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Reference Management Tools in Academic Research: A Comparative Analysis of Mendely, Zotero, RefWork and EndNote.

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ABSTRACT

The collection and management of bibliographic data play an important role in any research work for researcher or academician, but it is very tedious task to organize such records. To overcome this problem, several online and offline references management software tools are available to collate and manage citations. Reference management tools help researchers to collect and organize references according to citation styles using and retrieving data from different sources. The reference manager tools also support importing, exporting, file attachment, database search and capturing references directly from the PDF files or from online webpage. This paper focus on the basics of Reference Management Tools and comparative analysis of some selective and most popular citation and reference management tools like Mendeley, Zotero, RefWork and EndNote on their features like reference collection, storage, organization and information retrieval for reference management.

Keywords: Reference Management, Citation Management, Zotero, Citation, Open Source Software

INTRODUCTION

Managing bibliographic data and scientific references is very important task while doing research work for any academician and researcher. It is very challenging task to maintain accuracy in manual reference methods of organization and citation list generation.

Hence, recently the introduction and vast use of various types of commercial and open source reference management tools are available for managing citation and references online and offline. Reference management tools are combination of reference and citation management. Various citation styles are available in reference management software. The main purpose of these tools is to organize, store and format references within a document. There are several software tools currently exist for generating references and citations such as Mendeley, Refworks, Biblio Text, Zotero, End Note etc.. Mostly these tools provide basic functionalities, like adding, deleting and updating references, citation management, export and import, search of article publications, etc.

REFERENCE / CITATION MANAGEMENT SOFTWARE

Reference or citation management software. It is also stated as personal bibliographic management software for scholars, researcher and authors to use for listing, recording and utilizing bibliographic citations (references) also as managing project references either as a company or a personal. Once a citation has been recorded, it's often used according to need and again in generating bibliographies, like lists of references in scholarly books, articles and essays. Reference management software tools are designed to prepare, organize citations into specific formats for the preparation of manuscripts and bibliographies. Apart from managing references, most reference management software also enables users to seem references from online libraries. These online libraries are usually supported Z39.50 public protocol. Users just have to be compelled to specify the IP address, database name and keywords to start out a Z39.50 search. It's quicker and more efficient than an internet browser. Additionally, reference management software may automate building bibliographies, or footnotes, or reference sections in research papers. Reference management software may organize personal research libraries, or manage access to an outside reference source (e.g. web magazines, literature databases) [1-2].

Need of Reference Management Software

Presently every day researcher works and collect bibliographic data from different sources and manage references manually and Collecting, organizing, using references is a tedious job. But effective management of references is very important for future research work. The Reference management Software provides greater flexibility and efficiency, hence these tools are very useful for research scholars and authors for handling bibliographic data and reference sources like managing and utilizing bibliographic citations for research purpose.

Features of Reference Management Software
Some of the common feature of Reference management software is as follows:

- Support for a wide range of citation styles (e.g. APA, MLA, Chicago etc.)
- Automated creation of bibliographical entries, or whole bibliography
- In-line citation creation
- **To help building bibliographies, or footnotes, or reference sections**
- **Supports PDF files to Gather metadata**
- Import citations from bibliographic online databases and websites
- Add annotations, notes, to documents
- Support word processing software to facilitate in-text citation
- Document or reference import from outside sources
- Extraction of citation data (e.g. author, publication name, etc) from imported documents
- Synchronize data across shared or stored documents
- Support standard metadata formats for data exchange (e.g., RIS, BibTeX)
- Create a research profile, add publications to a scientific database via the software
- Plagiarism & Reference Style check [2]

Reference Management Tools Used in Research
Mostly used free open source and commercial Reference Management Tools in research

Zotero (www.zotero.org): Zotero is one of the popular free and open-source reference management software to manage bibliographic records, sources and extracting metadata from websites, related research

materials (such as PDF files). It is developed by a group of Librarians at Center for History and New Media at George Mason University. Most impartment feature of zotero is that the integration with the word processor application like Microsoft Word, LibreOffice and Google Docs and internet browser integration as well as online syncing, generation of in-text citations, footnotes, and listing of reference bibliographies. Zotero helps to easily synchronize collections among multiple computers & easy data backs up facilities, also provide drags and dropped functionality with standalone versions and plug-in for web browsers. [3]

