non-print outputs. In many areas of the humanities and social sciences, journals are often not the prime 'communication channel'. In that context, the assessment of research excellence through books, a key issue in the humanities, is a neglected topic. Many books have high impact and thus under the terms of bibliometric analysis should not be ignored. Analysis should not, however, be limited to book references in Thomson Scientific indexes as many variables are in play here.

Butler and Visser have demonstrated the potential of "extending citation analysis to non-source items" in Thomson Scientific databases but this requires a considerable investment of time, effort and money. (Butler and Visser, 2006) Other researchers have also noted the importance of extending journal based research impact assessment to book based disciplines. (Carr et al, 2006)

There are significant download usage statistics from the new institutional e-presses which can provide ready data for monographic impact, as indeed, usage statistics can be in the context of article downloads. However, the efficacy of their use in performance measurement and evaluation is yet to be fully tested.

The discussions in the UK, as to the RAE in 2008 and the establishment of a 'shadow metrics' in parallel with the traditional process, has led to significant debate in 2006. Rammell, the UK Minister for Further and Higher Education, notes that "the prize we are seeking is a system which builds on what the RAE was achieved over the last 20 years in a way that is recognised throughout the sector as significantly more efficient but at least equally as fair. It is therefore the Government's presumption that the 2008

RAE should go ahead, incorporating a shadow metrics exercise alongside the traditional panel-based peer review system.”. (Rammell, 2006)

A major issue is the lack of evaluative indicators for disciplines in the social sciences and particularly the humanities, where metrics are currently not easily available or meaningful. As a consequence, there are a number of initiatives arising from the UK RAE and the Australian RQF exercises to establish relevant indicators, such as ‘top’ lists of journals in a number of disciplines.

The UK Arts and Humanities Research Council is working, within the framework of the European Reference Index for the Humanities, to establish key journal listings across 16 subjects. While the initial lists have been criticised by peak bodies, such as the Royal Historical Society and the National Association for Music in Higher Education, it is clear that benchmarking standards will eventually be established.

In the Australian RQF, researchers working in the performing and visual arts are examining tiers of performance and impact, eg, venue and audience attendance, as traditional publishing metrics are inappropriate. In computing science, where conferences and peer review presentations are as important as articles in journals, major work is being undertaken by the peak Australian bodies to establish a ranking list for international computing and information technology conferences.

That pervasive impact factor (IF)

The Vice Chancellor of Warwick University has commented that the UK RAE “is no longer just an instrument for measuring, it has become the core reason for doing much of our academic planning, hiring and for our choice of research area”. (Hodges, 2006) The RAE clearly drives academic behaviour with journal impact factors a significant factor.

Researchers are keen to submit their work to journals with high impact factors to further their career and, as a result, the editors of journals with high impact factor are increasingly swamped with manuscripts by researchers. There is also increasing evidence that the importance of creating and maintaining high impact journals is reaching a state, both for authors and publishers, where it is perceived that the system can be manipulated. Scull has argued that the desire for accountability has encouraged researchers to work ‘the system’ rather than eliciting genuine educational progress. (Scull, 2006)

There is no ideal way to assess the quality of researchers’ published output. Yet as noted, many administrators and governments are increasingly using measures derived from data compiled by Thomson Scientific. In particular, the *Journal Citation Reports (JCR)* impact factor “has moved in recent years from an obscure bibliometric indicator to become the chief quantitative measure of the quality of a journal, its research papers, the researchers who wrote those papers and even the institution they work in”. (Amin and Mabe, 2000)

The *JCR* impact factor of a journal is calculated by dividing the number of current year citations it receives by the number of research or review articles during the previous two years. Journals with high impact factors tend to attract leading

researchers, and those who aspire to be leading researchers, as there is a strong perception that the higher the impact factor the ‘better’ the journal.

There are many issues that need to be considered when looking at a journal’s impact factor. These include self-citation practices, the nature and content of review articles, a heavy bias towards English language, and in particular, American journals, and fields with a short citation half-life. Given, moreover, what the impact factor is purported to represent, the citation rate of an article determines journal impact, but not vice versa. (Seglen, 1997)

Moed has authoritatively overviewed the role and nature of “citation analysis in research evaluation” in his monograph of that title. (Moed, 2005). He highlights the need for those in the policy arena to be fully aware of the nature of citation analysis, how indicators are constructed and calculated and what are the overall potentialities and limitations in scholarly research evaluation. Moed has also argued “there can be no direct relationship between statistics such as journal impact factors and policy decisions, yet there is evidence from both publishers and researchers of the direct influence of journal impact factors on scholarly publishing. (Moed, 2002)

