

How to Think about the Pace of Substitution of Open Access Academic Journals for Traditional Subscription Journals

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Introduction

As librarians, academic authors and editors, publishers, and others interested in scholarly communication consider the future, one of the pressing questions is: How fast will open access journals replace traditional subscription journals? It is clear that there are more open access journals now than a few years ago and that open access journals have become an important vehicle for some scholarly communication, but how long will we have to wait for this vehicle to become dominant?

This paper will consider this question and use a simple model to explore it.

The conclusion is that between 2018 and 2019 open access journals are likely to comprise 50% of all academic journals and should be approaching 90% of all academic journals by 2022.

While the data used in the study has some limitations and the methods are somewhat crude, I believe the conclusions are generally sound. I would invite others to refine the data and the methodology.

The Growth of Open Access Journals

Since 2002 the *Directory of Open Access Journals* compiled by the Lund University Libraries has attempted to list all academic open access journals published in the world.¹ We will use this as the measure of the growth of the number of academic open access journals. The *Ulrich's Periodical Directory* lists about 90,000 serials as indexed or abstracted. We will use this figure as the total universe of academic journals.² We will assume a 2% increase per year in the number of academic journals. Using these figures we see that the percentage of the total universe of academic journals that is comprised of open access titles

has grown from nearly nothing in 2002 to about 5% in 2009. The figures are shown in the Table 1.

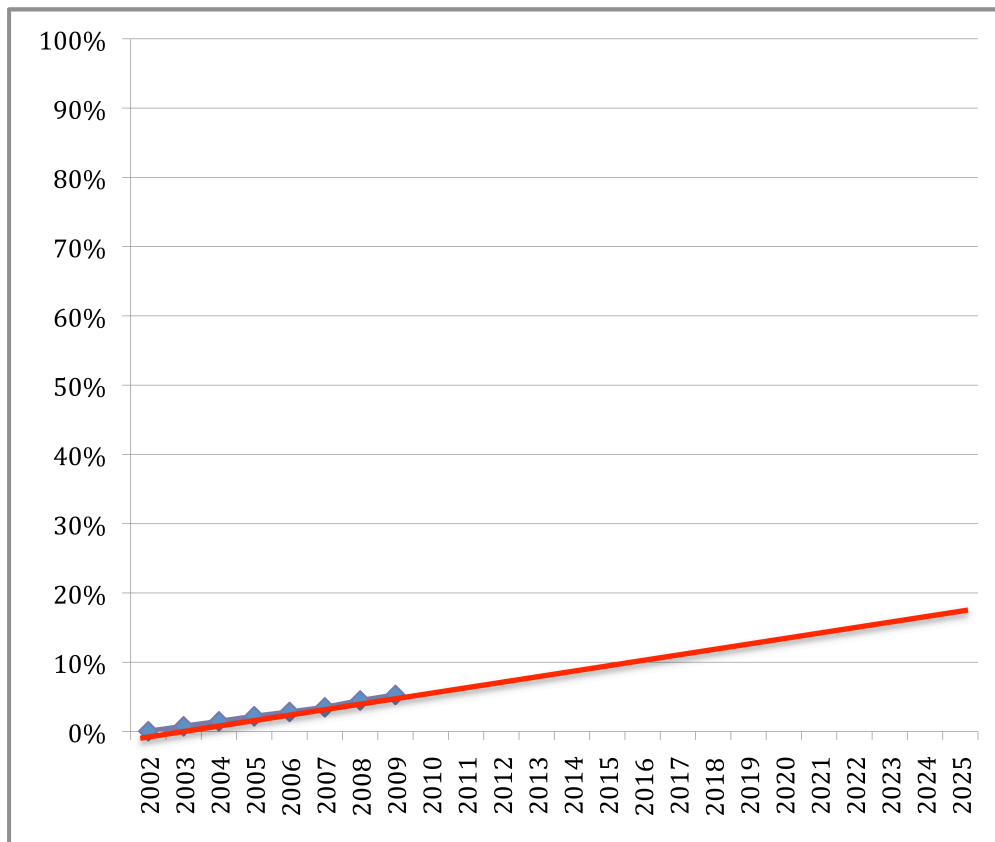
Table 1: Open Access Journals as a Percentage of the Total Universe of Academic Journals

	Open Access Journals	Total Academic Journals	Open Access as a % of Total
2002	30	78,131	0.0%
2003	592	79,726	0.7%
2004	1,172	81,353	1.4%
2005	1,785	83,013	2.2%
2006	2,322	84,707	2.7%
2007	2,909	86,436	3.4%
2008	3,774	88,200	4.3%
2009	4,508	90,000	5.0%

If we plot the growth of open access journals and then extend the trend line as shown in Figure 1, the results are somewhat depressing. The trend line indicates that by 2025 open access journals will comprise less than 20% of the total universe of academic journals. If this were the correct way to evaluate the problem we would be confronted with the prospect that commercial publishers of subscription journals will continue to dominate the market for academic journals for some time. Certainly for librarians and others who had hoped that open access would provide relief from the constant pressure of large journal price increases, this is not good news.

