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Web-based Citation Management Systems: Which One Is Best?

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Abstract

Librarians and researchers have long used citation management systems as research tools to help scholars organize their work, improve workflows, and ultimately save time. For many years, RefWorks has been the dominant citation management tool in many parts of Canada: the maturity of the product and its integration with many scholarly databases reassures users that it works well with these resources. However, a number of competitors now offer citation management systems that are as strong as RefWorks but offer different features to the user, therefore warranting a comparison with this leading tool. This paper reviews RefWorks, Zotero, WizFolio, and Mendeley, which are all popular citation management systems that either have a long history of use or are now gaining traction in Canadian academic circles. To compare these tools, we examined their import capabilities as well as their organizing, searching, annotating, and sharing functions. This review will interest both librarians and researchers who are considering alternative citation management systems at either the personal or organizational level.

Keywords

citation management systems; RefWorks; Zotero; WizFolio; Mendeley

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In an age of multiple device ownership, a web-based citation management system makes sense. Users are accustomed to working with their research in different places and on different computers, tablets, and phones. RefWorks (2001) was once the logical citation management system to use since its competitors could not match the utility of its web-based management functions or its integration with many scholarly platforms. However, since its inception, a number of competitors have appeared on the scene: the

most popular being Zotero (2006), WizFolio (2008), and Mendeley (2008). All of these tools help users manage their research and their citations, but picking the right system is no small matter since much time and effort is required to learn their intricacies and to build a library of resources. In this article, we will review RefWorks, Zotero, WizFolio, and Mendeley by examining how users import citations into each system, interact with the tools to enter citations into their documents, and share their research with others. This review will interest both librarians and researchers who are considering alternative citation management systems, at either the personal or organizational level. Since the most recent ECAR study of undergraduates and information technology has identified web-based citation tools as one of the three technologies that have grown the most in the past year, it is a timely issue for academics (Dahlstrom 19).

The citation management tools we review

RefWorks, Zotero, WizFolio, and Mendeley are tools that help users manage different parts of their research; all include citation management as a primary feature. RefWorks is the oldest, most established of these four products and perhaps the most well known. It is a web-based citation management system that requires users to log in through a library that has subscribed to the service. Zotero is an open-source competitor that is built around a widget that works with many popular web browsers. WizFolio is a hybrid of RefWorks and Zotero: it uses both webpages and bookmarklets. Finally, Mendeley is a new service that is gaining acceptance not only as a citation manager but also as a means to annotate and share electronically retrieved research in PDF format. RefWorks is exclusively a subscription-based service, while Zotero, WizFolio, and Mendeley offer both free and cost-based levels of service.

Importing citations

Citation management systems aim to remove the drudgery from the task of citing, so their ability to import references effectively and effortlessly from a variety of sources is key. Users of these tools import most of their material from library catalogues and databases, Google Scholar and Google Books, WorldCat, websites, articles saved on their computers, and citations found in the bibliographies of articles and books. None of these citation managers can import from all of these sources — at least not without glitches. Each one has different importing methods and interfaces, which forces users to consider not only their personal preferences but also the systems' effectiveness.

RefWorks is known for successfully importing citations from a variety of sources. Although it is sometimes hard to locate on the screen, the RefWorks import button is now ubiquitous in most online scholarly databases and resources in Canada. This is perhaps RefWorks' largest benefit as it reassures the user that its tools work well with many collections. RefWorks also has a browser bookmarklet called RefGrab-It, which helps users import records with a click of a button. A large disadvantage for those working off-campus, however, is remembering the RefWorks institutional login as well as their personal login. Users already complain that library databases require too many user accounts, and these two logins are a common annoyance to them. However,

RefWorks' primary dependence on web-based user accounts rather than browser add-ons means that it can easily be deployed at public terminals in libraries and learning labs.

Zotero works within the Firefox browser (or as a standalone app that links to Firefox, Chrome, or Safari), successfully retrieving references from library databases, Google Scholar, and the web. Zotero places a file icon in the browser's address bar. Users can click on this icon when they find publications they wish to cite; Zotero will then extract metadata from a PDF or from a publication's associated webpage. Users may also create a record for previously downloaded articles by dragging and dropping the PDFs into Zotero's browser-based interface, but metadata must be extracted in a separate step by right-clicking the record to "retrieve metadata for PDF." That said, Zotero's import capabilities for publications retrieved from the web are robust and often seamless due to its integration with popular browsers. Instead of completing complex export processes, researchers need only click an icon in the address bar to create a record in Zotero.

WizFolio users will appreciate the tool's bookmark feature, which is not difficult to master. By pressing the "WizAdd" bookmark, which is similar to RefWork's RefGrab-It tool, users will extract metadata from a source they have located on the web. The WizAdd bookmark works with many common database platforms and Google Scholar but not with all catalogues and discovery layers; however, WizFolio provides many other ways for users to import files into their account. Users can upload PDFs from their computer to extract their metadata, or they can copy and paste citations from bibliographies with the WizFolio "Import From Clipboard" option. This function is a particularly convenient feature, but in practice, it works better with articles than books. Finally, users can enter partial citations and click "locate bibliography" to see if WizFolio can retrieve the correct resource from Scholars Portal, Google Scholar, or PubMed collections. These last two import functions, which are unique to WizFolio, would be useful to users who are adept with online collections and research strategies. WizFolio cannot import book citations from many library catalogues and discovery layers, which is a drawback to its use.

