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Assessing the Awareness and Usage of Reference Management Software (RMS) Among Researchers of the Council for Scientific and Industrial Research (CSIR) Ghana

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Abstract. The study seeks to ascertain the levels of awareness and usage of reference management software (RMS) among researchers of the Council for Scientific and Industrial Research (CSIR), Ghana. The purpose and benefits as well as challenges associated with the use of these tools were also discussed. Descriptive survey methodology was employed for this study. A web-based questionnaire consisting of both multiple-choice and open-ended questions was used to collect data from 110 scientists in 13 research institutes of the CSIR, Ghana. Results show that overwhelming majority of scientists (80%) are aware and know about RMS. However, the adoption and usage of these tools are low. The percentage of non-usage was higher among the older scientists (22% for over 51 years) as against the younger researchers (9% for 31 to 40 years). Overall, 33.6% do not use RMS at all, and scientists occasionally used RMS. Mendeley was the most popularly used software among respondents. Results also show that most of the respondents got to know about RMS through training workshops and seminars. Most of the respondents had not received any training and for those who had attended a training workshop or seminar, majority of them noted that it was very easy to use. The main purpose of using these tools were for research work and literature review. Major benefits of using RMS packages are automatic generation of references list, electronic creation of bibliographies and changing of referencing style by a click of a button. Challenges associated with the use of these tools were slow internet connection, lack of training, and technical support. The study recommended that CSIR should make the effort to acquire these tools. Scientists should also be given the necessary training and technical support in order to effectively use these softwares.

Keywords: Reference management software; bibliographic management software; CSIR; Ghana; researcher; information management.

1. Introduction

Reference management software (RMS) is a tool that is essentially used by all levels of researchers (Mehrbakhsh *et al.*, 2016). These tools help researchers and scholars to organise their works, improve research workflow and save time. According to

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Francese (2012) and Reiswig (2010), RMS is used by researchers in academics to manage the bibliographic citations they encounter in their research. With these tools, scholars can keep track of the scientific literature they read, and to facilitate the editing of the scientific papers they write. These tools are popularly known as bibliographic software, personal bibliographic file manager or the citation management software (Nashelsky and Earley, 1991). They are also known by different names such as "Personal bibliographic software" (East, 2003), "Bibliographic citation management software" (Cibbarelli, 1995), "Bibliographic management softwares" (Fitzgibbons and Meert, 2010), but also "RMS" (Basak, 2014).

A study by Fitzgibbons and Meert (2010) indicated that RMS is established for time-saving tool to write researchers academic papers. RMS decreases researchers' workload in terms of editing, proofreading and avoiding the formatting errors (Aronsky *et al.*, 2005). RMS not only appraises and codes search results but also organises and stores search results (King *et al.*, 2011).

According to Steele (2008) and Emanuel (2013), the primary reasons in consideration of the use of citation management software when writing research literature reviews are promoting accuracy in reference citations, decreasing time in reformatting information to meet the style requirements of different journal publishers, and managing a large quantity of reference data.

In every scientific research environment, referencing, citation and bibliography play a major role in the dissemination of research findings through scholarly writings. Citing references while writing scholarly articles has become more eloquent mainly due to the availability of a range of bibliographic management utilities (Ram and Anbu, 2014). As of today, there are various types of RMS available for citation management, referencing and bibliographic compilation.

However, managing references has always been a difficult task in reporting research results and producing academic writings. Bibliographical information of cited references needs to be provided properly, so that the readers may find them if they need to. It is also time-consuming to write down the bibliographic information of references manually, as this may lead to some errors. Within the literature, the inaccurate bibliographical information stemming from references has been considered as a major hurdle in the retrieval of these resources (Steele, 2008).

Researchers, however, have confirmed that the use of bibliographic management software (BMS) has led to the occurrence of less citation errors (Smith and Baker, 2007). According to Maryam and Afsaneh (2014), software (RMS) packages have three helpful functions for authors:

(1) they ensure the accuracy of citation information;
(2) they allow us to save time when conforming to the demanding referencing style of target journals; and
(3) they help us manage a huge amount of bibliographical information.

These helpful functions of using RMS have been confirmed by other authors. According to Steele (2008) and Emanuel (2013), the primary reasons in considering

the use of citation management software when writing research literature reviews are promoting accuracy in reference citations, decreasing time in reformatting information to meet the style requirements of different journal publishers, and managing a large quantity of reference data.

The above studies therefore show that using these software tools will help researchers save a lot of time and thereby promoting the scientific productivity of researchers.

1.1. *Brief definition of RMS*

RMS is defined as "a tool which enables an author to build a library of references by entering the details of each reference in a structured format. They usually support mechanisms for organizing sets of references by tagging, and will generate references, citations or bibliographies in a range of referencing styles" (Jisc and Open University, 2010).

1.2. *Types of RMS*

There are several different types of RMS on the market with different features and purposes. Some of them are Mendeley (Medaille, 2010), Zotero (Arellano, 2010), EndNote (Reichardt, 2010a), CiteULike (McMullen, 2010), RefWorks (Reichardt, 2010b). There are many reference managers, and these are well known in the scientific community (Hull *et al.*, 2008; Mead and Berryman, 2010). According to Gilmour and Cobus-Kuo (2011), the first RMS packages have their origin in the 1980s. In these days, there are more than 25 different RMS packages available for use (Mead and Berryman, 2010). Some of these packages, such as CiteULike, have Web 2.0 capabilities for sharing data and can be used only online, while others also have the offline version, which can be installed and used on personal computers (PCs).