Fortunately, this not the correct way to predict the future.

Figure 1: Straight Line Projection of Open Access Journals as a Percentage of the Total Universe of Academic Journals



The Adoption of Disruptive Innovations

Disruptive innovations, like open access journals, do not replace older products in a linear fashion. As Clayton Christensen and his colleagues explain:

This transition is neither abrupt nor immediate. When a new approach or technology substitutes for an old one because it has a technological or economic advantage over the old, the substitution pace almost always follows an S-curve... The S-curves are sometimes steep; other times they are gradual. But disruptions almost always follow the pattern: the initial substitution pace is slow; then it steepens dramatically; and, finally, it asymptotically approaches 100 percent of the market.³

This pattern creates a problem in projecting the future when the innovation is new and on the initial flat part of the curve. As Christensen puts it, "If I'm on the initial flat portion of the curve, how can I know whether the world will flip on me next year, in 10 years, or not at all?"⁴

But, as Christensen goes on to explain, it turns out there is a way to forecast the flip. If you plot the ratio of market share held by the new product, divided by the share of the old product and use a logarithmic scale for the vertical axis, you can use a straight trend line to get a good projection of what will happen in the future with a disruptive innovation. As Christensen explains, “The reason the line is straight is that the mathematics ‘linearizes’ the S-curve. When the substitution pace is plotted in this way, one can tell what the slope of the line is even when the new approach accounts for only 2 or 3 percent of the total.”⁵

When this methodology is applied to the substitution of open access journals for traditional subscription journals we get the results shown in Figures 2 and 3.

Figure 2: The Pace of Substitution of Open Access Academic Journals for Traditional Subscription Journals

