Factors That Influence Choice and Usage of Reference Management Software by Postgraduate Students at the University Of Limpopo, South Africa

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Abstract

Inaccuracy in manual referencing of information sources in scientific papers resulted in the development of reference management software (RMS) for academics, researchers, scholars, and students. It is crucial to constantly assess the use of this software for decision making regarding sustained software purchasing and subscriptions. This study sought to identify factors that influence the choice and usage of RMS among postgraduate students in the Faculty of Humanities at the University of Limpopo. Stratified random sampling was employed to arrive at 244 participants. A questionnaire was used as data collection instrument. The study found that the majority of respondents have used RMS before. The respondents used RefWorks and Mendeley, because they were familiar with these packages and because they had received training on how to use them. As such, product knowledge, experience, and skills in using RMS are associated with their popularity and usage. It was also found that postgraduate students use RMS for basic purposes, such as saving and organising citations for easy retrieval and for creating bibliographic lists in a preferred referencing style, as well as for exporting citations from subject databases. Based on the findings, the study recommends intensified and more advanced training on RMS to ensure optimal utilisation of RMS by postgraduate students in general.

Keywords: reference management software; usage; postgraduate students; humanities; University of Limpopo; technology acceptance model



Introduction

Given the current budget constraints, coupled with the rising costs of library materials and resources in the digital environment, a large proportion of the library budget is being allocated to electronic information resources to facilitate instantaneous access to information and its resources (Savova and Price 2019). Among some of the electronic information resources in academic libraries are online databases, web information discovery tools, plagiarism detection software, bibliographic management software or reference management software (RMS), and so forth, acquired for utilisation by academics, researchers, and postgraduate and undergraduate students. Assessing what influences the use of such products can serve as justification for decision making about continued acquisition of and subscription to these packages.

This study sought to determine the factors that influence the choice and usage of RMS by postgraduate students in the Faculty of Humanities (FH) at the University of Limpopo (UL). Postgraduate students in higher learning institutions are confronted with the task of conducting research and thereafter publishing their findings through writing scientific papers in the form of dissertations, theses, and articles in scholarly journals (Morisano et al. 2017). In the process of writing scientific papers, the insertion of references and citations in a manuscript becomes one of the critical ingredients contributing to the credibility of the scientific paper produced (Ballyram and Nienaber 2019; Mohta and Mohta 2016; Salem and Fehrmann 2013; Sungur and Seyhan 2013). Several authors confirm that accurate and proper acknowledgement of the sources that were consulted in the process of writing a scientific paper forms an integral part of scholarly publishing (Amrutha, Kumar, and Kabir 2018; Damarell, Badcock, and Miller 2005; Gupta 2018; Kargbo 2010; Lamptey and Atta-Obeng 2012; Sungur and Seyhan 2013).

For postgraduate students, using word processing and handwritten notes to record and manage reference information is time-consuming and tedious, and it tends to result in inaccurate and erroneous references (Meredith 2013). Taylor (2002) found that up to 60% of research articles contain errors related to citations and referencing, while Mitchell-Williams et al. (2015) report that student papers in the field of medicine contain 24.9% citation errors, and further that 80% of papers or articles in journals have at least one citation error. Substantial referencing errors were also noted to be relatively high in the field of social work as compared to other professions or fields (Wilks and Spivey 2004). Therefore, inaccurate and erroneous bibliographic information in different fields, stemming from inaccurately cited references, is considered a major obstacle in the indexing and retrieval of sources cited and referenced in a manuscript in databases such as EBSCOhost, ScienceDirect, ProQuest, JSTOR, and so forth (Garfield 1990; Meyer 2008).

