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Fore-cite: Tactics for Evaluating Citation Management Tools

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Introduction

Once upon a time, there was a very limited set of options regarding citation management software, and this set was well understood to the trained mind and did what it was meant to do, and that was good. A leader, Endnote, arose among that set and was consequently supported by academic libraries and other research institutions across the world, who merrily spread the word that technology was breaking the age-long chains of paper's tyranny—at least when it came to storing and sorting one's references.

As the internet matured, with the advent of Web 2.0 and cloud computing, this set began to expand and the environment began to change. Increased functionality and flexibility meant that users began to question the hegemony of the leader. Librarians, those champions of information, began to develop comparisons to assist users with the gnawing decision of which tool was best.

Meanwhile, a growing number of free and open-source options began to appear, raising the question: are paid services worth their price? Users were no longer tied solely to institutional recommendations and budget cycles. Newfound autonomy led to personal exploration of the field, disrupting and, in some cases, reversing the traditional model. Librarians found that they were fast becoming the receiver instead of the dispenser of advice.

Not to be outdone, database aggregators and large software companies began packaging these tools with their products and further complicated an already crowded field with the alluring promise of one-stop-shopping. While these developments occurred, however, the winds of the world changed quickly. Librarians, those ever-noble champions of information, finding themselves facing cash-strapped kingdoms and nearly empty coffers, were left with a conundrum: which citation management tools should they support?

Thus begins the epic history of citation management tools. While constituting no threat to any of the authors who hold a place on the New York Times Best Sellers List, it does

bring up a number of germane points about the environment that librarians now face. First, there are an ever-growing number of choices when it comes to selecting citation management tools. Next, a strong free and open-source presence means that even those libraries that cannot afford the luxury of a subscription-based service can now supply their users with citation management options. Finally, the age-long warning of the potential obsolescence of the librarian is voiced; with a user-base gaining increased independence, what is the librarian's role in this new environment?

To date, most librarians have focused on the richness of features, often exploring the argument of naming the best or most-used package. Many universities have developed web-based comparisons where a limited set of options—the big three being EndNote, RefWorks, and Zotero—are compared in a head-to-head showdown focusing on the advantages and increased capabilities that a particular package holds over its competitors (University of Wisconsin – Madison Libraries, 2011; University of California – Berkeley Library, 2011; Yale University Library, 2010; New York University Libraries, 2011; MIT Libraries, n.d.; University of Pennsylvania Libraries, 2011). While valid, these comparisons are nothing more than snapshots freezing the field at a particular moment in time, inevitably unable to keep up with the mutable nature of software updates. For this reason, their creators must either choose to generalize, considering a set of standard features possessed by all or nearly all options, or run the risk of a very limited lifespan. The result is either difficulty in grasping a true sense of difference, or a false sense that a definite answer to the argument of "best tool" exists.

With the proliferation of options in citation management software over the past decade, it is extremely difficult, or perhaps impossible, to crown a winner of the contest. Just as Zotero was heralded as the victor of CiteFest 2008 (Northwestern University, 2008), a competition that compared some of the most popular citation management packages, a newcomer that would eventually create a buzz of its own, Mendeley, came into existence. Mead and Berryman (2010) call to light the changing "workflows and pathways" that the use of Mendeley and other "PDF-manager software" caused, namely a reversal in the direction of supply, moving from a librarian-initiated model to one in which users find and use these tools on their own, and a shift in focus from reference management to document management.

In light of this development, librarians can no longer provide support for only those options traditionally found in academic libraries, but must become acquainted with the much larger set of new tools that their users have discovered and are employing. Which, however, should be recommended and incorporated into the library's instruction efforts? Unfortunately, this is not a question that is easily answered. It seems only proper to concede that different situations will inevitably lead to different solutions. The decision is not directly quantifiable, but depends instead on the unique composition and preferences of each individual institution, each individual library, and even each individual researcher.

This paper will take a new approach to evaluating citation management tools. Rather than following the traditional methods of comparing a limited set in regards to specific capabilities and features, it will take a few steps back to explore the larger environment in which they operate and develop a macro-assessment of the field. In doing so, it will blend software selection principles from the corporate sector with the traditional collection development principles of the library to consider not only the tools themselves but also the users, libraries, and institutions that they serve. A list of eight of the most important general factors will be considered in detail, helping librarians grapple with the decision of which citation management tool best fits their unique situation.

