Scholarly Communication:

The Wild & Wonderful World of Digital Tools & Services

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Once upon a time the academic publishing process was relatively straightforward. Authors, or would-be authors, submitted articles to journals, which were peer-reviewed and then accepted for publication – or not, if they weren't deemed noteworthy enough. As far as the author was concerned, that was pretty much it, apart from checking the page proofs. Libraries carefully kept sets of all the major journals and filed them for subsequent reference.

Contrast that with the situation today! That simple world of scholarly creation has exploded in many directions simultaneously. Pity the poor academic author, or the librarian trying to help them steer a path through the following graphic, which tries to summarise recent developments in scholarly communication:

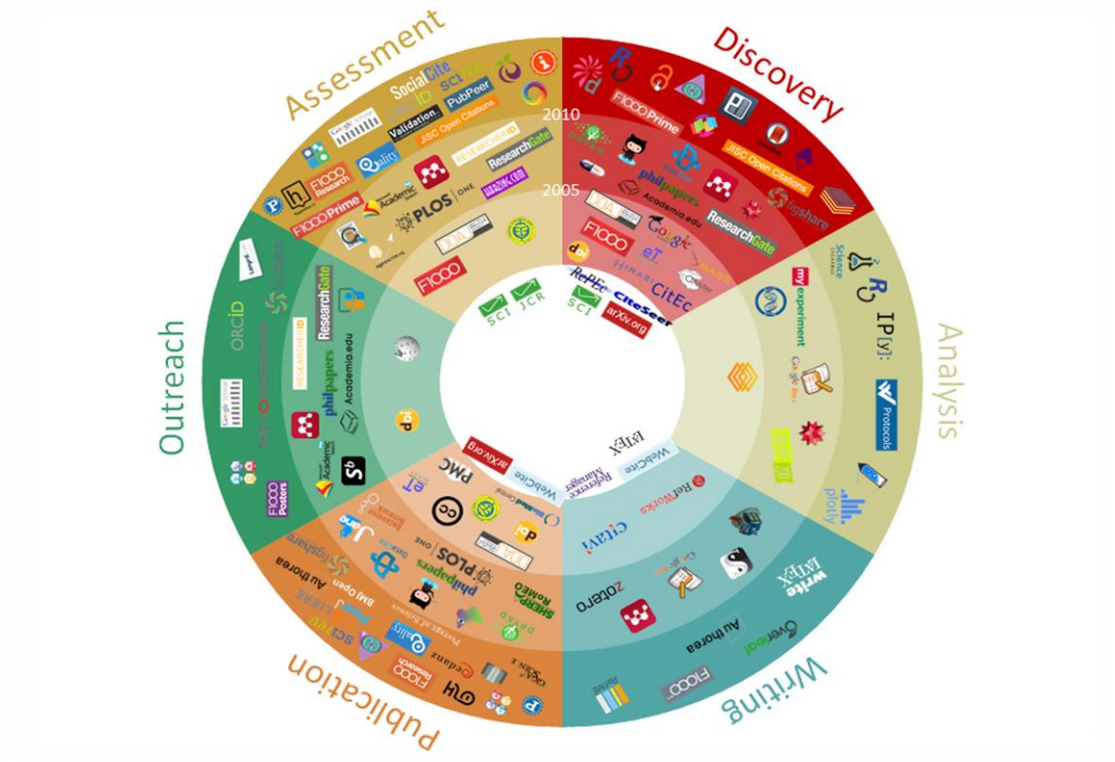

Figure 1 101 Innovations in Scholarly Communication (Kramer & Bosman) (CC-BY)

This graphic was prepared by two Dutch librarians, Bianca Kramer and Jeroen Bosman, both at Utrecht University Library. It has been very successful as a visual presentation of the many digital tools available in scholarly communication. Each element of the graphic represents an agent in the chain of academic communication, which Kramer and Bosman have helpfully grouped into six main areas:

- Discovery, finding of content, or the research process
- Making sense of the raw material or data (analysis)
- Creating the article (writing)
- Delivery of the content (publication)
- Dissemination of the results (outreach)
- Assessment of published articles (assessment)

The diagram can be seen at https://innoscholcomm.silk.co/. It looks colourful and reasonably accessible, but a few minutes of reading about the project shows very clearly how the digital scholarly communication world has become more complex. In fact, the graphic above simplifies things: the authors point out that the 101 innovations in the diagram were already selected from a list of 200 innovations in the initial compilation, and they have continued to collect details of further innovations until their list now includes over 400 items. Kramer and Bosman have carried out an exceptionally useful review of available tools; each innovation is carefully annotated by categories such as date of launch and which part of the scholarly workflow the tool affects:

3	name (blue ones were added last month)	link	year of weblaunch / introduction / founding	primary phase of workflow targeted	phase order	what is/does it? (free text)
74	CitEc (Citations in Economics)	http://citec.repec.org/	2004	search (lit/data/patents/code)	3	extracting references and citation from economics publications
75	JISC Open Citations	http://opencitations.net/	2011	search (lit/data/patents/code)	3	making references available
76	Metalib	http://www.exlibrisgroup.co	2002	search (lit/data/patents/code)	3	federated search
77	Baidu Scholar	http://xueshu.baidu.com/	2014	search (lit/data/patents/code)	3	scholarly search engine (Chinese)
78	Europeana	http://www.europeana.eu	2008	search (lit/data/patents/code)	3	search documents and artefacts from the European heritage institutions
79	Hathi	http://www.hathitrust.org/	2008	search (lit/data/patents/code)	3	preserve and disseminate collections of partner institutions in digital form
80	JSTOR	http://www.jstor.org/	1995	search (lit/data/patents/code)	3	database of journal articles, books and primary sources; some public domain material, back files
81	Open Grey	http://www.opengrey.eu/	2011	search (lit/data/patents/code)	3	search grey literature (in Europe), data from