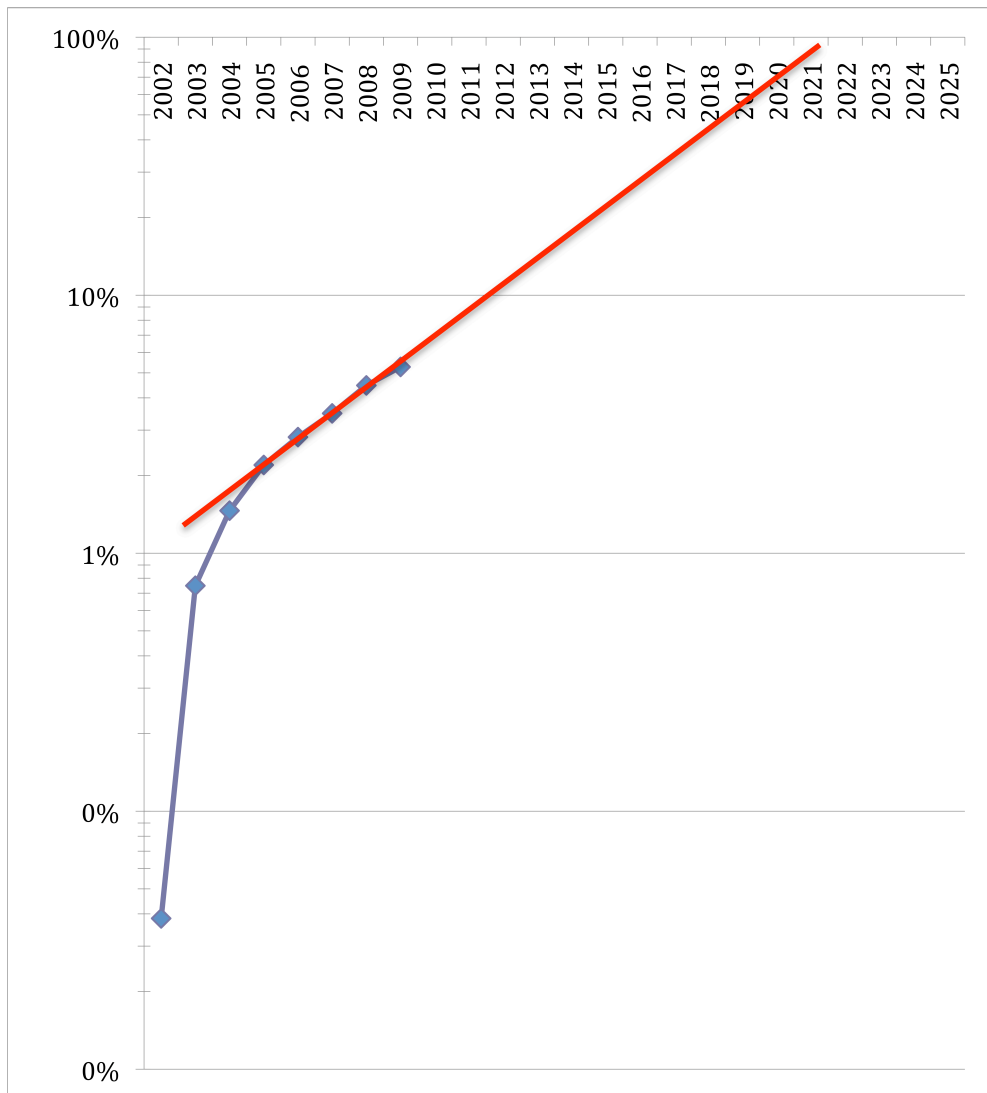
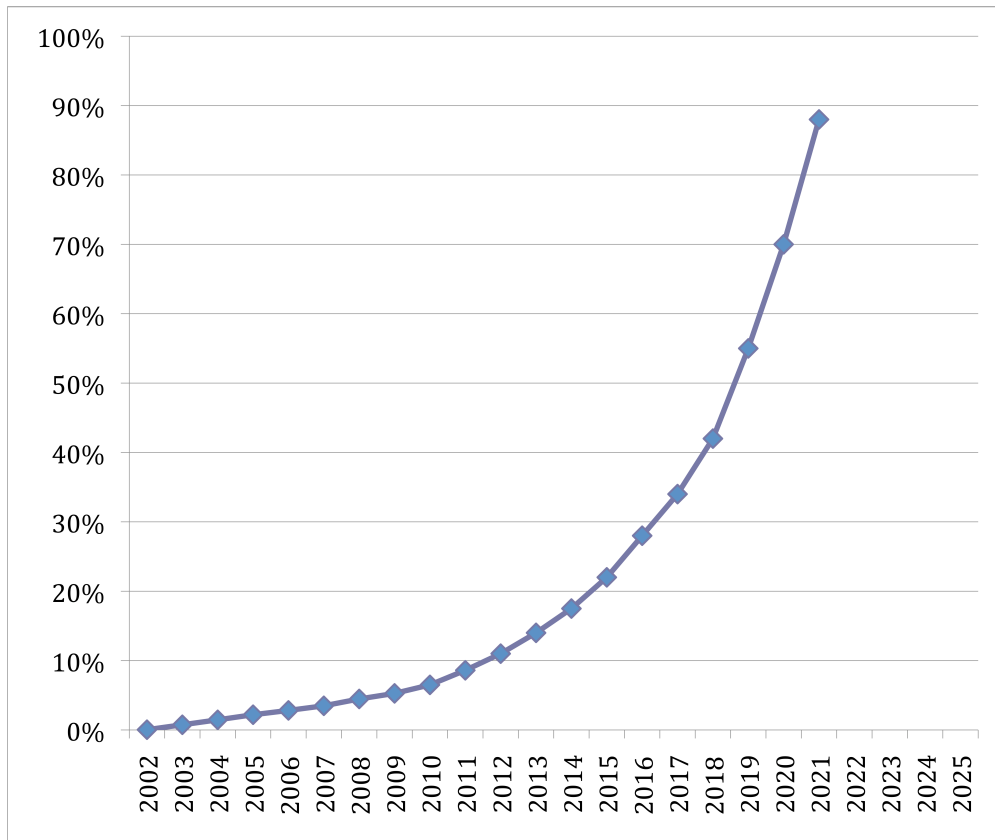


Figure 3: The Pace of Substitution of Open Access Academic Journals for Traditional Subscription Journals



Between 2018 and 2019 open access journals are likely to comprise 50% of all academic journals and should be approaching 90% of all academic journals by 2022.

This is very good news.

Are Academic Journals Like Other Goods?

An interesting and important question for this analysis is whether or not academic journals are like other goods. Will the substitution of open access for subscription journals work in the same way as the substitution of transistors for vacuum tubes?

Academic journals are arguably a different sort of good. In the past they have existed in at two markets. The first has been the market for the purchase of the finished product. Individuals, although this is a declining portion of the market, and libraries purchased academic journals from publishers in order to acquire the

knowledge contained in the journal. With the open access journal this market is no longer an issue, as the content is not sold, rather it is given away.