Literature Review

Although there is not a surfeit of literature published on the topic of citation management tools, the material that is available can be very useful for those who are researching the various options. The majority consist of product descriptions, reviews, and comparisons. Recent literature is dominated by the next generation of tools, such as Mendeley, Zotero, and social bookmarking options; established software, such as RefWorks and Endnote, is often used as a benchmark for comparison. Publication is heaviest in the health sciences, but generally, information provided is generic and can be applied to any discipline.

Recent, in-depth product descriptions and reviews can be found for a number of tools. Curran (2011a), Hicks (2011), Erlandson (2010), and Reiswig (2010) provide notable overviews of the features and functionality of Mendeley. Rethlefsen (2006; 2008) does

the same for the social bookmarking tools CiteULike, Connotea, and BibSonomy, including a section for each tool that is devoted exclusively to librarians. EasyBib is reviewed and rated by Curran (2011b), O'Gorman (2011), and Erlandson (2011). Fernandez (2011) most adequately covers Zotero, but Curran (2011b) and Vanhecke (2008) also provide relevant reviews.

The most comprehensive comparison to date is supplied by Wikipedia, where twenty-nine options are considered in detail as of December 2011 (Wikipedia, 2011). Kern and Hensley (2011) provide a comparison of RefWorks, Endnote X4, Zotero, and Mendeley, replete with a librarian's perspective on each tool. Ovadia (2011) compares three of the free tools—Mendeley, Zotero, and CiteULike—and notes the advantages and disadvantages of each. Gilmour and Cobus-Kuo (2011) add RefWorks to this grouping, comparing the available features as well as the accuracy of produced citations. Finally, Reher and Haustein (2010) provide an in-depth look at the social bookmarking tools CiteULike, Connotea, BibSonomy, and 2collab in supporting science, technology, and medicine.

In addition to reviews and comparisons, other related literature may be relevant in the assessment and adoption processes. Duong (2010) tells of efforts at California State University to increase awareness of Zotero. Mead and Berryman (2010) consider the implications of new PDF-management software on library workflow. For those looking for "how-to" works that can be used to train both librarians and patrons, Zimerman (2009) supplies a look at importing citations into RefWorks; users of RefWorks 2.0, however, will notice that this article predates the software revision. Clark and Stierman (2009) supply a similar work focusing on Zotero, highlighting some of the most commonly used features.

I. Know the environment

The term citation management tool is often applied to the gamut of software applications specifically designed either to store and manage a user's citations or generate her bibliography. These tools, however, are by no means homogenous and often differ in a number of qualities such as their distribution model—i.e., if they are desktop-based, web-based, etc.—and whether they are free or proprietary in nature (See Table 1). Additionally, they do not represent the only solutions at hand—a number of

word processors and scholarly database aggregators have recently begun to offer citation solutions. Therefore, it is imperative to survey the environment prior to committing to any single tool.

Citation management software falls into one of four distribution models: desktop-based, web-based, browser-based, or hybrid. Each distribution model can be further divided into more granular categories representing proprietary and open-source material. A vast corpus of literature has been dedicated to the advantages and disadvantages of open-source software, but in-depth analysis of this issue is out of the scope of this paper. What is important, however, is the understanding of what open-source software is and the reasons why organizations pursue this option, as well as the common pitfalls that plague its implementation. First, free does not necessarily denote open-source; in fact, most of the free citation management tools are not open-source in nature. Open-source means that the owner of the software makes the source code available to developers who may wish to customize it for their needs. Major reasons for choosing open-source solutions include cost savings, freedom from vendor lock-in, the ability for customization, the support of open standards, and efficiency of product development (Ayala *et. al.*, 2011; Rafiq, 2009; Ven *et. al.*, 2008). Pitfalls include hidden costs associated with implementation, problems with ensuring backward compatibility and maintenance following updates, lack of adequate support, poor usability, and saturated markets that hinder the selection process (Ayala *et. al.*, 2011, p. 97; Rafiq, 2009, p. 138; Ven *et. al.*, 2008).

