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Citation Managers on a Shoestring

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While many university libraries host comparison charts for citation managers on their websites, it is often difficult to direct students towards a single platform with which to organize sources, let alone furnish long-term support for the growing number of citation tools offered. The issue is further complicated by several factors that contribute to a student's choice in citation manager: general usability/share-ability (including reliance on the PDF format and the ability to interface with other citation managers), suitability for certain disciplines, multilingual functions, bibliographic generation, and any proprietary limitations. Thus, this guide is a quick reference to free citation managers (Zotero, Mendeley, Docear, and ReadCube) for instruction librarians as well as a tool to help them guide students towards a citation manager that best suits them.

Technology is constantly evolving and proliferating to the extent that it significantly influences the research strategies of most undergraduate and graduate library users (Hensley, 2011). Because of this interdependent relationship between technology and research, reference librarians often act as mediators between the researcher and the way the information is organized and credited due to their broad perspective on both information and research. Enter the free citation manager. Similarly to the manner in which they help users discover a variety of information and research strategies, librarians are often called upon to know which citation manager best suits the researcher (Hensley, 2011).

As Necka points out in *Selecting a reference manager*, many of the choices involved in choosing a citation manager come down to the researcher's pre-existing workflow, and how much they need to interact with the information they compile (Necka, 2013). Since citation managers are designed to increase the efficiency of research, it is important to critically evaluate them for how much time the researcher can save by using them and whether each citation manager supports research as a collaborative and conversational process.

Due to the sheer number of free citation managers on offer to researchers, I have selected Zotero, Mendeley, Docear, and ReadCube to compare in terms of general usability/share-ability, reliance on the PDF format, the ability to interface with other citation managers, suitability for certain disciplines, multilingual functions (if applicable), bibliographic generation, and any proprietary limitations as mentioned above. Each citation manager will be discussed in turn, and further resources for choosing citation managers and continued tech support will be included in the conclusion. Please note that these comparisons come from personal exploration of each citation manager unless indicated otherwise.

Zotero

Zotero is one of the most popular and user-tested free citation managers, and has a well-established presence in most academic disciplines. Developed as an open source tool with

funding from individual donations and charitable organizations like the United States Institute of Museum and Library Services, the Andrew W. Mellon Foundation, and the Alfred P. Sloan Foundation, Zotero was created at George Mason University in 2006. Because of Zotero's open source nature, users are constantly developing add-ons to the software, which are tailored specifically to their research uses. This customization comes in extremely handy for other users within the same field as any researcher who has created an add-on, as they often create tools specific to their discipline. Zotero itself runs primarily as an add-on through the Firefox browser (its original iteration) and can also be downloaded as a desktop application on any operating system including Windows, OSX, and Linux and used on mobile devices. As Necka points out, it is a streamlined software that caters to researchers who don't need to make extended notes as they work and simply need a way to organize and search their sources (2013). This observation can be extended to include researchers with an established system for research and simply need to economize their citation efforts. This means that rather than being particularly good for one discipline, Zotero is particularly good for experienced researchers as a demographic. Though Zotero has somewhat limited features, it is possible to take notes as add-ons to PDF's, which are automatically saved in a separate file and searchable along with citations. Zotero can also handle a couple of other commonly used formats such as Google Docs and web pages, and extract metadata for citations and the whole of the digital library the researcher assembles. Largely because of its streamlined nature, Zotero is very intuitive to learn. There are also many online resources including demos and an "official" blog linked to the website from the developers. Zotero's multilingual capabilities are currently limited to an add-on called Juris-M. Predictably, the bibliographic generator sometimes loses vital punctuation marks, but corrections usually amount to small edits in the final list of references. Zotero stores all types files from users' libraries in a cloud-based platform called "Zotero File Storage." This allows for access both on and offline on any device synced with a Zotero account, as well as access on non-synced devices through Zotero.org.

Mendeley

Until recently Mendeley, like Zotero, was a completely free online citation manager and desktop application. The software was recently acquired by the academic publisher Elsevier, making it proprietary to the company. However, the free version is still a powerful citation software and provides 2GB of storage. Similarly to Zotero, Mendeley runs through a web plug-in, desktop and mobile applications, and is very easy to learn and work with on multiple operating systems including Windows, OSX, and Linux. Unlike Zotero, notes are not stored separately from the PDF files they are taken in and are searchable only with the PDF file they pertain to (Necka, 2013). This can make annotations difficult and time consuming to find. The main strength of Mendeley is the share-ability between other Mendeley users (Necka, 2013). Mendeley allows for collaborative groups of up to three researchers who can then share documents and notes among themselves. However, this is a major drawback to the free edition due to how small the groups have to be to use it. Because the paid version allows more users to collaborate, it is an ideal platform for multiple people working in labs or on experiments (Necka, 2013). Largely due to this collaborative feature, it is a particularly popular citation manager for the natural sciences, and many labs encourage its use (http://libguides.mit.edu/references). Online support is available through Elsevier and is fairly comprehensive, though proprietary. Mendeley supports such formats as PDFs, Google Docs, LaTex, blogs, and emails. Like Zotero, it is able to extract