Thirunamachandran, Director Research and Knowledge Transfer for the UK Higher Education Funding Council (HEFCE) stated “although RAE panels are supposed to assess the quality of the content of each journal article submitted for assessment, we reported in 2002 that ‘there is still the suspicion that place of publication was given greater weight than the papers’ content’”. (Thirunamachandran, 2004)

In the same House of Commons Report as the Thirunamachandran evidence, the Committee reported “The perception that the RAE rewards publication in journals with high impact factors is affecting decisions made by authors about where to publish. We urge HEFCE to remind RAE panels that they are obliged to assess the quality of the content of individual articles, not the reputation of the journal in which they are published.”. (UK House of Commons, 2004)

The published guidelines for the 2008 UK RAE indicate that the disciplinary panels will vary in the proportion of the four best outputs they will ‘examine in detail’. The amounts specified range from 25% to 100%. In the case of the Australian RQF, which has only 12 disciplinary panels compared to 67 in Britain, the extent to which this will be done will be determined by the use of external expert assessors.

It has been argued that once an article has been submitted to a peer review journal and been published that it has passed a ‘quality’ test, based on the prestige of the journal and that no further assessment is required for RAE peer review purposes. However, there are stresses on the peer review process, partly through increased demands, because of ‘article ‘obesity’, on unpaid academic peer reviewers. Can unpaid peer reviewing for major STM publishers increasingly be seen as “misguided collegiality”?

Just as Departmental Heads and Vice-Chancellors have been known to encourage their staff to publish in Thomson Scientific cited journals, so there is also evidence that journals are changing their practices. Editors have reported that in order to seek increased citations they have changed editorial practices, such as accelerating the

editorial review process, moving to theme based issues, and publishing more review articles.

Increasingly, publishers themselves are becoming much more proactive in ensuring that editors optimise journal impact factors. Elsevier hold regular editorial meetings such as that held in Montreal in May 2006. Sessions emphasised the speed of the peer review process, holding author workshops on how to write an article, and the need to emphasise reputation and impact factor. (Cogan, 2006)

There are a number of examples of 'crib sheets' from publishers and library suppliers (the latter aggregating journal subscription packages) to increase a journal impact factor. Strategies range from courting key academics, producing special issues with prestigious editors, maximising review times, providing feedback after publication of articles, targeting new scholars, deliberately creating polemical editorials, publishing best papers early in a calendar year, publishing vanilla papers on cutting edge research, identifying new hot topics, publishing more review articles and encouraging self citations.

2006 has seen a flurry of press releases from major publishers announcing their ability to increase journal impact factors. Blackwell Publishing announced that 19 Thomson Scientific listed learned journals, which had been transferred to them in 2001, have seen an average increase in impact factor of 21% between 2003 and 2004. Blackwell further announced in July 2006 that two-thirds of their journals increased their impact factor from 2004 to 2005 according to the Thomson Journal Citation Reports, recognising that "impact factors are a significant benchmark of a journal's value". (Foley, 2006)

Cambridge University Press immediately followed with the announcement that the entire Cambridge Journals list has seen an average increase in impact factor of 15.1% from 2004-2005, noting that the equivalent changes in the aggregated impact factors of all the journals in the subject categories relevant to Cambridge, amounted to an average increase of only 6.9%. (Soule, 2006) Taylor and Francis followed suit with details as to their journals increased impact and coverage improvement, particularly in the *Social Sciences Journal Citation Reports*.

Publishers clearly have a vested interest in improving the impact factor of their journals, which then is clearly perceived to flow through into profit margins. The ability to implement increased impact editorial processes is more easily evidenced by large multinational publishers than say smaller learned societies. The impact game is certainly being played by the major parties and it seems that the main focus is arguably no longer the effective dissemination of knowledge, but rather gains in the reward system.

The pressures are even stronger when funding is linked to quantitative measures. Australian researchers responded very clearly to a funding regime based in part on a simple count of publications. The number of publications emanating from universities rose dramatically after the introduction of the government publications collection, with by far the biggest rise in lower impact journals. (Butler, 2003) With no account taken of the quality of either the article itself, or the journal in which it appeared, researchers responded accordingly.

Since 1989 a research incentive system has existed in Spain through which researchers are directly rewarded with salary bonuses for publishing in prestigious journals. Unlike the Australian case, where publication counts were purportedly used as a surrogate for some notion of quality, the Spanish policy was aimed squarely at increasing productivity. A recent study has clearly demonstrated that Spanish researchers also responded to funding stimuli by increasing their output well above long-term trends. (Jiménez-Contreras, et al. 2003)

Publishing obesity?