Desktop-based software (e.g. Bookends (http://www.sonnysoftware.com/), Papers (http://www.mekentosj.com/papers), JabRef (http://jabref.sourceforge.net)) runs according to the traditional model of computing, with both proprietary and free options available. A user acquires a program, which she then installs on her personal computer. Assuming that nothing goes wrong with the hardware itself, the program remains unchanged on that computer until either updated or deleted. This model has worked for years and carries with it a number of advantages and disadvantages. First, the user is in control of a program that is present on her computer and is not reliant on an internet connection. The software often sports robust features, such as the ability to search select databases from its interface, sync with mobile devices, or connect to resources through an institution's proxy server. The program may, however, be

dependent on a particular operating system—both Bookends and Papers run only on Mac OS—or licensed for use on a single computer. Data is stored locally and remains under the control of the user, but may be vulnerable to loss in case of accidental deletion, misplaced USB drives, or hardware problems.

Web-based tools (e.g. RefWorks (http://www.refworks.com), EasyBib (http://www.easybib.com), BibMe (http://www.bibme.org), Connotea (http://www.connotea.org), CiteULike (http://www.citeulike.org), BibSonomy (http://www.bibsonomy.org)) operate entirely via the internet. They run in a browser and can be accessed from any computer or device with an internet connection. Some, such as RefWorks and EasyBib, offer mobile-enhanced versions. Data is stored in the cloud and protected from malfunctioning personal computers. The versatility of cloud computing, however, is both the greatest asset and liability, as loss of an internet connection brings an end to work. Additionally, many of the free web-based tools are funded by advertisements, so a user's work must often contend with these ads for attention.

Zotero (http://www.zotero.org) is a browser-based tool that supplies online functionality as well as the ability to work without an internet connection. The reasoning behind marrying a citation tool with a browser is to supply an unobtrusive means to manage citations from the place where users perform the majority of their research. Its open-source nature provides developers with a means to enhance or develop rich features. Zotero can interface with a number of mobile applications on both the iOS and Android mobile platforms (Zotero Blog, 2011). Data is stored locally, yet can be synced with the Zotero server for back-up and read-only access. There are, however, two major disadvantages associated with this tool. First, stable versions are tied to the Firefox browser, alienating those who use other non-supported browsers. Second, data is tied to a particular browser instance, meaning that in a lab environment, where multiple users may access the same browser daily, it is difficult to separate and ensure confidentiality of data.

Hybrid tools (e.g. Endnote (http://www.endnote.com), Colwiz (http://www.colwiz.com); Mendeley (http://www.mendeley.com), Zotero 3.0 Beta (http://www.zotero.org/blog/announcing-zotero-3-0-beta-release/)) combine the best

aspects of web or browser-based tools with their desktop-based counterparts. These tools consist of a desktop client that can interface with a web-based component, allowing both online and offline access to work, with data existing locally and in the cloud. Mobile devices are often supported. The combination of Endnote and Endnote Web provides the most well-known example of this distribution model. While most are proprietary in nature, the addition of Zotero 3.0 Beta, with its support for both the Safari and Chrome browsers, adds an open-source component to the field and warrants special attention towards further developments.

Recent and often overlooked entries into the market include citation features found in common word processors. Like browser-based citation management software, these tools attempt to offer point-of-need assistance—in this case, however, during the writing process instead of the search process. Both Microsoft Office and OpenOffice offer databases to store and manage citations as well as assistance with bibliography creation. Microsoft Office 2007 and 2010 offer support for MLA, APA, and Chicago citation styles; Microsoft Office 2010 Service Pack 1 for Windows includes an increased array of citation styles, including APA 6th edition, MLA 7th edition, Harvard-Anglia 2008, and IEEE 2006 (Bost, 2010). OpenOffice allows users to create bibliographies in any citation style by editing the entry's structure through a user interface.

Finally, citation generators have been added to the sites of large database aggregators, giving users the option to cut and paste a bibliography entry formatted in a citation style of their choice. Examples of such support are currently found in packages provided by EBSCO, Gale, ProQuest, and others. Supported styles range from the most common, such as APA and MLA, to more specialized offerings such as AMA, Harvard, and Vancouver. Check with your supplier for further details.

