

RUSQ: The Accidental Technologist Column

Title: Citation management software: Features and Futures
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Introduction

When I was an undergraduate student, I used a portable word processor to type all my research papers. (Does this date me too much?) In other words, formatting and typing a paper was a lot of work and had to be properly thought out ahead of time. I would write each reference on an index card, consult my dog-eared copy of the *Publication Manual of the American Psychological Association, 3rd Edition* and carefully write out each element of the citation, double-checking my work along the way. An errant finger could mean using White Out on the mistake, or worse, re-typing the entire page. Today's students have it easy. They can import references into their own personal database, choose any citation style and format a bibliography in seconds.

When will we admit to ourselves that 21st century students do not identify with the importance citation style? It is an afterthought, a requirement added onto an assignment where a professor can reliably deduct points. It is an aggravation to be dealt with right up until the dissertation submission date. When I was in college, we choose a citation style, usually according to our discipline, and got to know it intimately. This is simply no longer the case. As librarians, how have we adjusted to the emergence of the citation manager? With new products being released every semester and old ones being updated, should we stand behind a single product? Is it our responsibility to buy access for our students and faculty? The answer is, it depends.

As librarians, we fuss over citation style details more than anyone else in the academy. As reference librarians, we endlessly answer questions about nuances of citation style management. As teaching librarians, we attest the value of academic integrity by illustrating the differences between intentional and unintentional plagiarism. As technology experts, we demonstrate and explain functions of the tool. And as discerning fund managers, we purchase citation management tools. But with so many choices available, how can we use our expert knowledge to review and recommend the "best" citation manager of the day? And will that change tomorrow? I faced this dilemma when user questions spanning the vast number of citation managers started to mount. How can I possibly understand the ins and outs of all the citation managers on the market? How can I develop instructional materials and teach workshops on several citation managers? Choices have to be made.

We know this much to be true - students are integrating technology into the larger fabric of their lives. Reference management increasingly resembles personal digital

libraries¹, with students refining their workflow by "living in the cloud." Ultimately, today's researcher is interconnected and searching for value beyond the citation. As so much these days is in perpetual beta, let's examine a few of the citation managers on the market by asking ourselves two questions:

- Is there a value-added citation manager worth investing money and time?
- What are the reference and instructional impacts of these choices?

A brief scan of academic library web sites confirmed that RefWorks, EndNote and Zotero are currently the most popular citation managers promoted and supported. There are many comparison charts freely on the web so let's instead take our review from a user's perspective.

A comparison of citation management software

Probably the most popular and most powerful citation managers currently on the market are RefWorks and EndNote. Both allow users to import thousands of citations into their own database, format into any citation style and feature cite as you write capability. The main difference lies in the responsibility of paying for access to the software. I surfed the Internet to compare how this is handled by academic institutions and it seems the majority are placing the cost of EndNote on the user, although most campuses offer an educational discount. This also means that when an update is released, it is up to the user to purchase and install. RefWorks, on the other hand, is sold by institutional license (although individual users can purchase a license for \$100/year), placing the cost on the library. In order to demonstrate return on their investment (e.g. continual increase in usage statistics), libraries must allocate resources to marketing and instruction.

RefWorks

<http://refworks.com/>

RefWorks-COS is a business unit of ProQuest.

Benefits: RefWorks is web-based and compatible on all platforms. Most database vendors have adapted their interface to export references relatively easily into RefWorks. Users can also import references from library catalogs, other citation managers, RSS feeds and web sites. A bookmarklet is available for download to the browser in order to import metadata from web sites. RefShare allows researchers to collaborate across institutions. Since RefWorks added the attachment feature, researchers can upload a variety of file types for up to a 100MB limit and the administrator can increase this limit at intervals up to 5GB. Write N Cite is

¹ Dempsey, L. "Reading lists, citation management and bibliographic tissue." May 22, 2010. <http://orweblog.oclc.org/archives/002092.html>. (accessed November 10, 2010).

relatively easy to learn and incorporates the need to write with in-text citations and footnotes. RefWorks can be customized to suit your institution by adding a link resolver, which from a user perspective is convenient to link to library resources without having to use space from the attachment feature. And finally, users are surely pleased that the library foots the bill for access to RefWorks.