Mendeley (www.mendeley.com): One of the best and most popular among the all bibliographic management tools. Mendeley was founded in November 2007 by three German PhD students and is based in London. UK, which provides products and services for academic researchers. It is most known for its reference manager which is used to manage and share research papers and generate bibliographies for scholarly articles. Mendeley was named after Dmitri Ivanovich Mendeleyev who developed the periodic table of elements and Gregor Mendel who is often called the "father of modern genetics" (Mendeley, 2010). At present Mandely is maintained and managed by Elsevier and provides free storage of up to 2GB of files. It is available as a free software package with an facility to upgrade at cost. Desktop application can support Windows, Mac and Linux. Mendeley has integrating plug-in for word processor like MSWord or OpenOffice to easily create reference

citations and/or bibliographies also organize PDF into multiple files. Mendeley imports metadata, discovered and retrieves full text scholarly articles from web through web importer plug-ins of browser extension. [4,5,6]

RefWorks (www.refworks.com): RefWorks is a web-based commercial reference management software package. It is produced by Ex Libris, a ProQuest company. A word processor integration utility called Write-N-Cite enables users to work with Microsoft Word documents and also have ability to import references quickly and easily from various text files or bibliographic online databases. The RefShare module of RefWorks provide and allows users to make public all or part of their RefWorks reference databases. [7]

End Note (https://endnote.com/**)** EndNote is one of the most popular and oldest reference management software for desktop. It is commercial citation reference management software package, used to manage bibliographies and references while writing scientific articles. [8] It is the introduced Clarivate Analytics (previously by Thomson Reuters) in the year 1988. Now it is available for both desktop and web platforms. Most bibliographic databases supports to export citation to EndNote libraries as HTML, plain text, Rich Text Format, or XML also organize and manage PDF files. It is also provide a facility to save a document file, Excel spreadsheet, single image or other file type to each citation or reference in an EndNote library. [8]

Table 1. Comparative Analysis of Reference Management Software

Criteria/Features	Mendely	Zotero	RefWorks	EndNote
Developer & Designer	Elsevier	Librarians of George Mason University	ProQuest	Clarivate analytics Thomson Reuters Corporation
Cast/ free	Free / storage limitation , fees for Premium accounts)	Free / storage limitation (fees for Premium accounts)	commercial software, Institutional subscription, Individual sub. $100.00/year	commercial software, Basic Free account
Online space/ storage limits	2 GB web storage, 500 MB each for personal shared storage. Additional	300MB of file storage for free. Additional space available on	5 GB per individual account	50,000 records and 2GB of file attachments per EndNote online

	space available on purchase	purchase		account.
Operating System Support	Windows, Macintosh, Linux	Windows, Macintosh, Linux	Win (IE, Firefox, Chrome) Mac (Firefox, Safari) Linux (Firefox)	Windows, Macintosh
Computer or Web-based	Both web-based & computer install	standalone app for Computer install , add-ons for web browsers & word processors	Web-based Computer install of CiteNWrite for Word	computer install, Web-based Computer install of add-ons for Word & web browsers
Web Browser Support	Internet Explorer, Chrome, Firefox, Safari	Chrome, Firefox, Safar, Opera	Internet Explorer, Chrome, Firefox, Safari	Internet Explorer, Chrome, Firefox, Safari
Word Process/ plug-ins Support	Microsoft Word; Libre Office	Microsoft Word; LibreOffice; Google Doc	Microsoft Word	Microsoft Word; Open Office
Document Types support (like Book, book Chapter)	20 document types	33 document types	31 document types	51 document types
Citation Style Support	12 citation styles with installation, More than 7,500 styles can be added (including user generated and modified styles	16 citation styles with installation, More than 7,000 styles can be added (including user generated and modified styles	More than 1,600 citation styles, New citation styles can be added	More than 6,000 citation styles installed
Sources /online databases Export & file support	Fetch/ Export bibliographic data (BibTeX, RIS, EndNote, XML)	Fetch/ Export bibliographic data (BibTeX, RIS, MODS, RDF)	Fetch/ Export bibliographic data (BibTeX, RIS, Tab Delimited, RefWorks, XML)	Fetch/ Export bibliographic data ((BibTeX, RIS, Tab Delimited)
Records adding & capturing facility	Manually; web browser capture tool; From pdfs; RIS & other standard record formats	Manually; web browser capture tool; From pdfs; RIS & other standard record formats	Manually; Database export /connect; RIS & other standard record formats	Manually; web browser capture tool; online databases export/ connect; RIS & other standard record formats
File Attachments (PDFs etc) Support	Any file type. Searchable within desktop app.	Any file type. Searchable within desktop app.	Many file types, including Images, Not available to individual Subscriptions.	Any file type.
Data Import from RSS feeds	No RSS feeds data import	Online RSS feeds data import	Online RSS feeds data import	No RSS feeds data import