II. Know your user
Citation management tools are dependent on research. As in collection development, you should strive to match an appropriate citation tool with your library's unique user base. To do so, you will have to gather information and develop an accurate user profile.

First, assess the type and extent of research performed at your institution. Using the Carnegie Enrollment Profile Classification [I.], which defines an institution in terms of the ratio of undergraduate to graduate students, may be helpful in completing this step. If your institution is classified as exclusively undergraduate, it might not make sense to supply expensive, complex citation management packages since the majority of undergraduate assignments do not require tracking or citing a great number of sources. In these cases, you may be able to rely on the citation functionality in word processing programs and search databases, or a simple web-based tool such as EasyBib or BibMe. On the other end of the spectrum, if your institution is classified as majority graduate/professional or exclusively graduate/professional, you will probably want to seek out more complex tools with robust features, such as Endnote, RefWorks, Zotero, or Mendeley. For those in the middle, you may want to choose numerous tools that achieve a balance between simple and robust, ensuring that the needs of a varied user base are supported.

Next, consider the organizational structure of your library system. At many large universities, departmental or discipline-specific branch libraries exist. These specialized libraries have very different needs. Some citation management tools are designed with certain specializations in mind. For example, Connotea was designed by the Nature Publishing Group to assist scientists and clinicians with reference management. For this reason, features, such as the direct import of citation material, are tailored to studies in the sciences and might be of little use to those in arts and humanities fields. Determine which departments will be supported by the citation management software. A departmental library serving one discipline may get by with a specialized tool. Otherwise, the best practice is to choose a generic, multi-disciplinary option.

At many colleges and universities, learning is no longer contained to the physical constraints of campus. Distance-education and online learning options not only have opened the door to many non-traditional students, but also have given traditional on-campus students a new, flexible outlet. If you find yourself in such a situation, be sure to consider support for these extended programs. In such instances, beware of software solutions that are tied to physical, on-campus labs, as well as those with steep learning curves that may require the development of complex tutorials.

Next, focus on individual users. Students often emulate their instructors, learning to use tools that have been proven to work for others in a mentoring role. For this reason, just as a dialogue with faculty is important in the collection development process, it can be invaluable to speak with them and identify which citation styles they prefer and which, if any, citation management tools they are using.

Finally, consider the devices used to access these tools. The ECAR National Study of Undergraduate Students and Information Technology [II.] provides a good summary of national trends. For a more detailed look at your individual institution, consult your IT department or webmaster. Be sure to look not only at computer ownership numbers and trends, operating systems usage, and preferred browsers, but also to consider the impact of mobile technologies at your institution. As access to mobile devices continues to increase, you may wish to explore tools that offer either mobile apps, which are tied to a particular operating platform, or mobile-enhanced websites, which are available for viewing on any device that can access the internet.

III. Recognize the software's purpose

Throughout their history, the evolution of citation management tools has taken place not only in terms of advancing technology but also in terms of purpose. Norman (2010) briefly describes this evolution as a two-stage process: first, as a shift from databases designed mainly for storage and retrieval to tools that assist with the creation of bibliographies, and then, from these bibliography generators to social networks. Mead and Berryman (2010) put a slightly different twist on this evolution, identifying it as a shift from reference management to document management, noting that many tools now offer storage and indexing of a user's documents in addition to citations. These key evolutionary shifts provide logical categories for grouping by purpose.

A tool can be categorized in terms of purpose as a simple bibliography generator, a social bookmarking site, a traditional tool sporting robust features but limited social networking capabilities, or a tool sporting robust features and social networking capabilities (See Table 1). Knowing the purpose of each tool and properly matching it with user needs can be a vital part of making a proper choice.

Simple bibliography generators include EasyBib and BibMe, as well as word processor and database options. Their main purpose is to assist users with creating a bibliography. For this reason, they do not offer enhanced features or database functionality, but work well for lower-level students who need assistance in completing simple assignments.