Drawbacks: Users need access to the Internet in order to use the functionality of their database. Each database interface implements a different process for exporting references, hence the onus is on the user to figure out how this process works. A librarian at our institution created instructions for importing citations by database. Not only is this type of instruction time consuming, the document requires constant updating. In addition, how often will students explore beyond their point of need to hunt down these instructions? While RefWorks will upload PDF documents, it does not import metadata from the PDF's. Although RefGrab-It will pull metadata for web pages, it is not possible to take and save web site screenshots. Similar to other citation managers, RefShare does not allow the user to attach files to citations. The RefWorks mobile site is not as user friendly as a phone application could be. Possibly the most important consideration for a scholar may be that there is access for alumni for as long as the institution subscribes to RefWorks. What happens to user data if the subscription is cancelled? This is similar to the library's relationship with database vendors, students are "leasing" access to the software rather than controlling ownership of their database.

The librarian's perspective: There is significant upfront cost as negotiated with RefWorks based on number of students at your institution. The interface is not as intuitive to learn as some of the other citation managers available hence there is a human resource cost in developing instructional materials (although RefWorks help files are substantial) and teaching workshops. RefWorks is a powerful tool, almost too powerful for the needs of an undergraduate student. If you don't have graduate programs at your institution, there are cheaper options available. And finally, the library has a commitment to the campus community and alumni to continue the subscription long term or find a way to migrate user data to another platform, a potentially daunting task to say the least. Should a library decide to cancel their institutional subscription, the user may purchase an individual RefWorks annual subscription for \$100.

EndNote X4 (released Summer 2010)

<http://www.endnote.com/>

EndNote is a product of Thomson Reuters. Every EndNote license includes access to the web version, EndNote Web.

Benefits: EndNote is most heavily used in the sciences. When I ask students why they use EndNote, I frequently hear that students are emulating their advisor. EndNote is compatible with Windows and Macintosh computers and is arguably as powerful as RefWorks. EndNote is a desktop application, which means it is

accessible offline and online access is available through EndNote Web (although admittedly it is not as robust and limited to 10,000 records). Importing records requires the connection files that EndNote updates regularly at the start of each month. The ResearcherID function builds a custom publication profile and EndNote Web allows researchers to collaborate using the "Groups" function. EndNote allows the user to save search strategies, going a long way in assisting researchers with keeping a research log. For projects as large as a thesis/dissertation and for faculty, the most interesting features are that metadata can be extracted from PDF's, including the ability to search across the full text of PDF's, and records can be compared and edited side by side. Similar to RefWorks, both EndNote and EndNote Web work with a cite as you write program (Microsoft Word, Apple Pages and Open Office). Institutional link resolvers can also be configured to work with EndNote.

Drawbacks: All of EndNote's information is downloaded and saved to the computer hard drive, including attached files. Not only does this take up valuable space on a user's personal computer but file attachments are not accessible from EndNote Web. The search capabilities of the connection file technology are not always as nimble or comprehensive as the native database search interface. Although PDF metadata is extracted, there is not the capability to work with PDF's within EndNote. Web site metadata can be imported but there are known issues with using IE and Safari browsers; EndNote suggests using Firefox instead. Maybe most surprisingly, there currently is no smartphone compatibility and there is no cloud solution. Since there are no cloud storage options, users will need to find their own solution for backing up their database, which adds to the license cost for the user. The cost could be considered prohibitive: Students with university ID: \$115.95. All other users: \$249.95 as a download, \$299.95 for the physical CD. Upgrades can be downloaded by everyone for \$99.95 and the CD costs \$109.95.

The librarian's perspective: The software is not intuitive to use, so if your library chooses to actively promote EndNote, librarians need to be prepared to address navigation and technology troubles through reference and instruction. One of our librarians spent considerable time configuring the local connection files to redirect to our institutional server address for both PC and Macintosh computers. The cost of the software resides with the user so the library can focus its resources on support.

Zotero

<http://www.zotero.org/>

Zotero was developed by a team of librarians at the Center for History and New Media at George Mason University. It is a free extension of the Firefox browser.