The UK Publishers Association notes that “While it might be thought that the increased pressure on academics to publish as a result of the RAE has been a boon to the publishing industry, in reality it has had a number of perverse unintended effects on the type, timing and quality of proposals and manuscripts submitted to publishers. There has also been a marked increase in pressure on the editorial boards and journal staff that support the peer-review system, and a discrimination against certain journals because of their impact factor weighting”. (UK Publishers Association, 2002)

One of the results of the desire to publish in high impact journals is an increased flow of manuscripts to those journals and consequent issues for cost structures in terms of peer review and editorial costs. *Nature* has the highest impact of all multi-disciplinary journals. In 2005, 25,000 papers were submitted to *Nature*, according to the journal, but only around 2,000 were published, giving a rejection rate of 90 -95%. A large proportion of the papers then ricochet down the publishing chain with consequent costs to the system.

Recent studies have shown that manuscript backlogs are growing in journals with high impact factors. The *BMJ* had 7,000 research papers, submitted annually with only 7% acceptance; *Journal of American Medical Association* received 6,000 papers with only 6% acceptance; *Science* receives 12,000 papers annually with acceptance of just under 8%; and the *New England Journal of Medicine* has a 6% acceptance rate. (McCook, 2006)

The American Chemical Society (ACS), in a presentation to the International Coalition of Library Consortia, noted that submissions to ACS were up 20% in 2005 over the previous year, thereby requiring a tightening of rejection rates. ACS has seen significant increases in submissions from China and India and editors now handled 500 manuscripts on average. (ICOLC, 2006) This trend is undoubtedly going to accelerate as Asian researchers seek to publish in high impact English language journals.

And cite unseen?

Despite this trend, even within high impact journals, the well-known 80:20 rule seems to prevail, where most citations emerge from a relatively small number of articles. In 2004, 89% of citations in *Nature* were generated from just 25% of the papers (Nature, 2005). Thomson itself notes that recent citation analysis has shown that a core of approximately 2,000 journals now accounts for about 85% of published articles and 95% of cited articles. (Thomson Scientific, 2004)

Doyle and Julian have analysed 31,696 unique articles published between 1995 and 2004 in the journal *Geomorphology*. They found that of those articles, only 22 were referenced at least 20 times, with a vast majority, 92%, cited only once or twice. (Doyle and Julian, 2005)

Chew and Reylea-Chew have found that 10% of papers in a group of radiological journals accounted for 50% of the citations. (Whitehouse, 2001) Garfield notes that from 1900 to 2005 about 0.5% of cited papers were cited over 200 times. Out of about 38 million source items about half were not cited at all. (Garfield, 2005)

Commentators have noted the low use of articles through download factors, for example in the UK 2005 NESLI download figures for university libraries. (Woodward and Conyers 2005) Nicholas has cited the CIBER OhioLINK analysis, noting of 6000 journals available that all but five were not used within the month surveyed. (Nicholas 2006) The cost of the scholarly communication system is already prodigious viewed globally, so with low citations and low downloads for a large proportion of scholarly articles published, what scholarly benefit?

Monograph issues and metrics

The market for research monographs has contracted in recent years for several reasons. With the rise in prices by STM publishers and the adoption by many major universities of 'Big Deal' packages, the proportion of the university library budget spent on monographs has declined dramatically.

The British Academy was sufficiently concerned in 2005 about the future of the scholarly monograph that it included a section in its report *E-resources for Research in the Humanities and Social Sciences*. The following words are extremely relevant in this context, "at some point in the 1990s, the UK academy ceased to be a self-sustaining monographic community: the subjects that have survived and/or thrived in this context have been those (like economics or linguistics or classics) with international appeal". (British Academy, 2005)

As with serials and research assessment exercises, the reward systems influence scholarly communication patterns in the monograph arena. Cronin and La Barre indicated, from a survey of the major US Ivy League universities in 2004, that a scholarly monograph is still an essential prerequisite for promotion and tenure in those universities, yet the outlets for monograph publishing via university presses have declined. (Cronin and La Barre, 2004) The monograph therefore becomes a physical symbol for tenure and promotion rather than an effective model for the distribution of the research contained within the book.

