

Open Access brings benefits for a variety of constituencies. Researchers gain from the increased usage and impact of their work. Their institutions benefit from the aggregated usage and impact of their researchers and the increased presence that Open Access brings. Society benefits from better technology transfer, better diffusion of know-how and a better-informed populace.

Open Access helps research to be carried out more efficiently by reducing duplication and blind alley research, by enabling researchers to find what they need more quickly and without cost and by helping researchers develop and diffuse the use of open standards. It makes possible better peer review and other methods of upholding academic rigour because researchers can easily see and judge the work of their peers and can access data for re-analysis and independent confirmation of findings. It also encourages collaborative endeavours by making research visible to new communities, including the general population.

Academic impact from Open Access

The authors of academic works enjoy increased visibility, usage and impact of their research outputs when they are made Open Access. Because Google and other web search engines index Open Access repositories, authors' work is easily found and retrieved by others.

Visibility

This visibility is new: without Open Access, the only way to see academic work is by paying for subscriptions to journals or by paying a fee to view an article on a publisher's website. This has the effect of restricting access to all but the minority who can afford to pay for access in these ways. For those of us who work in universities with well-stocked libraries, it is sobering to note that the World Health Organization found in a survey conducted at the start of the millennium that more than half of research-based institutions in lower-income countries had no current

subscriptions to international research journals, nor had they had any for the previous 5 years. Unsurprisingly, researchers in developing countries rank access to the research literature as one of their most pressing problems ⁽¹⁾.

"There is no doubt in my mind that ePrints [the Open Access repository] will have improved things ... many more access my papers who wouldn't have thought of contacting me personally in the 'old' days. While this may ... increase ... citations, the most important thing ... is that at least these people can find out more about what others have done..."

Professor Martin Skitmore, School of Urban Design, Queensland University of Technology, Brisbane

But it is not just in the developing world that access is an issue. In survey after survey, it is found that researchers in the wealthy, developed world also run into problems accessing what they need. A recent study by the Research Information Network in the UK, for example, found that although researchers report no problems in finding the information they need, gaining access to it is still difficult ⁽²⁾.

By making their work Open Access, researchers are helping to create a global knowledge commons so that all may benefit.

Usage

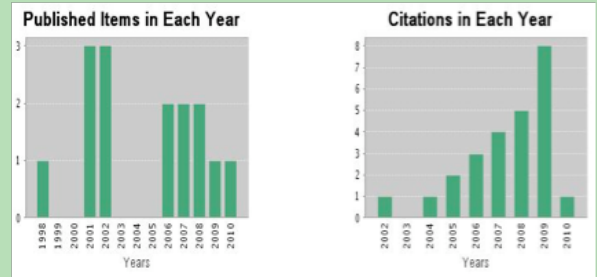
Visibility translates into usage. Download figures from repositories indicate the latent demand for research information that has traditionally been locked up behind pay-walls, accessible only through subscription or by paying for individual article access. For example, the items in the University of California's large Open Access collection, eScholarship, are viewed well over a million times per year. At School level the activity is even more illustrative of this level of latent demand, with downloads of the 7-8,000 full-text items from the University of Southampton's School of Electronics & Computer Science repository averaging around 30,000 per month.

"Self-archiving in the PhilSci Archive has given instant world-wide visibility to my work. As a result, I was invited to submit papers to refereed international conferences/journals and got them accepted."

Philosophy researcher, USA

Case study: Martin Skitmore

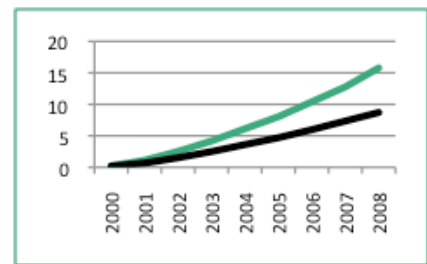
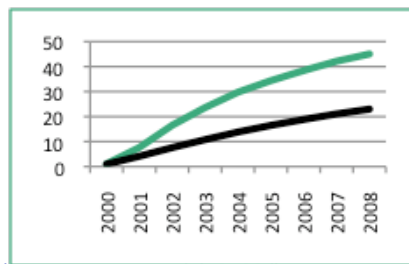
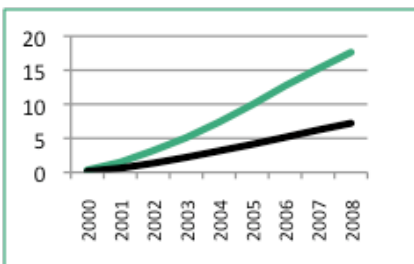
Professor Martin Skitmore (see box above) began to do deposit his articles in the repository at Queensland University of Technology in 2004. The charts here show the number of papers published (left chart), which do not increase year on year, and the citations to those papers (right chart), which increase as Skitmore makes his work openly available through QUT's repository, which he began to do in 2004 when a mandatory policy was introduced at the University. There are numerous other examples like this, from this university's repository and others.



Source: Web of Science (Thomson Reuters) Note: citation data incomplete for 2010

Citation impact

This high usage brings ensuing benefits in terms of impact. It can be impact in the traditional academic form – citations to the work. A substantial literature is growing up on the effect of Open Access on citation impact^(3,4,5). Citations tend to rise when an author starts making his or her work Open Access. Importantly, the citation advantage persists - and frequently increases – as time goes on. This is probably explained by the fact that citations feed upon citations, so the earlier an author makes their work Open Access the better chance of maximising citation impact. The graphs below show the Open Access citation effect in a sample of disciplines – engineering, clinical medicine and social sciences. The vertical axis shows citation numbers to papers; the horizontal axis shows time since publication in the year 2000. The **black curves** are the citations to articles that are published in toll-access journals and not made Open Access: the **green curves** are papers that are Open Access from the date of publication.