Benefits: Zotero recently updated to 2.0 and with it brought several upgrades including automatic synchronization across multiple computers, backup space on Zotero's servers, and automatic sync of attachment files to a WebDAV server, including your university server. Since learning how to use Zotero is fairly intuitive and uses drag and drop technology, importing references is not as complicated as it

is for RefWorks and EndNote. Users simply click on the Zotero item image in the location bar of the browser and the citation information is added to the user's library. Zotero stands out in its ability to scrape metadata from web pages and includes screen shot capability. In an effort to bring researchers together, Zotero created the Zotero Groups and Zotero People features where users can upload their CVs and share libraries for quick collaboration. Like EndNote, Zotero has the capability of recognizing and importing PDF metadata. For researchers on the go, cloud service syncs data across machines. Zotero also has a cite as you write application (Microsoft Word, Mac Word and Open Office) but unlike RefWorks and EndNote, Zotero also works with Google Docs. Conveniently, there are two ways to directly link to an item through the "View" (which works through your proxy server) and "Locate" (which works through the institutional link resolver) buttons. Three of the more unique features of Zotero include the ability to create a timeline feature, assignment of shortcut keys, and the application of tags instead of folders to organize citations.

Drawbacks: Zotero is not as robust of a software program as RefWorks or EndNote, although consistent updates indicate there will be improvement over time. Since data is saved in the individual's Firefox browser, users should be concerned about storage space. Currently, users are limited to 100MB of free cloud-based storage and must pay for additional data access (RefWorks administrators can set each individual account up to 5GB, and in contrast that same amount for Zotero will cost the user \$60/year.). Zotero's web site indicates that the next update, Zotero Everywhere, will include a standalone desktop version and plugins for Chrome, Safari and IE, as well as mobile access. For researchers who are managing thousands of citations, Zotero may not be the best solution.

The librarian's perspective: With a free option like Zotero, many librarians are wondering if it is still worth substantial funds to license access to citation software. It is increasingly clear with the development of Zotero and other free citation managers, that citation management service has been monetized through data storage. Institutional storage plans are available from Zotero, so if your institution deemed it adequate, you could invest in Zotero. Even though librarians have critiqued the longevity of web applications, any company or institution could decide to discontinue a service or close. And finally, many have argued that Zotero is more suited to casual and undergraduate research. Since this is not easily quantifiable, it would arguably be a significant tool in which to start the intellectual discussion on the complexities of citation management.

Mendeley

<http://www.mendeley.com/>

Mendeley is a London based company.

New to the party, Mendeley (a London based company) is the next generation of citation management software. It is an integrated research tool that promotes

collaborative work and weaves itself into the research process rather than simply organizing citations.

Benefits: Mendeley combines both a desktop and a web-based application that is compatible across platforms. Mendeley is also fairly intuitive to learn and features drag and drop technology. There is a "Cite this document" feature that allows users to copy and paste a citation for a single item using the major citation styles, similar to Landmarks Son of Citation Machine and WorldCat. Like RefWorks, a bookmarklet allows metadata to be imported from web sites and users can take snapshots of web pages that can be annotated. The most valuable advancement Mendeley boasts is comprehensive PDF management that includes: importation of PDF metadata, automatic naming and filing of documents, opening of multiple PDF's in a single application that are navigable by tab, and the ability to highlight and annotate PDF's within the application. Mendeley Dashboard takes academic collaboration to a new level by leveraging the users of Mendeley to watch research trends. Research groups, which can be made public or private, have the ability to collaboratively annotate and share notes. As for cite as you write, Mendeley generally works a little different than other software programs, it inserts formatted citations by dragging and dropping into any text editor including Google Docs, LaTeX, blogs and e-mails. There is also a Microsoft Word plug-in. Other features include: link resolver capability, iPhone and iPad applications, generation of overall Mendeley and individual statistics, synchronization with Zotero and CiteULike, as well as a simple, yet research changing feature, the ability to mark papers as read or unread.