The Modern Languages Association (MLA) in America had highlighted in 2002 the problems of scholarly monograph publishing, particularly for the younger scholar. MLA returned to this topic in December 2005 deploring the "fetishization of the monograph" and called for new metrics to demonstrate scholarly worth, such as a body of articles, translations of works, electronic databases, etc. (Inside Higher Ed, 2005)

Researchers in the social sciences and humanities have more problems than those in science in obtaining global distribution of their output. It is therefore surprising that they are particularly conservative, in terms of the understanding and acceptance of new modes of publishing access and distribution. Many researchers seem unaware of the potential of various methods of e-scholarship such as e-presses and institutional repositories.

There are far fewer documents in institutional repositories from the humanities than from STM disciplines. (Allen, 2005) This result has been confirmed by a recent major German study in which in a survey of 1000 researchers, found that more doubts were expressed about open access publications by researchers in the social sciences and the humanities compared to those in the sciences. (Deutsche Forschungsgemeinschaft, 2005)

New models of monograph publishing are emerging to overcome the academic monograph 'crisis'. The role of institutional repositories is also crucial in terms of providing alternative means for the dissemination and preservation of a university's research output. If these are included in new reward systems they could provide a framework for a fundamental shift in the processes of knowledge distribution. Institutional repositories have potentially significant benefits for institutions if they are integrated holistically into university frameworks. (Steele, 2006)

New metrics?

When it seemed possible early in 2006 that the UK RAE peer review process might be abandoned in 2008 for a solely metrics exercise, there was instant euphoria by some 'open access evangelists' that this would ensure that researchers would deposit their articles in institutional repositories and thus allow for new metrics to be adopted. But, unless new fully tested metrics, are accepted by the traditionally conservative peer review panels and bureaucracies, then this euphoria could prove to be short lived and the increasing trend to publishing within conventional reward systems will continue.

Within the traditional publishing environment, Elsevier's Scopus is clearly going to be a tool that competes with Thomson Scientific's current 'monopoly' of citation dominance. A recent as yet unpublished analysis by Elsevier's Scopus has indicated that 15% of the top 160 journals in which Australian researchers have published between 2003 and 2005 are non-Thomson Scientific journals.

The entry of Scopus into the metrics world of Thomson Scientific has already provided an element of competition, but as with the scientific journal environment, it is unlikely that one product will displace the other and many universities and libraries will need to purchase both products. Elsevier announced in July 2006 that three Australian universities have chosen Scopus to support their literature research workflows, monitoring the performance of researchers within their institutions and to identify "hottest topics and most cited papers and researchers". (Reed Elsevier, 2006)

Increasingly, a composite basket of metrics will need to be developed utilising a variety of sources such as Scopus, Google Scholar and Microsoft's Windows Live Academic Research. Google Scholar is another potential additional metric resource,

although there have been criticisms of methodological flaws in Google analyses. (Jasco, 2005) Google also picks up references which are not strictly citations but rather references to a more ephemeral links which could relate more to assessments of societal rather than academic impact, such as in the Australian RQF.

Usage factors could become as important as citation factors. The United Kingdom Serials Group (UKSG), in association with COUNTER is funding a study exploring how online journal usage statistics might form the basis of a new metric of journal quality. Analysis of download data can provide further journal impact factors not captured by Thomson Scientific. (Bollen et al, 2005) The linking both by Thomson and Scopus in recent initiatives of journal usage on campus with journal impact factors is another reflection of the increasing sophistication of measuring tools.

Several commentators have analysed alternative metrics in the open web environment. (Shadbolt et al, 2006) Adams has indicated that early citation counts correlate with accumulated impact, which this ties in with publication of material in open access formats such as relevant journals and institutional repositories. (Adams, 2005) Depending on the discipline, citations can increase between 25% and 250% compared to papers in the same journal but not on open access. (Sale, 2005)

Brody and others have analysed how short term web usage predicts medium term citation impact, ie web usage statistics are predictors of later citation impact. (Brody, Harnad and Carr, 2006) Eysenbach has also found in a comparison of citation rates in the *Proceedings of the National Academy of Sciences* that open access articles are cited earlier and, on average, more often. (Eysenbach, 2006)

In the Australian RQF exercise there has been interest from the smaller universities in what might be termed 'predictive' indicators, compared to the 'regressive' Thomson Scientific indicators. Open access may well be as good an indicator of predictive impact as one is likely to see?

Towards an holistic approach

The dysfunctionality of the scholarly communication system has been termed the 'Jekyll and Hyde' syndrome, as the academic researcher adopts one set of values as a creator of knowledge and a markedly different one as the reader of research publications. (Guedon, 2001) The researcher in many cases bears little, or no responsibility for the purchasing of the scholarly information he or she has 'given away', as termed by the University of California. Researchers need to be a key component in scholarly communication debates, but rarely are in terms of holistic understandings, remaining 'locked away' in their disciplinary confines both as creators and readers.