metadata from these formats for multiple purposes. Mendeley's main and most unique strength is its ability to extract metadata on what's "trending" among researchers by providing a "feed" on the user's screen that displays the most popular search terms and articles day to day. Though it may not apply directly to any given topic, it could be useful in generating new keywords for database searches and expanding a user's research within a discipline. Mendeley's unique use of metadata gives it a somewhat revolutionary position in the academic world by providing "academic social networking" through its feeds and metadata on the number of reads of articles and dissertations. As librarians continue to teach research as a collaborative process, this may prove to be an invaluable asset.

Docear

Docear is a newer, completely free (like Zotero) citation manager developed in 2010. Docear is a new wave manager that goes beyond organizing sources and takes on the rest of the research process by providing mind-mapping and document planning as tools within the software. Docear is described by its developers as an "Academic Suite" meant to operate for researchers as Microsoft Office does for office workers (Beel, J. et al., 2011). Despite these bells and whistles, Docear manages to maintain a sleek interface and is easy to learn. It has its own database, which is largely sourced from- and functions like- Google Scholar and automatically links references to full-text articles in that database. Another feature is Docear metadata, which is very similar to that of Zotero and Mendeley and can isolate information in PDFs and convert them to citations automatically, with little input from the researcher. Because Docear hosts enhanced PDFs to facilitate mind-mapping, more editing is required in finalizing references from the automatic citation generation, as spellings sometimes get scrambled. This metadata is also used to create "recommendations" on other scholarly literature which may pertain to a researcher's work (Beel, J. et al., 2011). Based on my experience with Docear, I am inclined to say that it aids researchers in "information management" as much as it does in "citation management," which is quite exciting. This seems to indicate that it would be appropriate in any discipline, but particularly useful to a researcher looking to integrate evidence and resources into their planning process as they write. The Docear developers are also extremely active and continually increasing the capabilities of the software. For example, Docear is partly multilingual and more limited than Zotero in this respect, but the developers of Docear are working on a more comprehensive multilingual function. Their website is more informative than that of Zotero (quite a feat), and includes video and extensive screenshot tutorials as well as the philosophy behind the program and a vision for what it could do in the future.

ReadCube

ReadCube is essentially the proprietary (to a collective of publishers), very flashy version of Docear and is one of the newest citation managers available. It specializes in enhanced PDF's more so than Docear, meaning that researchers can highlight, annotate, and interact with a PDF almost as seamlessly as if it were an analog copy. Though I really had fun playing with these various features for annotating files, I didn't find it as easy to use as Docear. This meant that I spent a bit of extra time with the software and made some interesting discoveries in terms of other features. ReadCube is very in-tune with the idea of researchers building a vast digital library of references, as described by Hensley (2011). Similarly to Zotero and Mendeley's digital

libraries, ReadCube allows users to import any existing saved files from their computer (Windows, OSX) and organize them into various folders in the desktop application. The most useful feature in ReadCube is its ability to save a user's login information for database access and circumnavigate the cumbersome library authentication systems that come with institutional database subscriptions. Larger databases like PubMed and Google Scholar are also searchable through ReadCube. Like Docear, ReadCube links references within articles to the full-text if available. ReadCube also delivers "daily recommendations" based on the previous day's searches. The bibliographic generator was just as suspect in terms of errant punctuation marks and misspellings as Docear's, thanks again to developing metadata kinks in the interactive PDFs that will likely be resolved as the program matures. Related to the software's flashy overall appearance and function, I could not make heads or tails of any multilingual functions. To counter that, in terms of electronic language, it is extremely easy to import documents into ReadCube from other citation managers though its sharing capabilities are limited and the software is meant to stand alone – I assume as a "research suite" similar to Docear. Based on this, ReadCube seems most suited to researchers in the humanities, or any researcher looking to make their search process through their institution's databases more efficient.