The problem of inaccurate bibliographic information has therefore been an issue of concern in the process of scholarly publishing. This has led to the development of dedicated software specifically known as bibliographic management software, or

reference management software. RMS is defined as software that scholars and authors can use to record and utilise bibliographic citations or references. Amrutha, Kumar, and Kabir (2018) have shown that RMS packages were developed to help authors manage their references, regardless of how many they may have. RMS also assists researchers to maintain consistency when referencing sources used to write a scientific paper (Masic 2013). These software packages support importation, exportation, file attachment, database searches, and the capturing of references directly from search engines and databases. Some of the basic functionalities provided by RMS include adding, deleting, and updating references, as well as exporting to, importing from, and searching databases (Pradhan and Karmbe 2020). Researchers and writers of scientific papers can easily find, cite, and store references using RMS (Sungur and Seyhan 2013). RMS has enormous benefits, as confirmed by Amrutha, Kumar, and Kabir (2018), in that the software ensures consistency when the writer references the sources consulted and used to write a scientific paper. These bibliographic management tools can therefore be used by researchers, academics, and postgraduate students to minimise errors when citing and referencing sources that they have used or consulted in their quest to produce new knowledge.

Like any other university, the University of Limpopo (UL) has incorporated a number of technologies to improve on the delivery of information services to support academic research. For quite some time, the UL library has been subscribing to the RMS called RefWorks. Access to certain RMS packages, such as EndNote and Mendeley, was arranged as complementary software for the university library as part of the subscription to the Web of Science and ScienceDirect databases. The UL library publicises and promotes these software tools to researchers, academic staff, and postgraduate students through offering some form of training on how to use these resources optimally when writing research papers. The suppliers of databases such as Elsevier and ProQuest also conduct training sessions on RMS packages such as Mendeley, RefWorks, and EndNote for postgraduate students, with the aim of assisting them to acquire the "technical knowhow" to manage and manipulate references effectively and efficiently in their endeavours to write research papers.

Even though the UL library has invested in these software packages to assist postgraduate students and provide them with an easier way to collect, store, and cite their literature, as well as collaborate, there is still a need for empirical confirmation of whether postgraduate students use these resources. Although it is possible to obtain usage statistics from the vendors or suppliers of these products, these statistics are not presented according to who the users are and for what purpose these tools are used. Since there are different types of RMS products (some free of charge and some subscription-based), there is also a need to understand what influences users to choose and utilise particular RMS products rather than others. Lonergan (2017) stresses that although the literature on the features, capabilities, and benefits of RMS is extensive, it seems that there is a dearth of studies investigating postgraduate students' preferences and usage of RMS.

Therefore, guided by the concepts of "perceived usefulness" and "perceived ease of use"—from the technology acceptance model (TAM) advanced by Davis (1989)—this study sought to examine the variables or factors influencing the choice and usage of RMS among postgraduate students in the FH at UL. The objectives of the study are to:

- 1. describe some of the RMS packages that are available for use in university libraries in terms of their features and capabilities
- 2. establish the RMS products that postgraduate students in the FH at UL have used
- 3. establish for which purposes postgraduate students in the FH at UL use these RMS packages
- 4. identify the factors that influence choice and usage of certain RMS products among postgraduate students in the FH at UL.

Investigating the use of these RMS tools among postgraduate students could also help identify potential problems experienced by postgraduate students. This would place the library in a better position to decide on relevant interventions to ensure that resources are optimally utilised. Such studies would also support informed decisions regarding cost reduction, budgeting, research, and effective information dissemination in the library, more especially in the digital environment at universities.

Literature Review

Theoretical Framework

The TAM, as proposed by Davis (1989), focuses on users' preparedness to accept new technological innovations based on two variables, namely "perceived usefulness" and "perceived ease of use". The two constructs influence attitudes towards new technology, which in turn influence the usage of that new technology (Teo and Zhou 2014). "Perceived usefulness" is defined as the possibility of being convinced that adopting a particular technological application would improve the way one performs a particular task (Davis 1989). Khayati and Zouaou (2013) identify "perceived usefulness" as the gain in performance that an individual believes he or she can obtain when using a particular technology, system, or software. In the context of this study, the "perceived usefulness" of RMS refers to the possibility that using RMS could improve postgraduate students' citation and referencing in their scholarly papers. On the other hand, "perceived ease of use" is the degree to which using a particular system is free of physical and mental efforts (Davis 1989; Fumiyo and Hisashi 2014). The "perceived ease of use" of RMS can be associated with the user-friendliness of the RMS tools. Davis (1989) notes that "perceived ease of use" means freedom from complexity and trouble; thus, the application that is perceived to be easier to use is generally accepted and utilised by more people.