Figure 2 400 Scholarly Tools (Kramer & Bosman)

What is different about this new world? Most importantly, much of the activity has passed to the end user – not just the use of the tool, but also its selection and intelligent use. To give a simple example, Zotero, the well-known reference management tool, is listed under "writing" – it is indeed an innovative open-source tool for managing reference and citations. Using Zotero, the author can compile a list of citations. But in addition, Zotero (and similar tools such as Mendeley) can be used by the author to store a library of PDFs that will be used in the writing of the article – in other words, part of the discovery process. What is interesting about Zotero is that the author, or librarian, will probably

have discovered this tool for themselves and learned how to use it single-handedly (albeit perhaps helped by staff from a library, if the author is fortunate enough to find the relevant website and/or attend a training course). When you multiply this necessary learning activity by 101, or by 400, the magnitude of the task faced by the user becomes apparent.

Here is an example. In the area of dissemination, several new initiatives are now widespread. The diagram lists the following:

- Mendeley
- Google Scholar
- Academia
- ResearchGate

For all the resources above, registration is necessary so the author can make effective use of the tool. Once the service knows who you are, it can provide benefits based around your background, your activities, and your preferences – and we mostly see the benefit in providing our details for these services to do their work. For example, by creating an account on Google Scholar, you can have a library of recommended articles and chapters, a list of citations to your work, and so on. But if it is necessary to create an account with all of these tools, then an irritation factor starts to creep in. I have to remember a username and password – and not lose them. Next time I log in, I usually forget what the username was (or which email address I used when I created the account – was it my work email or my home email?). In this respect, of course, Google Scholar is an exception, linking platforms, services and tasks under one Google ID. But perhaps this is the reason why many people are suspicious of allowing Google to embrace all of their Web activity.

There is no question that all these tools have valuable benefits for everyone involved in the scholarly process, but deciding which of them to use is a real challenge. One suggestion is to use all of them, but this starts to convert the activity of the scholar into that of a full-time digital researcher, since each service has not only to be investigated at the start but also followed in detail as the product evolves. If each of these 101 (or 200, or 400) services requires registration, a login, a discovery process (since it takes time to become familiar with what each of the services provides), then it leaves little time for doing anything else!

However useful these tools might be, the truth is that there are too many of them for most of us even to find out about. It's perhaps not surprising in the attritional world of digital publishing that some of the new tools last only a year or two before disappearing. One contender as the record-holder for brevity was a new service from HighWire, Stackly, that lasted only a few months after its release before being closed down earlier last year. By the time would-be users had started to find out about it, it had been removed.

Finding out about new initiatives

How is the researcher or librarian to find out about these tools? You would expect at this point a few links to websites that helpfully summarise the features of relevant tools.

Unfortunately, the problems don't end there. You look on the Web, of course, and in true Web fashion, before you have looked at two or three sites you have been more confused than aided by what you find. Say, for example, we want to compare two research services from the list, Readcube and Colwiz.

A search for "readcube v colwiz" on Google lists a promising sounding article that might help us: "Which is the best reference software?" We eagerly turn to this review, only to find ourselves more confused than ever. The author goes in turn to several websites to find a comparison between tools. Each website gives a clear and compelling reason why that tool is the best:

- At the RefWorks site, RefWorks is compared to EndNote, Reference Manager, Zotero and Mendeley – and RefWorks is found to be the best
- At the Mendeley website, Mendeley is compared to RefWorks, EndNote, Zotero and Papers – and Mendeley is found to be the best
- Colwiz compares itself to Mendeley, Endnote, Zotero, Researchgate and Academia.edu

Notice that each tool compares itself with a slightly different set of competitors. And the reason they can all claim to be the best is that if you provide a box of tricks, and some of those tricks are not in the competitors' toolbox, then you can claim with some justification to be "better".

And so on. Ironically, this review article appears on the website for another scholarly communication tool, Docear, which of course claims to be better than any of them. Plus, by each tool not being a simple clone of a competitor, it can claim to meet users needs more precisely. For example, Colwiz describes itself as "a robust reference manager with data sharing and collaboration capabilities". Colwiz is rated highly by some reviewers since it includes a calendar. Most of us already have a calendar, but of course most of the other competitors don't have such a feature. And on it goes.

Reviews of individual services, even when they appear in reputable publications, tend to sit on the fence and say very little. Here is the conclusion from a review of Colwiz:

> *In conclusion, Colwiz is a new tool that is full of potential. Designed by academics for academics, it supports every step of the research process, and, as such, is likely to grow in influence.*

In conclusion, these new initiatives have indeed transformed the world of scholarly communication, but they have introduced a substantial learning curve and technical challenge for everyone involved in the process, including authors, librarians, and publishers. It is a complicated and a fast-moving world – and it's not getting any simpler.