Social bookmarking sites—such as Connotea, CiteULike, and BibSonomy—are designed to organize and share resources, much like Delicious. They provide researchers with a means to discover what others in their field are reading, but typically lack the robust import features present in other citation management tools and do not return nice, formatted citations that can be dropped directly into a paper—a feature that may be extremely important for student users. Despite this fact, Ekert (2009) points out that these tools may be useful in teaching information literacy skills to lower-level students because their content has been twice vetted—once in the initial publication cycle and again, in attracting a professional reader base that has found value in them.

Traditional tools, such as Papers and RefWorks, offer a very robust set of features but, because of their limited user base or pay-to-use structure, lack either the critical mass or the open nature that defines enhanced sharing and social networking capabilities. New entries to the field—Zotero and Mendeley—incorporate many of the traditional, robust features but allow for greater sharing and social networking experiences.

IV. Consider system and browser requirements
Even the best software will be useless if it does not run properly on a user's computer. For that reason, system requirements should be considered. Most IT departments publish a list of minimum support requirements that can assist with this task. If, however, this is not readily available on your campus, both of the major platforms— Windows and Mac OS X—should be supported. Additionally, consider support for Linux, which some specialized users may be running.

With the majority of today's citation management tools tied to a web browser, operating system support is less of an issue than in the past. While some, in particular those designed exclusively for Mac OS—e.g. Bookends and Papers—will run on only one platform, most popular options now support all major systems. Browser support,

however, is becoming increasingly important, and care should be taken to ensure that any web or browser-based citation management tool is able to run in all of the most-popular browsers—Microsoft Internet Explorer 7.0 and higher, Mozilla Firefox, Google Chrome, and Safari.

V. Ensure accessibility for all

In its Access to Information statement, the American Library Association (ALA) voices the need for "equity of access," charging libraries with "help[ing] ensure that Americans can access the information they need—regardless of age, education, ethnicity, language, income, *physical limitations* or geographic barriers…" (American Library Association, 2011). According to the 2008 American Community Survey, 1 in 10 Americans between the ages of 18 and 64, the range that includes most traditional and non-traditional college students, have some form of disability (American Community Survey, cited in US Census Bureau Public Information Office, 2010). This means that academic libraries, falling under Title II or III of the Americans with Disabilities Act, as well as Section 504 and, to some extent, Section 508 of the Rehabilitation Act of 1973, must make necessary accommodations for these individuals (Association of Specialized and Cooperative Library Agencies, n.d.).

Recently, however, it has become increasingly apparent that these laws are antiquated, written prior to the massive growth of the internet and not adequately providing for web accessibility. In light of successful adjudication and a number of settlements holding major entities liable for their websites' deficiencies, several organizations have called for a tighter enforcement of web-accessibility standards [III.].   In 2009, the ALA issued the *Purchasing of Accessible Electronic Resources Resolution*, which strongly recommended that libraries require their vendors to comply with web standards, as evidenced through documentation of successful testing (American Library Association, 2009). Furthermore, in July of 2010, the Department of Justice filed an Advanced Notice of Proposed Rulemaking, calling for the revision of Titles II and III of the Americans with Disabilities Act to reflect compliance with a set of universal web standards, which are to be determined at a later date (Department of Justice, 2010).

So what are these web standards and what should we, as librarians, be requiring? At present, there are two accepted standards under consideration by the Department of

Justice: Section 508 and the Web Content Accessibility Guidelines (WCAG). While their intricacies are out of the scope of this paper, let's summarize each in order to gain insight into what defines an accessible webpage.

According to Section508.gov (Section508.gov (http://www.section508.gov/index.cfm?fuseAction=stds), Section 508 revised the Rehabilitation Act of 1973 by requiring that federal agencies provide their employees with accessible data. It governs a number of different technologies, ranging from computer hardware and software to web applications and multimedia. Over the years, it has been accepted by the judicial community as a touchstone of web accessibility, listing sixteen criteria by which the code of an accessible webpage must abide (Coombs, 2010, p.11-12).

More recently, the Worldwide Web Consortium (W3C) released web standards of its own—the WCAG. In its current iteration, WCAG 2.0, there are 12 guidelines based upon a framework of four principles (Henry, 2011). These principles state that in order to be considered fully accessible, web content must be presented in a manner that disabled users can perceive; it must contain operable interfaces that are robust enough to accommodate a number of assistive technology devices both now and in the future; and it must have content and an interface that the user can understand (W3C, 2010). These guidelines are quantifiable at three levels—A, AA, or AAA—and tend to be more strict than their Section 508 counterparts.