Several studies have used the TAM to examine the usage of RMS (Basak 2015; Charan 2018; Le Roux and Breshears 2016; Margam 2016; Nilashi et al. 2016; Rempel and Mellinger 2015). Le Roux and Breshears (2016) used the TAM to assess the effectiveness of a workshop intervention that was conducted to introduce Zotero as an

open and free RMS to staff and students at a rural university in South Africa. The results of the study showed that participants in the workshop developed a positive attitude towards the software, including its "perceived usefulness" and "perceived ease of use". Closely related to this study, Rempel and Mellinger (2015) used the unified theory of acceptance and use of technology (UTAUT) model as a guiding framework to provide a better understanding of the adoption and use of RMS tools by researchers. Nilashi et al. (2016) used the same model to identify and analyse the prominent features in the choice of appropriate RMS.

Therefore, in the current study, it is presumed that "perceived ease of use" and "perceived usefulness" would stimulate a preference for and the use of RMS tools. The study examines whether the use of RMS tools is likely to be free of effort for postgraduate students in the process of doing research and writing scientific papers. Postgraduate students may consider using RMS products if they will derive benefits and find the tools easy to use for their studies. Therefore, in this study, "perceived usefulness" and "perceived ease of use" are regarded as the independent variables that affect the dependent variables, namely the choice and use of RMS by postgraduate students.

Types of RMS

Endnote, Mendeley, RefWorks, Zotero, and CiteULike appear to be the most commonly known and supported RMS products in academic libraries (Ivey and Crum 2018). Certain studies conducted on RMS products compare and contrast different RMS products in terms of their features and capabilities (Basak 2014a; Basak 2014c; Gilmour and Cobus-Kuo 2011). The results of the study by Basak (2014a) shows some similarities among different RMS packages with regard to importing the bibliographic fields of a journal, such as author, title of article, name of journal, year of publication, volume number, issue number, number of pages, and publishers. Basak (2014c) compared RMS packages such as RefWorks, Mendeley, and Endnote in terms of their capacities and functionalities. It was found that Mendeley appears to have the capacity to import more data from Google Scholar as compared to RefWorks and Endnote, which can import data only from subscription-based databases.

The study by Gilmour and Cobus-Kuo (2011) compares the features and capabilities of four prominent RMS packages, namely CiteULike, RefWorks, Mendeley, and Zotero, in terms of the accuracy of the bibliographies that they generate. The study found that RefWorks generates the most accurate citations; the bibliographies generated by the other three packages are not always accurate. Comparing different features and capabilities of RMS packages would ultimately reveal the determinants of users' expectations, choice, and usage of RMS.

Usage of RMS Tools

Most of the studies conducted on the usage of RMS tools among postgraduate students have reported low levels of usage (Adeyemi, Sulaiman, and Akanbi 2020; Bugyei, Kayi, and Obeng-Koranteng, 2019; Francese 2011; Francese 2013; Lonergan 2017; Melles and Unsworth 2015; Meredith 2013). Most of these studies suggest that although researchers are aware of the existence of RMS, actual usage of these resources seems to be low. Melles and Unsworth (2015) examined the reference management practices of postgraduate students and academics in the Art Faculty at Monash University, Australia, and found that the reference management practices of students and academics are personal and do not always involve the use of RMS. Meredith (2013) presented a paper at the BELITA Conference in Newcastle, in the hope that there would be a robust discussion about the advantages and disadvantages of Endnote, RefWorks, and Zotero. However, it turned out that hardly anyone who attended the BELITA session used RMS. After the conference, Merideth (2013) conducted an online survey among academics and postgraduate students in the Faculty of Law at Oxford University, wherein they were asked about the methods that they use to manage citations. The participants were provided with options to choose from: index cards, handwritten notes, notes on a word processor, Excelor Access, EndNote, RefWorks, Zotero, Mendeley, and other products. It was found that the majority (65%) of the respondents made notes using a word processor and/or by hand, and only five had tried RMS (Meredith 2013). The majority of studies has therefore revealed the underutilisation of the advanced features and capabilities of RMS. However, there are studies which show occasional usage of RMS by researchers at two universities in India (Charan 2018; Margam 2016).