Sync across computers / web	Records and attachments	Records and attachments	Records & attachments synced on web; records only in offline CiteNWrite	Records & attachments can be synchronized between web and desktop
Record limitations	Unlimited	Unlimited	Unlimited	Unlimited
Mobile web Access Version	Not Available	Not Available	web Access Version available	Not Available
Share references online	Public or private read/write sharing	Public or private read/write sharing	Public or private read/write sharing	Read/write sharing of reference groups – restricted to subscribers

Table 2. RMS Vs. Operating System Compatibility/ Support

Reference Management Software	Operating Systems				
	Windows	Linux	Macintosh	Mac OS X	Unix
Mendeley	Yes	Yes	Yes	Yes	No
Zotero	Yes	Yes	Yes	Yes	Yes
RefWorks	Yes	Yes	Yes	Yes	Yes
EndNote	Yes	No	Yes	Yes	No

Table 3. RMS Vs. Web Browser Compatibility

Reference Management Software	Web Browser				
	Internet Explorer	Chrome	Firefox	Safari	Opera
Mendeley	Yes	Yes	Yes	Yes	No
Zotero	No	Yes	Yes	Yes	Yes
RefWorks	Yes	Yes	Yes	Yes	No
EndNote	Yes	Yes	Yes	Yes	No

Table 4. RMS Vs. Word Processors Compatibility

Reference Management Software	Word Processors			
	Microsoft Word	Libre Office	Google Doc	Open Office
Mendeley	Yes	Yes	No	No
Zotero	Yes	Yes	Yes	No
RefWorks	Yes	No	No	No
EndNote	Yes	No	No	Yes

Table 5. Referencing/ Bibliographical Style / Citation Style:

Reference Management Software	Referencing Style				
	APA	MLA	Chicago/ Turabian	Harvard	Other Support
Mendeley	Yes	Yes	Yes	Yes	More than 7,500 styles
Zotero	Yes	Yes	Yes	Yes	More than 7000 Styles
RefWorks	Yes	Yes	Yes	Yes	More than 1600 styles
EndNote	Yes	Yes	Yes	No	More than 6000 Styles

Table 6. RMS Vs. File Format Support

Reference Management Software	File Format Support				
	DOC	PDF	HTML	RTF	RSS
Mendeley	Yes	Yes	Yes	Yes	No
Zotero	Yes	Yes	Yes	Yes	Yes
RefWorks	Yes	Yes	Yes	Yes	Yes
EndNote	Yes	Yes	Yes	Yes	No

COMPARATIVE ANALYSIS

Comparative Analysis of Reference Management Software

Most of the popular web-based and commercial reference management software packages are basically designed for the fulfillment of collection and reference management purpose but in some reference manager software designed with some special features. Table No. 1 shows the some comparative analysis of the RMS on the basis of general feature.

RMS Comparison based on ICT Tools for Academic Research Purpose

Due the vast use of ICT in research many reference management software tools used every day for research purpose but compatibility and support with some hardware and software application is very important while using reference management software for reference database management according to user need. Following tables shows the comparative study of the RMS with some ICT based application and web technologies.[9]

CONCLUSION

In research Reference and bibliographic record management play a vital role. Reference management software's helps in organizing, collecting and maintaining these records properly with data sources, in different supporting file formats by creating bibliographical libraries in various formats. By using these tools A researcher can easily find and manage bibliographic records of the references like title, author's name, year of publication, etc. Various citation styles are available in citation management tools which help in creating and organizing lists of references in specific formats for preparing manuscripts and bibliographies. Multimedia information file support like web URL links, video, images etc. can be easily saved in reference manager. So now a day's bibliographic data collection and management not a difficult task for researcher due to the existence of reference management tools.

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