Because the majority of citation management tools are available in web-based form, it is imperative that any selected for formal library support be accessible, as is currently evidenced by compliance with at least one of these standards. A caveat arises at this point, however. With the exceptions of RefWorks and Endnote Web, which articulate explicitly that their interfaces have an accessible mode, other citation management software packages seem to ignore the question completely (RefWorks-COS, n.d.; Thomson Reuters, 2012).

Zotero provides a unique problem in its very nature; it is not web-based, but browser-based in its current stable release (which as of the completion of this paper is 2.1.10). When a discussion came up on its support forum in 2008 regarding its compliance with

Section 508 standards, the answer indicated that developers were relying on the accessibility features inherent in the Firefox browser. At that time, they stated that they did not think that accessibility would pose a problem for disabled users of Zotero (Zotero Forum, 2008). Regardless, further testing is necessary before a definitive verdict can be reached.

How can a librarian be sure that their citation management tool of choice is accessible? Unfortunately, adequate coverage of this issue is lacking, and the burden often falls to the librarian. If concerned about the accessibility of a given tool, try contacting the developers first. This can be challenging, especially with open-source software, where often times a community of programmers assist in the development process and the support structure can be difficult to identify. Should this path not yield the desired results, you can also evaluate the software yourself.   A quick validation of Section 508 and WCAG compliance that requires no more than the URL of a webpage to be tested can be performed at www.cynthiasays.com.   Additionally, the Association of Specialized and Cooperative Library Agencies maintains a toolkit to assist with the process, including evaluation checklists that can be handy with the testing of software applications [IV.].

VI. Determine features important to your circumstances

Although differing in minutiae from tool to tool, most features can be grouped into three large categories: import/export features, storage features, and access/collaboration. Consider your user profile when determining which features are most important in each of these areas. Then, look for a tool that best highlights those features, ignoring or, at the very least, making the other "bells and whistles" a lower priority. The following considerations may assist in this process.

Most users probably agree that it disturbs them when their workflow is disrupted. In terms of citation management tools, this disruption most often manifests itself in the processes of importing or exporting citations. In importing, what should be a one-step process is often expanded into three steps; information for a retrieved article must be downloaded, saved as a separate file, and then imported into a citation management tool. In exporting, there are often difficulties in interfacing with word processors or

steep learning curves that may be more than the user will tolerate given the stresses associated with student work habits and rigid due dates.

A number of citation management tools provide direct import features that can lessen these occurrences. Look for tools that offer a robust number of "translators," or add-ons that will take database metadata and translate it into code that the citation manager can read. Tools with more robust features, such as RefWorks and Zotero, will often have a translator for each database supplier, whereas simpler tools may rely on a service such as CrossRef. Be aware that changes in the interface or code at the source will affect the functionality of these import tools, so printed compatibility lists may not always be accurate. For this reason, test the tools often to ensure that the majority of your library databases are supported and that the imported information is accurate.

When considering export features, look for tools that adequately support the citation styles identified in your user profile while offering effective interfacing with popular word processors. While most products claim support for popular software such as Microsoft Office, look on user forums or search for documented experiences to get a general idea of their ease of use and any problems that may arise. For instance, Gilmour and Cobus-Kuo (2011) highlight that the earlier version of RefWork's Write-N-Cite, a plug-in for Microsoft Office, has a number of bugs and is prone to crashing. (While a new version fixes a number of the issues for Windows users, this earlier iteration is still the only version available to those who use Mac OS.) Most importantly, be sure to perform adequate in-house testing of this feature before recommending it to users.

There are two schools of thought regarding data storage—those who prefer data to be stored locally and those who prefer storing it remotely in the cloud. Each has a number of advantages and disadvantages. For instance, local storage is completely under a user's control but is vulnerable to hardware failure, accidental deletion, and other catastrophic phenomena. Remote storage guards against catastrophe, but requires a certain amount of trust in third-party vendors and relies on an internet connection, with the potential to be rendered useless in the case of a network outage. Ideally, a compromise should be entered, looking for tools that offer both options, giving users a choice based on their personal preference.