Other Considerations

Despite researchers' reliance on it, the PDF is an increasingly cumbersome format to read research in across multiple fields of study and even more difficult to interact with (Madisch, 2015). Madisch claims that the PDF is particularly problematic in publishing scientific research, as readers are forced to constantly scroll back and forth through hundreds of pages just to compare graphics, charts, and text (2015). Some citation managers support the PDF format, while others are equally able to support a diversity of formats such as Google docs. As citation managers become more sophisticated and offer more ways to annotate PDFs, the fixity of the format is becoming less of a concern. However, as more citation managers offer enhanced PDFs, these capabilities could be valuable decision points for some researchers. For example, Docear and ReadCube could address the many concerns researchers have with the PDF due to their highly interactive platforms and availability of "enhanced" PDFs.

Despite the problematic nature of the PDF, the fact remains that many citation managers have been developed to extract metadata from the format and would require significant technical revisions in order to cope with any new, "universal" format developed to correct the flaws of the PDF. This means that in some ways, researchers could be faced with even more challenges to establishing research as a conversational process without the PDF. This brings up two big questions in how we currently conduct and teach research: First, if we can share collective wisdom better, do we sacrifice the universal – if clumsy – readability of it that we currently have through the PDF? Or, second, does the question become more philosophical: How is the input of a community of research most easily shared as technology continually evolves?

Another major consideration to take into account when comparing citation managers are the limitations of the free software versions and established communities of users. For example, Mendeley is a popular choice in scientific research labs, but the free version only allows for collaborative groups of three. This could be a major issue in larger research groups especially if the department or professor mandates the use of this limited software, regardless of the

proprietary nature of the company that provides it. Mendeley's new proprietary status also introduces a concerning precedent: the transition from totally free software to a mandatory buy-in to retain the full capabilities of the previously free platform effected a huge number of established users. Can we truly trust these free programs to remain free, given this precedent?

Based on the relatively universal accessibility and availability of support for free, though potentially transitory citation managers, it may be productive for institutions to reconsider the purchase of licenses for other reference software such as EndNote and RefWorks. Each of the free citation managers discussed in this guide are equally as easy to teach and nearly (if not equally) as powerful as paid citation managers. Faced with constantly threatened budgets, can we justify the use and instruction of expensive, limited citation managers? Or, is the security and consistency of these subscriptions sufficiently valuable enough to justify their purchase if not all free citation managers remain free?

Conclusion

Thanks to the large role personal experimentation played in this paper, it is safe to conclude that citation managers are most easily chosen based on personal preferences. However, it is important to acknowledge the established practices of a user's field of research as a confounding factor in this conclusion. Not all users have the luxury of choice, let alone the time needed to try various citation managers and make that choice. As established citation managers, Zotero and Mendeley have the largest networks for online user support. These resources are extremely easy to access as either a librarian assisting a user or as an independent user. In terms of general usability, Zotero, Mendeley, and Docear were the easiest and fastest to learn. Mendeley is the clear free citation leader in the natural sciences thanks to established users, while Zotero offers the most multilingual functionality for international users. Zotero and Mendeley also generated the most accurate bibliographies. In terms of overcoming the inflexibility of PDF formatted files, Docear and ReadCube provided more ways to take and search notes than either Zotero and Mendeley. An aspect not considered in this guide was the cutting edge information management capabilities in Docear and ReadCube, which allow researchers to plan their written document and mind-map their findings. The best course of action in advising users is to determine exactly what aspect of their research could benefit most from the features of one of the four citation managers discussed above.

References

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Madisch, I. (2015, February 11). Researchers: It's time to ditch the PDF. *The Guardian.* Retrieved from http://www.theguardian.com/higher-education-network/2015/feb/11/researchers-its-time-to-ditch-the-pdf?

Further Reading/Citation Manager Support

Comparison between Docear, Mendeley (free version), and Zotero: http://www.docear.org/2014/01/15/comprehensive-comparison-of-reference-managers-mendeley-vs-zotero-vs-docear

Docear: http://www.docear.org/docear/about/

Mendeley: https://www.mendeley.com/home/d/?e=201

MIT Library Guide: http://libguides.mit.edu/references

University of Wisconsin-Madison Library Guide: https://www.library.wisc.edu/services/citation-managers/comparison-chart/

Wiki Tables: https://en.wikipedia.org/wiki/Comparison_of_reference_management_software

-Extremely helpful as a one-stop shop/quick reference table for comparing almost any citation manager, particularly free software in the spirit of open source information! Links to support sites and provides basic information on the software including operating system requirements.

Qiqqa: http://www.qiqqa.com/

ReadCube: https://www.readcube.com/

Zotero: https://www.zotero.org