The Purposes for Which RMS Packages Are Used

RMS packages have a wide variety of functions, such as saving and organising citations for easy retrieval, sharing citations with other students, exporting citations from subject databases, searching databases, "cite while you write", creating a reference list with the preferred referencing style, and editing of citations according to the preferred style (Ivey and Crum 2018). Those who use RMS tend to rely only on basic features, such as organising references and organising citations (Francese 2011). Francese (2013) observed that respondents use the basic functions of the software because they do not know how to use the advanced features. As RMS products have become more sophisticated, their functionalities have extended beyond the basic function of producing references in a consistent style. They now allow researchers to do much more than store and organise sources; researchers can also share their bibliographic citations through social networking tools (Francese 2012; Parabhoi and Verma 2019; Poore 2014), save and organise citation information for research and create bibliographies (Francese 2012), manage related documents (Emanuel 2013), build collections of documents and citations and share and discuss these among colleagues (Francese 2011), and "keep track of the scientific literature that they read and to facilitate the editing of scientific papers that they write" (Osmani et al. 2016, 135).

Sarrafzadeh and Hazeri (2014) note that RMS products help authors to manage information and documents and to make a database of retrieved information or documents, whilst also allowing them to save bibliographic information and full-text versions of these documents in the database for easy access when needed. RMS products provide, amongst others, functions such as importing references from different sources; citing while writing; searching for, editing, and sharing references with other researchers; and storing papers and bibliographic metadata in a database for later retrieval—all of which allow researchers to insert citations and references using a chosen citation style when writing a text (Fenner, Scheliga, and Bartling 2014). However, it remains to be seen which features postgraduate students prefer and use more frequently.

Reasons for Choice and Usage of RMS

There are a number of factors that influence postgraduate students to choose and use specific RMS packages. Rempel and Mellinger (2015) explored how researchers choose a bibliographic management tool and what causes them to continue using this tool. They found ease of use to be the most important factor in choosing a particular RMS tool. Furthermore, workshop attendance was also found to be a factor that influences usage of a particular RMS package by participants. Several studies have shown that choosing the right citation manager is often a matter of personal preference (Childress 2011; Francese 2013; Zaugg et al. 2011). Studies have shown that students and academics choose between different systems, software, and software features to suit their particular needs and the type of work they are involved in. Therefore, adopting a particular system usually involves some form of compromise between the perceived benefits and limitations of a particular system.

To this end, most university libraries have resorted to displaying the differences between different RMS products on their websites or in their subject LibGuides, so that users can choose according to their preferences. For instance, the Rhodes University LibGuides provide a table comparing RefWorks, Mendeley and Zotero, three of the most commonly used RMS tools. LibGuides from several other university libraries also demonstrate how to migrate from one bibliographic management tool to another. All these features and capabilities have an influence on the choice of one RMS package over another, as researchers may, for example, choose to adopt a particular RMS tool because it saves time. Functionality therefore also plays a significant role in whether RMS is used or not. Problematic RMS products may be abandoned. However, as Ollé and Borrego (2010) found, some of these decisions are based on incorrect perceptions and incomplete knowledge of the software.