In those cases where a tool stores items remotely, be sure to check the amount of storage space that it offers. Some tools, such as CiteULike, offer unlimited storage as a term of subscription. Others, such as Zotero and Mendeley, offer a fairly large but limited amount of storage for free and require that the user buy an expanded account when that limit is reached. Based on your user profile, you may find that the free limits are adequate for the majority of your users.

If the remote storage features can be synced with local content, you may wish to determine how this function works and what settings can be manipulated to provide for a better user experience. Can individual users customize their settings? If used in a lab environment, will local computing policies forbid downloading or syncing with a remote server? Can an administrator change the default setting to provide for automatic and frequent syncing, lessening the risk of lost data? Can local and remote storage syncing be disabled, allowing for local data to be wiped clean in a lab environment? Where is the information stored? What is the provider's policy for data protection and user privacy rights?

Finally, collaboration with peers is an intrinsic part of the academic world. Group work is found on all levels of the academy, and for that reason sharing is an important and popular feature. Some citation management tools have evolved into social networks, where researchers can share articles of interest based upon field of study and specialization, even finding other researchers with similar interests for collaborative projects. While social-networking capabilities fulfill the original intent of the internet, expanding the academy into a world-wide learning network, they also create a potential problem for libraries in ensuring that intellectual property rights are not violated.

Fortunately, most developers have addressed this problem and now offer safeguarding features, or controlled sharing. Controlled sharing features allow users to make their citations available for others to view, but any documents that are stored as attachments or standalone files are not visible to outside users. Each citation manager achieves this in a slightly different manner; further information regarding these features can be found in the documentation of most tools.

VII. Work smarter, not harder – consider vendor support

It is no surprise that the recent economy has not been kind to any type of library. Workload has increased and resources to create tutorials, instruction sessions, and other support features have dwindled. Many citation management tools, however, have pre-developed materials that that can greatly assist with alleviating some of this burden. Therefore, be sure to consider the external support that is available with a given tool.

Nearly all tools supply some form of online documentation that can be used to answer frequently asked questions. These may vary greatly in complexity and usefulness from tool to tool. Some, such as Connotea, consist of simple, searchable blogs or wiki pages that are updated by an engaged user base. Others, such as RefWorks and Zotero, provide more elaborate user guides that are indexed by subject and can easily be referenced for answering basic user questions.

Many of the tools supply resources that may supplement or replace traditional instructional sessions. RefWorks and Mendeley host live webinars. RefWorks maintains quick-start guides that are available in a number of languages. Most tools now offer video-based online tutorials that assist users with their initial forays into citation management. Additionally, YouTube holds a great number of instructional videos.

Customer support resources generally differ along the lines of whether a tool is free or must be purchased. Pay-for-use tools, such as RefWorks and Endnote, typically offer more traditional methods of customer support, with centers that may be reached by telephone or e-mail during set business hours. Free options, such as CiteULike and Zotero, tend to supply LISTSERVs and Forums, where the user community may post common questions and problems, then collaborate to find an answer or fix.

Social media has quickly gained notoriety as an effective form of customer support. Most tools now maintain a presence on popular social network sites such as Facebook and Twitter. Additionally, some maintain a blogging presence. To ensure that your user base finds these pages, be sure to like or follow them from your library's own social media presence.

VIII. Consider the actual cost of ownership

In the corporate sector, many companies attempt to find the true cost of ownership (TCO) that will be exacted by the adoption of a new software application. While generally practiced with decisions affecting major system components, such as operating systems, human resources clients, etc., calculating TCO can be a beneficial exercise in considering adoption of any software package. For cash-strapped libraries, this can be an especially important exercise when determining whether to support costly subscription-based citation management tools or to try free alternatives.

In short, TCO calculations take into account a number of different factors beyond the simple cost of the software, which can amount to as little as 10% of the total (MacCormack, 2003). These factors include other, often-overlooked personnel-related criteria such as training, maintenance, support, and administration (MacCormack, 2003). Anyone who has ever been a part of an ill-conceived in-house development effort will know that these costs often add up quickly.