The more important market is the market for good articles in which the journals compete for the best papers and “pay” authors not with money, but with the promise of enhanced prestige and reputation. Authors use these markers of enhanced prestige and reputation to increase their ability to get promotion and tenure, to make themselves more competitive for grants, and to negotiate for higher salaries. Authors are looking to enhance their reputations in two ways. First, they want their work to be widely read, used, and cited. They want their work to be known and respected by colleagues. Second, they want it to be published in journals with a high impact factor, because this is often used as the easy indicator of reputation in promotion and tenure decisions. Arguably, subscription journals, because of their longer history, are in a stronger position in the second way on “paying” authors, and open access journals, because they are one click away from everyone with an internet connection, has the advantage in the second means of “payment”.

So while this analysis focuses on the number of titles, the real measure of substitution should probably be whether open access or subscription journals get the best papers and what is the rate of change in this area.⁶ This is a complex question that is beyond the scope of this paper, but it seems that we do have a market with two different models competing and that the basic dynamics of Christensen’s substitution framework should hold.

It is interesting to note that to date much of the success in open access publishing has been outside the established academic centers of North America and Europe. This would be what Christensen would predict. Innovative disruptions nearly always begin where they can compete against non-consumption. Scholars outside the traditional academic centers have had trouble getting their work in front of a worldwide readership with subscription journals soon open access provides something they could not otherwise achieve. That open access begins to be dominant at the periphery should not be a surprise nor should it lead us to alter our predictions about how it will impact other markets.

Implications

If this method of projecting the pace of substitution of academic open access journals for traditional subscription journals is valid, and I see no reason why, if Christensen is correct, it should not be, then it will have several implications for scholarly communication.

1. Academic libraries can anticipate that the number of subscription journals they will need to support will decline significantly over the next decade and these resources can be reallocated to other efforts.

2. The ability of academic libraries to spend less on subscription journals will provide a source of funds to support open access journals and other forms of digital scholarship, thus producing a virtuous circle.
3. Publishers of traditional subscription journals will need to migrate their titles to an open access model or find other markets or products.
4. Academic and professional societies that have used their journals as a means of subsidizing other activities will need to find other means to do so. One would hope they will embrace open access journals as a valuable membership benefit, even if it means having to significantly adjust their economic models.
5. Scholars and researchers in less well-resourced institutions and the general public will have access to nearly all research and scholarship.

Conclusion

Open access advocates have struggled long and hard and if the results to date are extrapolated into the future in a straight-line fashion, one can only wonder whether the work has been worth the effort and whether the promise we see will ever come to pass.

What we need to understand is the pieces are now falling into place. Creative Commons has developed an effective intellectual property regime. The Open Journal System provides an easy, inexpensive, and powerful platform for producing open access journals. The *Public Library of Science* demonstrates conclusively that a journal of the highest quality can be open access. Libraries and others are beginning to provide ongoing institutional support for open access ventures. Google Scholar provides both the means of discovery and citation counts. The pieces of the alternative value chain required for the innovative model of open access journals to be successful are quickly falling into place. The world is ready to flip.

This flip will happen at a pace that will likely surprise even the most optimistic open access advocates. Within a decade open access will be the norm. Young scholars and researchers will wonder how one could ever have considered publishing in a journal that was not available to everyone. Young librarians will find the serials crisis an interesting historical oddity not unlike the catalog card. And those of us now in the midst of the fight will look back and wonder why we ever doubted we would win in the end.

It will be a good time.

Notes

¹ *Directory of Open Access Journals* country list available at: <http://www.doaj.org/doaj?func=byCountry> (accessed December 17, 2009). There are some indications that the *Directory of Open Access Journals* because it sets a high bar for the review process before including journal, that their figures may somewhat underestimate the total number of academic open access journals.

² The figure of 90,000 titles is probably high and the number of academic journals has certainly grown since 2003. However, using this figure if anything understates growth of open access journals and leads to a conservative estimate of the future. The 2% growth figure is also probably high and this again leads to a conservative measure.

³ Clayton M. Christensen; Michael B. Horn, and Curtis W. Johnson, *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns*, New York: McGraw-Hill, 2008, page 96.

⁴ Clayton M. Christensen, et. al., *Disrupting Class*, page 97.

⁵ Clayton M. Christensen, et. al., *Disrupting Class*, page 98.

⁶ One approach would be to look at the growth of the impact factor of open access journals as compared to established subscription journals. If open access journals impact factors increase at rapid rates and if they catch their the competitive subscription titles in their field, this would confirm the conclusion reached in this paper.