In a survey conducted by Meredith (2013), it was found that academics and students at Oxford University's Faculty of Law did not use RMS because the software packages were found to be complicated and tedious. Several researchers found they could not insert footnotes into their documents, or that the footnotes inserted needed many corrections. Several other participants thought that RMS would be useful, but did not

have the time to learn how to use an RMS package or to put their existing references into it (Meredith 2013). A study conducted by Lorenzetti and Ghali (2013) found that a number of authors identified specific challenges associated with RMS. These include record errors that occur when downloading references from electronic databases such as MEDLINE, difficulties in identifying and deleting duplicate records from reference management databases, errors in journal output styles, difficulties in transferring reference databases from one software package to another, and delays in accessing RefWorks databases. Gilmour and Cobus-Kuo (2011) noted that many RMS products still require the user to edit the bibliography or reference list to guarantee accuracy. Accordingly, Hantla (2017) advises that all downloaded bibliographic data must be manually checked, as the RMS package might not be capable of finding errors in the downloaded content. There is thus a need to gain insight into the features that lead postgraduate students to either choose or reject RMS.

Methodology

The study used a quantitative research methodology by utilising a survey research design, with a self-administered questionnaire consisting of closed-ended questions as data collection instrument. Before the questionnaire was distributed to the participants, a pilot study was conducted with five postgraduate students in the same faculty at UL to determine the validity and reliability of the questionnaire. The participants were asked questions about the variables that influence their choice and usage of RMS products.

The population for this study consisted of 244 postgraduate students in the FH at UL. Stratified random sampling was used to select participants. This type of sampling is usually used in instances where the population is divided into various subgroups called strata (Maree 2016). The postgraduate students in the FH were divided into three schools, namely the School of Education, the School of Languages and Communication Studies, and the School Social Sciences. The sample was further subdivided into strata; samples were drawn from each stratum according to their level of study—that is, honours, master's and doctoral—and calculated at the value of 5% per stratum. This resulted in the sample size being distributed proportionally to the size of the population: 131 honours, 146 master's, and 43 doctoral students made up the total of 320 targeted participants. However, 244 questionnaires (72%) were returned. The researchers used the Statistical Package for the Social Sciences (SPSS) to analyse the quantitative data. These are presented in the form of tables, pie charts, and bar graphs.

Results and Discussion

From the 320 questionnaires that were distributed, only 244 completed questionnaires (a response rate of 72%) were returned. This response rate was sufficient for the researchers to generalise the findings to the entire population (Punch 2013, 102).

Respondents' Usage of RMS

The respondents were first asked if they had ever used RMS before. As shown in Figure 1, out of the 244 respondents who participated in the study, 58 (24%) indicated that they had never used RMS before; 186 (76%) had used RMS.

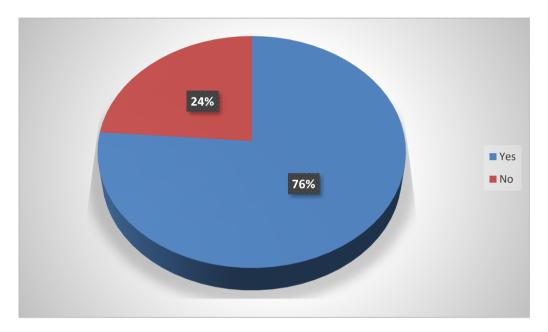


Figure 1: General usage of RMS (n = 244)

These findings are contrary to the findings of most of the studies mentioned in the literature review (Francese 2011; Francese 2013; Lonergan 2017; Melles and Unsworth 2015; Meredith 2013). However, similar findings—of postgraduate students using RMS more frequently—have been reported by two studies conducted at two universities in India. Charan (2018) reports that pharmaceutical students at the Maharshi Dayanand University in India use RMS occasionally. Similarly, Margam (2016) reports high usage of RMS among students and research scholars of the Department of Library and Information Science at the University of Delhi. On the other hand, Bugyei, Kavi, and Obeng-Koranteng (2019) and Adeyemi, Sulaiman, and Akanbi (2020) report low usage of RMS among researchers at the Council for Scientific and Industrial Research in Ghana and faculty members of the University of Ilorin in Nigeria, respectively.