In determining the TCO, add up perceived expenses associated with the implementation of the software in any affected area. Keep the following factors in mind. First, cost can be offset by value. This means that if you are paying for an expensive package and both usage figures and user satisfaction are high, switching may not be worth the money saved. Next, do not base your particular TCO studies on documented literature, models, or hearsay of what works at other institutions. Ven, Verelst, and Mannaert (2008), in writing about the adoption of open-source software in the corporate sector, state that TCO studies should be unique to the environment in which the software will be used. As mentioned earlier in this paper, each library faces a unique situation and must determine which option will ultimately work best.

Conclusion

At first glance, surveying the field of citation management tools can seem like a task of Herculean proportion. Broadening one's view, however, brings focus to a larger picture where certain patterns begin to emerge. The eight criteria presented in this paper will hopefully prepare you to identify these patterns in not just the present set of tools, but also those to come.

Above all, it is important to know your institution and your users. Developing an accurate user profile that takes into account the composition of your user base and identifies their needs is of the utmost importance. Be sure not to forget important minorities, such as distance learners and those with disabilities. Once thoroughly identified, these needs can be matched to a tool designed for a specific purpose.

Citation management tools are, above all things, merely one tool in the librarian's toolbox. While useful and having the ability to link users with information, they are generally not used to their full potential by the majority of users and ultimately, do not add content to the library's collection. For this reason, it is more important to focus on features that will be used instead of simply having an expensive, robust tool for the sake of owning it. Be sure to consider the true cost of ownership, but realize that successful software comparison is more than comparing features or cost savings exhibited by different products. It is a process of exploring how your users will ultimately interact with the program, of defining what value is added to their life.

Notes

I. Carnegie Foundation for the Advancement of Teaching – Enrollment Profile Classification (http://classifications.carnegiefoundation.org/descriptions/enrollment_profile.php)

II. ECAR National Study of Undergraduates and Information Technology (http://www.educause.edu/Resources/ECARNationalStudyofUndergradua/238012)

III. In its "Purchasing of Accessible Electronic Resources Resolution," the ALA names the National Federation of the Blind, et. al., v. Target Corporation; the National Federation of the Blind v. Law School Admissions Council Inc. and the National Federation of the Blind v. Connecticut Attorney General's Office as examples. (American Library Association, 2009) Fulton (2011) adds that the University of California Hastings College of the Law, Thomas Jefferson School of Law, Whittier School of Law, and Chapman University School of Law were added to the National Federation of the Blind v. Law School Admissions Council Inc. case.

IV. For web-based software, see "Internet and Web-based Content Accessibility Evaluation," (http://www.ala.org/ala/mgrps/divs/ascla/asclaprotools/thinkaccessible/webeval.cfm). For desktop-based computer software, see "Electronic Database and

Computer Software Accessibility Evaluation,"
(http://www.ala.org/ala/mgrps/divs/ascla/asclaprotools/thinkaccessible/softwareeval.cfm).

Table 1: Overview of Select Citation Management Tools

Tool	Purpose				Proprietary	Open-source	Free
	Simple bibliography generator	Social bookmarking tool	Traditional tool w/ limited or no sharing	Traditional tool w/ enhanced sharing/social networking			
Desktop-based tools							
Papers (http://www.mekentosj.com/papers)			☐		☐		
JabRef (http://jabref.sourceforge.net)			☐			☐	☐
Bookends (http://www.sonnysoftware.com/bookends/bookends.html)			☐		☐		
Web-based tools							
EasyBib (http://www.easybib.com)	☐				☐		☐
BibMe (http://www.bibme.com)	☐				☐		☐
Connotea (http://www.connotea.org)		☐				☐	☐
CiteULike (http://www.citeulike.org)		☐			☐		☐
BibSonomy (http://www.bibsonomy.org)		☐			☐		☐
RefWorks (http://www.refworks.com)			☐		☐		
Browser-based tool							
Zotero (http://www.zotero.org)				☐		☐	☐
Hybrid tools							
Endnote/Endnote Web suite (http://www.endnote.com)			☐		☐		
Colwiz (http://www.colwiz.com)				☐	☐		☐
Mendeley (http://www.mendeley.com)				☐	☐		☐
Zotero 3.0 Beta (http://www.zotero.org)				☐		☐	☐

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