Drawbacks: Unlike other citation managers, the web client for Mendeley only supports direct export from a limited number of databases. The web version is also not as reliable at ingesting PDF's as the desktop version. The web version incorporates ways to improve imported data by sending the extracted metadata and query the compatible online resources for "more accurate data" as well as flagging the item "unchecked" which allows for comparison to Google Scholar. The desktop application does not import from databases, instead it relies on the metadata from PDF's which leads to issues when databases do not include the PDF or if it is not available. Attachment space is limited to 1GB, including 5 private groups with 10 users each. More cloud storage can be leased (for example, 7GB \$60/year). The Dashboard function for watching research trends is not robust with users yet, limiting its current usefulness. Mendeley is not that difficult to learn, although there is not much instructional material available outside of the company support pages, which need to be updated.

The librarian's perspective: The development of Mendeley is a clear indication of the future direction research tools. Citation management is going beyond generating bibliographies and scholars are looking for ways to streamline their research processes. If the development of Mendeley is any indication, research tools will continue to look for ways to embed the organization of research materials, add social collaboration features and incorporate compatibility with smartphones and tablet technology.

A final comment regarding the longevity of citation managers: For many students, research doesn't end with graduation. Graduate students frequently ask me if they will be able to access their database long after their institution access has been terminated. After devoting much time to populating a citation manager, students and faculty don't want to be burdened with learning a new system and transferring all of their work to a new system unless it is their choice.

There are many other citation managers to choose from^{2 3}, I certainly didn't cover every detail of these citation managers but I hope I did provide you with a context with which to begin to look at what is best for the users at your institution.

Reference and instruction support

In addition to trying to choose the best tools for our users, we must consider the impact our choices will have on how we support the tools. Once the library markets a citation manager, librarians need to be ready to answer the inevitable questions that arise in using technology. In examining an overall view of teaching and learning on campus, the ability to systematically generate bibliographies arguably frees the student to focus less on the minutia of generating citations and focus more on scholarly content. As for the librarian, we are freed to spend less energy teaching the specifics of citation styles and more time on not only why it is essential to properly cite but to introduce more advanced information management skills such as copyright and Fair Use, a task that is increasingly important given the nature of our digital environment. Consider the following best instructional practices for supporting citation management tools:

1. If you decide to adopt supporting more than one citation management software program, consider assigning each tool a different librarian or group of librarians. This allows for a deeper understanding and specialization of the tool.
2. Consider adapting instructional materials created by other institutions. LibGuides is a great example of how the collaboration and sharing of instructional materials can relieve the pressure of original instruction development.
3. Link your instructional pages to commercial tutorials and tech support. Even though we are inclined to create our own instructional materials, it is time to consider relinquishing this responsibility.

² Comparison of reference management software.
http://www.wikipedia.org/wiki/Comparison_of_reference_management_software. (accessed November 9, 2010).

³ Citation management tools. Digital Research Tools Wiki.
<http://digitalresearchtools.pbworks.com/w/page/17801648/Citation-Management-Tools>. (accessed November 12, 2010).

4. Teach open workshops, they provide a marketing opportunity as well as help more than one person at a time through a hands-on experience.
5. Integrate citation management into your course-related instruction. This can be done in numerous ways: Give an example of how to export citations when you are demonstrating databases, use opportunities to introduce conversations about copyright and Fair Use, and look for opportunities to present in campus forums.
6. Conduct internal staff training at regular intervals so that many people can answer basic questions.
7. Solicit regular feedback from your users, formally and informally, and be willing to accept what you hear.
8. Let your usage statistics guide your decision making process. For example, if a low percentage of your students are logging into RefWorks after several years of marketing and instruction, it may be time to consider promoting other tools.

Why we support citation management: A reminder

It is probably true that at least some of the above will be obsolete before this goes to press, but that is the benefit of researching in today's environment, updates abound. In getting to this place, librarians have done an excellent job of selling our expertise about citation management. In turn, students and faculty expect us to be able to answer questions about the tools that generate bibliographies. If we don't want to lose our credibility with the academic community in this arena, we have a decision to make: which tools are we going to support? I would argue that citation management remains a gateway in immersing our expertise into the larger research process and continues to open doors to leading conversations about academic integrity and the publication process of scholarly work.

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