In this study, the respondents were asked to indicate the RMS products that they had used. The questionnaire listed six prominent RMS packages, namely RefWorks, EndNote, Mendeley, Zotero, CiteULike, and RefME, for the respondents to choose from. As shown in Figure 2, of all the respondents who said they had used RMS before, 105 (89%) had used RefWorks. Mendeley is the second most commonly RMS product, with 30 respondents (25%), followed by Endnote with 18 respondents (15%), and

Zotero with 15 respondents (13%). CiteULike and RefME were the least popular RMS products, with 9 respondents (8%) each.

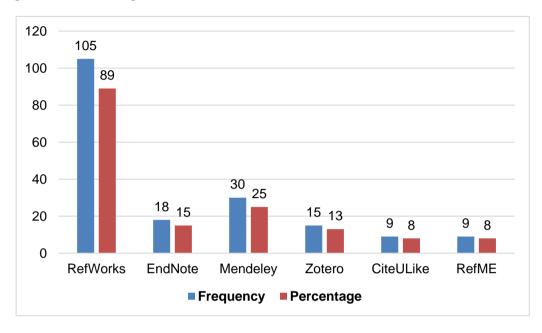


Figure 2: The popularity of different RMS packages (F = 186)

The popularity of RefWorks is attributed to the subscription and training offered by the university library and the service providers. Gilmour and Cobus-Kuo (2011) compared four prominent RMS packages, namely CiteULike, RefWorks, Mendeley, and Zotero, in terms of the features offered and the accuracy of the bibliographies that they generate. These scholars found that RefWorks generates the most accurate citations, while Mendeley was found to be reliable in PDF management. A study by Adeyemi, Sulaiman, and Akanbi (2020) reports that EndNote and Mendeley are the most popular among faculty members of the University of Ilorin, Nigeria. In another study, RefWorks was again the product of choice for more than 98% of authors who used RMS (Lorenzetti and Ghali 2013). In the current study, Mendeley is the second most commonly used RMS tool. The advantage of using Mendeley is that it works on all major platforms, such as Mac, Linux, and Windows, and the basic version is free to use (Pradhan and Karmbe 2020). Mendeley also provides a desktop version of the software that integrates with the web-based version and is reliable at handling and importing PDF files and automatically extracting bibliographic data (Gilmour and Cobus-Kuo 2011). Mendeley can also be used as a social media platform (Poore 2014). Researchers can create a public profile, work on several computers if they synchronise with the web version, and create public groups for discussion and collaboration with colleagues (Parabhoi and Verma 2019).

The Purposes for Which RMS Tools Are Used

The respondents were asked which features of RMS products they normally use; they could choose up to five of the most important features listed on the questionnaire. The most important features identified by students were "creating reference list with preferred referencing style" (85 respondents; 72%), followed by "saving and organising citations for easy retrieval" (82 respondents; 69%), "exporting citations from subject databases" (68 respondents; 58%), and, lastly, "cite while you write" (67 respondents; 57%). The less frequently used features of RMS tools are "searching databases" (34 respondents; 29%), followed by "sharing citations with other students" (16 respondents; 14%). The features that were chosen most often by respondents are depicted in Table 1.

Table 1: The purposes for which RMS tools are used (n = 244)

| Features | n (%) |
|--|---------|
| Saving and organising citations for easy retrieval | 82 (69) |
| Sharing citations with other students | 16 (14) |
| Exporting citations from subject databases | 68 (58) |
| Searching databases | 34 (29) |
| Cite while you write | 67 (57) |
| Creating reference list with preferred referencing style | 85 (72) |
| Editing of citations according to preferred style | 53 (45) |