University libraries themselves employ a 'merchant model' in dealing with publishers and a 'community model' in dealing with staff and students. Reward systems and library purchasing patterns also tend to cross link, particularly in North America, where Cameron has indicated how librarians rely on the Thomson Scientific journal impact factor as a tool for selecting periodicals. (Cameron, 2005) This is compounded by the library 'Big Deals' in which a publisher 'bundles' together, in one electronic package, all their publications and libraries buy the whole output.

Wiley, Elsevier and Springer 'Big Deals' have achieved over 70% of market penetration of the 89 American Research libraries surveyed, while Blackwell's took a 60% market share. (Hahn, 2006) Such deals tend to squeeze out the publications of learned societies in the research library market, along with monograph purchasing.

EPS Services Limited have recently indicated that the STM information market is likely to reach 11 billion dollars by 2008 and report:

Publicly-traded STM publishers grew 8.6% in their reported currencies in 2005; aggregate profit margins held steady at 25%. Thomson posted the strongest increase in profits with a year-over-year gain of 20.5%, outperforming its peers and the market average of 17.7%. Elsevier achieved the strongest organic growth: 5% and 6% in its Science & Technology and Health Sciences divisions, respectively. The five largest players (Reed Elsevier, Thomson, Wolters Kluwer, Springer and Wiley) continued to acquire scale, and now account for over half (52.3%) of total market revenues. (EPS, 2006)

Elsevier note that the average increase in 2006 of journal prices, across all STM publishers, was 8.1% in Europe and 9.82% in the US. They note that the average Elsevier price increase for Elsevier journals in 2007 will be 5.5%. (Menefee, 2006) These figure remains significantly higher than annual library budgetary increases. So, as Worlock has stated, "the wheels have certainly not come off the subscription model quite yet". (Worlock, 2006)

To return to Sulston's concerns:

How are we to ensure the university's contribution to a fairer world, if access to the research it produces about the world is itself a source of inequality, if for no other reason than faculty indifference over access rights, as they vainly pursue the glory of appearing in the top titles in the field?...Universities may now be at risk ...of 'becoming a branch office of conglomerates and corporations' ... Yet the knowledge that the universities produce already stands, in too many cases, as corporate assets for Blackwell, Springer, and Elsevier...The open access movement has done no more than demonstrate how the right to know can be more fully realized by more people, if scholars and researchers seize hold of current opportunities. (Willinsky, 2005)

Research assessment exercises and global league tables, which arguably enshrine and encourage traditional conservative publishing patterns, may now prove to be catalysts for change through the introduction of new metrics and the accessibility of national best research outputs, for example in the UK RAE and the Australian RQF 2008 exercises.

Harnad and his colleagues have argued that collection of publications on campuses "would have the effect of seeing research papers linked to CVs for "online harvesting, scientometric analysis and assessment". (Harnad et al, 2004) In Australia the RQF has been linked to the development of an "Accessibility Framework" to make Australian research more publicly accessible.

Research assessment exercises and university league tables may thus impact on two potential paths for scholarly publishing. One in which the Thomson Scientific dominated metrics are accepted, particularly for the hard sciences, as a reliable tool for research quality assessment. This will accentuate the trend by researchers into publishing in existing high impact journals and indirectly increase the profits of the

leading multinational STM publishers. The other variant is that new broader metrics will be required, particularly for the social sciences and the humanities, and that these may well play out in the context of open access developments, notably via institutional repositories, to collect and harvest national “best research output”.

Ultimately, the prime issue is surely to disseminate research knowledge, which has been funded by tax-payers, as effectively and openly as possible, rather than for that knowledge simply to be seen as a static and dormant symbol of research ranking, both individually and collectively. The ideal would be to merge both processes in a return to some of the original motivations of scholarly publishing, rather than those that are currently being fashioned, either explicitly or implicitly, by multinational publishers on the one hand and governmental induced metrics on the other.

More public good benefits from the scholarly communication system, will be achieved, if we review “the whole value chain, from initial research proposal to article citation and archiving”. (Olivieri, 2006) To achieve this, a more structured dialogue is needed between the constituent parts of the scholarly communication chain, with an agenda which places access to research literature and the economics of scholarly publishing within the broadest contexts. (Houghton, 2003)

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Bios

Colin Steele is Emeritus Fellow at the Australian National University. Linda Butler is Head of the Research Evaluation and Policy Unit, RSSH at the Australian National University. Danny Kingsley is a PhD student at the Australian National University.