Mendeley is not just a citation manager but also a personal storage system for annotating articles and sharing notes with others. The system offers a bookmarking function like RefWorks and WizFolio. Mendeley also lets users drag articles on their computer into the downloadable Mendeley desktop; it will automatically extract metadata, and it is the only system that alerts users if details need revising. The drawback of this system is the two-step process that requires users to download articles and then drag them into Mendeley or a folder it watches on the computer. Since Mendeley's goal is to merge file annotation, citation, and retrieval tasks for articles in electronic format, it has a hard time importing records that do not have a PDF file attached, such as books or articles only available in print. Like Wizfolio, Mendeley cannot import citations from library catalogues. Citations can be imported from Google Books or WorldCat, but this process involves additional steps on the part of the user.

All four citations managers have automatic and manual means to extract or create metadata for a user's library. While RefWorks has arguably the most reliable importing functions and an established record of integrating with many scholarly resources, the other citation managers we reviewed have equally strong organizational and use functions, which we will consider in the next section.

Using these tools

Importing citations is obviously a vital function for citation management software, but it is not the only criteria one should consider when evaluating these systems. RefWorks, Zotero, WizFolio, and Mendeley all offer different user experiences based on their presentation and organization of information, their help functions, their sharing options, and other features unique to each system.

RefWorks' web platform presents its records predominantly in one list of information. Upon logging in, users encounter a list of records from a pre-determined folder; neither the system's folder structure nor the user's organizing principles are immediately apparent to the eye. Instead, users must discover folders hidden in tabs or listed in secondary panes on the right side of the screen. Unlike the other tools, RefWorks does not allow for tags. Its help functions and tutorials are also cumbersome: its introductory tutorial is twenty minutes long, a length that might dissuade people from learning and using the tool. As Gilmour and Cobus-Kuo note, this tool has one of the steepest learning curves. And if users access RefWorks through their institutional accounts, they are faced with the "alumni problem": all their research is stored in a system that they are unable to access once they graduate (Hensley 205).

Whatever RefWorks lacks in the presentation and organization of information, it makes up with its ability to build bibliographies and embed citations into documents. Users can utilize RefWorks' bibliography export tool to create lists in various document formats, or they may cut and paste information directly into their document. The revamped Write-N'Cite plugin for Microsoft Word, meanwhile, is a robust tool that helps users embed citations in pre-defined or user-developed styles.

Zotero is built on an interface that may be familiar to many users as it mimics folder views in Windows and OS X, and in many e-mail programmes. Zotero utilizes a three-pane interface: a folder pane, an item pane, and a bibliographic information pane. With only a little initial guidance, or by using Zotero's series of short tutorials, users can quickly learn how to organize their citations, search via tags and other fields, click on records to access files or build citations, or analyze a citation's bibliographic information. Zotero makes it easy for users to edit corrupt metadata, and it encourages them to embed notes directly into the system by displaying a "Notes" tab with every citation. Like RefWorks, Zotero can export bibliographies, and its users can use plugins for Microsoft Word as well as OpenOffice, LibreOffice, and Google Docs.

WizFolio also adopts a three-part interface to help users work with their citations. WizFolio's panes show users their citations' folder structure, a list of citations, and then

the document's abstract or full-text content as opposed to its bibliographic information. Like Zotero, WizFolio users may add searchable tags to citations. This citation management system relies predominantly on tutorials for its help content. These are useful for first-time users but may make advanced help queries difficult to answer. Accessibility is also problematic for any information offered through the audio track. WizFolio has plug-in features for Microsoft Word, OpenOffice and LibreOffice.

WizFolio users also benefit from the search functions embedded directly into the system. Users may search major collections within WizFolio itself, including PubMed, Google Books, WorldCat, and Scholars Portal Journals. This search function merges a vital part of the research process with citation management.

Mendeley is a research tool that helps users not only manage citations but also annotate the publications to which these citations are linked, meet colleagues in their field, and create and share knowledge with others. Many researchers use Mendeley as a discovery tool that can alert them to the latest or most popular articles in a field, and also help them measure research value (Cooke 361; Zhang 56). As Farkas observes, users can see how many scholars have added an article to their own libraries, which is a tacit recommendation of the research it contains (23). One of Mendeley's most useful functions, argues Robbins, is its ability to search both personal and collective libraries (7). Mendeley uses a three-pane view that includes folder management and citation filtering tools in the left-hand pane, folder content and file annotation in the main pane, and, finally, bibliographic information and user-created notes in the right-hand pane. Any notes that users append to a publication or annotate directly onto the PDF in the main window will also be collected in this right-hand pane to facilitate browsing. As Farkas notes, users love the fact that they can store citations, documents, and notes all in one place (23). Like Zotero and WizFolio, Mendeley allows them to add tags and filter searches by these tags.