There are many other purposes for which RMS can be used by postgraduate students, including collecting and organising citations, citing sources for assignments, viewing citations from other researchers, and creating reference lists (Basak 2014b; Francese 2012; Lorenzetti and Ghali 2013; Zhang 2012). Similarly, Emmanuel (2013) found that 84% of respondents used RMS tools for the "creation of reference lists for publications", whilst 82% indicated that they use the software for "storage and organisation of references". Additionally, Melles and Unsworth (2015) discovered that the most important feature identified was "creating reference list" (91%). A study conducted by Speare (2018) found that the top four features used were "creating lists of references" for papers, theses, dissertations, and manuscripts; "creating folders and organis[ing] citations" (81%); "adding in-text citations to papers" (73%); and "saving citations from databases such as EBSCOhost, Google Scholar, Web of Science, etc" (59%). Speare (2018) further discovered that features such as "sharing citations with others" and "creating public or private groups for project collaboration" were minimally used.

Reasons for Choice and Usage of Specific RMS Packages

The reasons for choosing a particular RMS package differ from one person to another. A question was posed to the respondents about their reasons for choosing particular RMS products. The results are depicted in Figure 3. Most of the respondents (73; 32%) indicated that they chose to use a certain RMS tool because they had received training on it. Next, 53 respondents (23%) replied that they chose to use a particular RMS tool

because it was the only one they were familiar with. Thirty-two respondents (14%) stated that they use the RMS tools of their choice because the packages are user-friendly; 30 respondents (13%) stated that the RMS packages they use have all the features they need; 22 respondents (10%) specified that they use a particular RMS tool because it is free; and a mere 18 respondents (8%) chose software which was suggested by fellow students.

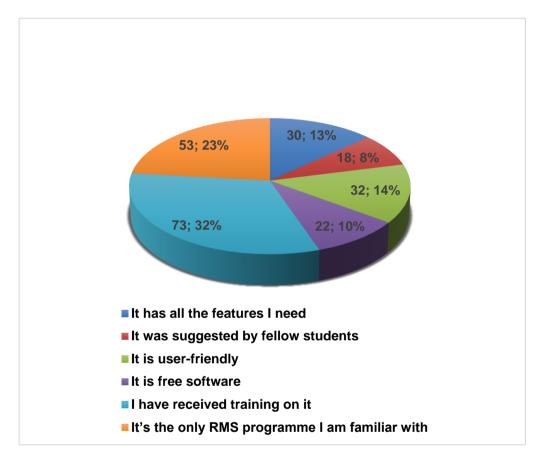


Figure 3: Reasons for choosing a particular RMS product over others (n = 244)

The extension of the TAM emphasises organisational support in the form of training for the use of new technologies (Davis 1989). The study by Emmanuel (2013), which was also based on the TAM, found that "ease of use" was the number one response, with 69% of users specifying it.

Conclusion

This study shows that most postgraduate students in the FH at UL have used RMS. The RMS packages that have been used most frequently are RefWorks and Mendeley. Furthermore, the results of this study show that postgraduate students choose and use

RMS products which they are familiar with and on which they have received training. This implies that product knowledge, experience, and skills in using RMS are positively associated with choice and usage of an RMS package, as suggested by the TAM. The study found that another reason for choosing a particular product is user-friendliness. Therefore, looking at these findings from the perspective of the TAM, this study reveals "usefulness" and "ease of use" as determinants of postgraduate students' choice to use RMS. Even though the purposes for which a particular RMS package is chosen can be similar to the reasons for using that RMS tool, "perceived usefulness" and "perceived ease of use" (Davis 1989) have been proven to be the major variables that determine the choice and usage of RMS packages. The user's behavioural intention to choose and use a particular RMS product is therefore driven by the usefulness and user-friendliness of that RMS package.

It was also revealed in this study that postgraduate students use these systems for basic purposes rather than for their advanced and technical capabilities and functionalities, which can be of great benefit. Based on these findings, it is recommended that advanced or intensified training be offered for postgraduate students to enable them to optimally utilise the advanced features of RMS tools.

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Motlhake and Bopape

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