(Data from Gargouri & Harnad, 2010: <http://eprints.ecs.soton.ac.uk/18493/>)

Impact for universities

Impact can also be in other forms. Perhaps the most important of these is the way academic research impacts upon society outside the research community. Universities are now under increasing pressure to strengthen their competitive position and to demonstrate the value that they bring to society. Open Access can help a university with both these things.

Competitive profile

One of the ways by which a university can enhance its profile and presence is by showing off its research programme. An institutional repository, full of up-to-date research outputs, does this job superbly well. Repository content is indexed by Google so anyone – potential research

Case study: University of Southampton

There are a number of world rankings of universities. Some, such as the Shanghai Jiao Tong's Academic Ranking of World Universities, measure purely academic impact: others, such as the QS-Times Higher Education World University Ranking, include some elements of subjective peer review: and yet others use Web-based criteria to measure presence and profile. One of these is the Webometrics Ranking of World Universities (<http://www.webometrics.info/>), produced by the Spanish National Research Council, CSIC, measuring a range of indicators. In this, the top four UK universities in the ranking are Cambridge (ranking position 1), Oxford (3), Edinburgh (4) and UCL (8).

The next UK university to appear is Southampton (ranked 12th in the European ranking), punching above its weight for a university of its size. This outstanding performance by Southampton is due to its huge web presence as a result of having a well-filled institutional repository and one in the School of Electronics & Computer Science. Between them, these digital archives have tens of thousands of full-text, freely-available research articles, generating huge usage levels and impact for Southampton.

staff, potential students – around the world searching the Web using keywords will be alerted to these outputs and have instant access to them. A repository is an excellent showcase for any university eager to build its profile and reputation.

Knowledge transfer

One of the main efforts of universities is to transfer knowledge and know-how to the education and business communities, and to diffuse cultural and scientific understanding and appreciation to the public at large. Open Access facilitates these things. 'Citizen Science' is becoming an increasingly successful collaborative venture between university research groups and interested lay people. Projects such as Einstein@Home and Galaxy Zoo show the progress that can be made when public effort is incorporated into a communal effort, led by scientists but unable to achieve full potential without citizen involvement. These projects work on Open Science principles and make their data and findings freely accessible to all.

"With a small oncology company ... it is imperative that I have access to the literature. But small companies do not have the "deep pockets" necessary... The for-profit journal publishers have effectively barred access to key scientific information except to those who can afford their outrageous fees. Much of the most innovative work is being done at companies like mine that cannot afford to pay \$30+ per paper or pay per-search charges in abstracts or journal collections."

Terence Dolak, SDR Pharmaceuticals

Open Access is the answer to one problem encountered by R&D-based SMEs (small and medium-sized enterprises. Studies indicate that SMEs find it difficult to access the research information they need as they cannot afford to pay for journal subscriptions and publisher licensing restrictions mean they cannot use their local university's electronic library^(6, 7).

Moreover, regular European Innovation Surveys conducted on behalf of the European Commission have shown that universities and research institutions come at the bottom of the list of partners that SMEs use for their innovation activity⁽⁸⁾.

Opening its research literature to the wider world will therefore place a university in a position where the knowledge it is creating can much more effectively be diffused: the university can better contribute to the knowledge economy and find it much easier to forge industrial and business partnerships.

Case study: industrial partnership

"Just last week, the General Manager of Sustainable Development from an Australian rural industry called me – based on reading one of my research papers in [QUT] ePrints. He loved what he read – which he thought was the most clear approach he'd seen on quantifying social impact – and we are now in discussion about how we can help them measure their industry's social impacts."

Dr Evonne Miller, Senior Lecturer, Design, Queensland University of Technology, Brisbane

"We submitted a patent application however, we got one remark from the patent authorities that stated that [some of this] was known and published [in] a scientific paper. ...We had to send supplementary data and information to the patent authorities explaining that our invention was different than the prior [one].

This came approximately at the same time as we were about to close a financing round. As a consequence our closing was delayed In this period we were really broke and we could not afford to do any experiments. New experiments were essential ... otherwise we would have to withdraw four other patent applications we had filed.

The lesson is that if we had had access to the scientific paper then we would have been in a much better position."

CEO, small pharmaceutical company, Denmark

Economic IMPACT from Open Access

Open access can have economic benefits, too. Recent economic modelling work by the Australian economist, John Houghton, has shown that nations would enjoy savings from switching to Open Access models as the basis for scholarly communication. The UK, for example, would enjoy annual savings of around £400 million a year from Open Access⁽⁹⁾. Nations with smaller research programmes would also benefit: The Netherlands could save some €133 million a year and Denmark around €80 million a year.

But the savings do not only accrue at national level. It is possible to model the benefits at institutional level too⁽¹⁰⁾. A typical UK university might save some £500,000-600,000 per annum and a large research-intensive university might save considerably more.

There is more, however, and this revisits the issue of universities demonstrating their value to society. One of the figures calculated by this economic modelling is the economic return to research and development; that is, the value of the knowledge that they set free by making their research Open Access.

This knowledge can be used not only by the academic research community but also in the wider knowledge economy by professional and practitioners, by businesses and industries, and by others outside the research community itself. Open Access to research can increase the value of this contribution to the knowledge society for a typical UK university by over £500,000 per year: for one of the UK's 'elite 5' institutions, the value of this contribution is nearly £3 million per year.

Modelling the economic benefits of Open Access at institutional level is now being done for universities around the world, so there will soon be additional examples to examine.

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