Mendeley has also developed robust apps for smart phones and tablets. These apps can bring a user's entire library to their mobile device for on-the-spot reading or sharing with colleagues. This programme's sharing features, and its annotation and notation system are beneficial to researchers accustomed to working in digital environments; however, researchers who work with documents that are not digitally-born will be frustrated by Mendeley's preference for electronic-only publications.

Syncing citations across devices

Data syncing is a relatively easy task with any of the citation management systems reviewed in this article. As web-based systems, syncing is not an issue with RefWorks and WizFolio: users must log in to their web-based account in order to access or edit citations or to create bibliographies; however, syncing is slightly different for Zotero and Mendeley users, whose citation libraries are stored on their local devices. Zotero supports automatic synchronization of citations and metadata for users who create a free account with zotero.org, which handles the process. Mendeley users, however, must remember to sync collections before closing their programme as there is no

automatic function. Doing this will synchronize the citations, metadata, and PDFs in their local library with the Mendeley server.

All of the citation systems reviewed support advanced synchronization capabilities at various costs. Users of RefWorks who are part of an organization-wide license can attach files to their citations when editing a record's metadata. Zotero and WizFolio can also attach files that can be synchronized to their accounts; they may also purchase extra space if needed. Since web-based citation systems require an Internet connection to work, the need to sync files in RefWorks, Zotero, or WizFolio is not great; however, file synchronization is essential to Mendeley's use. File synchronization lies at the heart of Mendeley since it is as much a file annotation and sharing tool as it is a citation management tool. Users are encouraged to purchase extra storage capacity from Mendeley, but it is also possible to use free web-based file storage space, such as Dropbox, to synchronize files across platforms without incurring extra costs.

The bottom line: what is best for you?

Zotero and Mendeley are both award-winning tools, RefWorks has the benefit of a large user base, and WizFolio offers strong search functions within its interface. However, none of these systems will consistently extract accurate metadata or operate without glitches. Generating a bibliography from any one of them will produce at least a few issues, either due to user- or system-error. So, which citation manager is best? It largely depends on how users interact with a system, where they find the majority of their sources, and which features are priorities for them. See Table 1 for a comparison between the various tools.

Table 1. Feature comparison between the four tools

Feature	Citation Management System			
	RefWorks	Zotero	WizFolio	Mendeley
Platform	• Cloud-based	• Attached to user's local browser • Cloud-based options available	• Cloud-based	• Stand-alone app • Cloud-based options available
Access and Subscriptions	• Institution-based subscriptions • User must be part of a subscribing institution • Cost is borne by institution	• User-based • Institutional plans available • Free to use • Optional fee-based upgrades	• User-based • Institutional plans available • Free to use • Optional fee-based upgrades	• User-based • Institutional plans available • Free to use • Optional fee-based upgrades

Primary Importing Process	• Export button embedded in most databases	• Browser Bookmark	• Browser Bookmark	• Drag-and-drop from downloaded PDFs
Secondary Importing Processes	• Browser bookmarks and manual importing	• Drag-and-drop and manual importing	• Copy-and-paste from bibliographies and manual importing	• Browser bookmark and manual Importing
Importing from catalogues and discovery layers	• Direct export from many resources	• Bookmark works with many discovery layers	• Bookmark works well with some resources	• Bookmark works well with some discovery layers
Syncing Citations	• Citations are automatically synced	• Users may sync citations for free on zotero.org	• Citations are automatically synced	• Citations are synced into Mendeley's crowd-sourced catalogue
Syncing Documents	• Documents can be attached after importing citations	• Documents can be uploaded to the user's optional zotero.org account	• Documents can be uploaded to the user's WizFolio account	• All documents are automatically synced to the user's Mendeley account
Personal Storage Space	• 100MB • More space may be allocated by the local administrator	• 300MB • Users may purchase up to 6GB of space on zotero.org	• 1GB • Up to 5GB may be purchased from WizFolio	• 2GB • Unlimited space may be purchased from Mendeley
Word Processor Integration	• Microsoft Word	• Microsoft Word • OpenOffice • LibreOffice	• Microsoft Word • OpenOffice • LibreOffice	• Microsoft Word • OpenOffice
Mobile Access	• Mobile website at a different URL	• Website is designed for mobile browsing	• Specially designed portal for tablets	• Robust apps for phones and tablets

RefWorks began, and has largely maintained its identity, as a citation tool. The other three systems are research tools that also include a citation manager as one of their

features. Mendeley is the most comprehensive research tool, allowing its users to create a library of articles and sources, annotate these sources by highlighting text or adding notes anywhere on a page, use the tool as an academic social network, and search a comprehensive library of shared resources for the latest or most popular articles in the field. If convenience is a top priority, Zotero is the handiest one-stop interface. This tool also extracts metadata from more types of files than its competitors. WizFolio's iPad version and its ability to import from the clipboard are two of its best features, while the ubiquity of the RefWorks Export button is helpful to many. RefWorks is also the only system that includes the convenient "create a bibliography" feature. The good news is that even if users have worked exclusively in one citation management system, they can easily export their library of resources into any other if they find a tool more suited to their needs.

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