A group of these packages is commercial and needs to be purchased, but others such as Zotero are open access and can be used freely. A lot of research has been done to introduce and compare these packages (Sahraee, 2013). For this study, the authors considered a selection of 15 most popular RMS, among the available RMS tools on the market are

(a) Citavi
(b) CiteULike
(c) Colwiz
(d) Docear
(e) EndNote
(f) EndNote Basic
(g) Mendeley
(h) Paperpile
(i) Papers
(j) Qiqqa
(k) ReadCube

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(l) Reference Manager
(m) RefWorks
(n) WizFolio
(o) Zotero

1.3. *Awareness of RMS*

The Cambridge dictionary online defines "Awareness" as "knowledge that something exists, or understanding of a situation or subject at the present time based on information or experience" (Cambridge University Press, 2018). Awareness means, essentially, that you can perceive something and know that it exists. For the purposes of this study, awareness of RMS means knowing the existence of RMS, and having the relevant skills for accessing and using available RMS tools.

1.4. *General purpose of study*

The purpose of this study is to establish the level of awareness and usage of RMS among researchers of the Council for Scientific and Industrial Research, Ghana.

1.5. *Research objectives*

(1) To find out the level of awareness of RMS among Researchers of CSIR.
(2) To measure the level and frequency of usage of RMS.
(3) To know the benefits associated with the use of RMS for research work.
(4) To identify the challenges in using RMS for research work.

1.6. *Research questions*

(1) What level of awareness about RMS exists in the researchers of the CSIR?
(2) What are the usage levels of RMS among researchers?
(3) What, out of the available benefits, do researchers derive from using RMS for research work?
(4) What are the challenges or problems encountered while using RMS for research work?

2. Literature Review

2.1. *Theoretical framework*

One theory in information science useful for explaining how RMS is utilised is the Technology Acceptance Model (TAM) propounded by Davis in 1989. The TAM is an information system theory that models how users come to accept and use a technology. The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when they will use it. These factors are behavioural intentions, attitude and perceived usefulness (PU) of the system, perceived ease-of-use (PEOU) of the system, individual intention and facilitating or organisation condition. Figure 1 shows details of the theory.
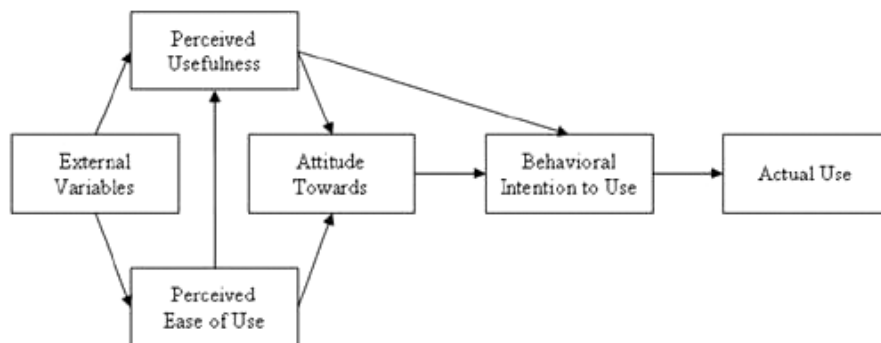
Fig. 1.   Original TAM (Davis, 1989).

TAM is the most influential extensions of Ajzen and Fishbien's Theory of Reasoned Action (TRA) in the literature. He hypothesised that the attitude of a user towards a system was a major determinant of whether the user will actually use or reject the system. The attitude of the user, in turn, was considered to be influenced by two major beliefs: PU and PEOU having a direct influence on PU.

This theory is relevant to this paper in the following ways.

According to Davis, perceived usefulness (PU) element as defined above is relevant to the study because researchers believe that using RMS will ensure the accuracy of citation information, it will allow them to save time when conforming to the demanding referencing style of target journal, and help manage a huge amount of bibliographical information.

PEOU is another element in the theory that is relevant to the study. If researchers perceive the use of RMS to be easy, they would be willing to accept and use RMS for research work. That is, those researchers who perceived that, the use of RMS have more advantages, would prefer to use it since it would improve workflow or save time and would consider the ease-of-use as well as the currency and timeliness of information. In other words, efforts to manage references in traditional ways are reduced significantly with the use of RMS. However, researchers who perceive that the use of RMS imposes a lot of problems will refuse to use RMS tools. The authors adopted this theory because of its relationship to the problem under investigation.

Effectively, the attitude of a researcher towards the use of RMS will depend on the researchers' own interest and how ready he is willing to learn how to have access to timely, accurate and complete information on RMS. It is appropriate that most of these researchers will have adequate training on the use of RMS as well as to be encouraged by other colleagues on the field who use the software tools.

2.2.   *Review of the related literature*

The literature about RMS focusses mostly on two main themes: on the one side, we find description, comparison and technical analysis of the features offered by the software; on the other hand, we find papers about library initiatives of training and

promotion. These two main threads are confirmed by Martin (2009) and McMinn (2011). Several papers have been written about bibliographic management products. Some have compared their features (Butros and Taylor, 2010; Gilmour and Cobus-Kuo, 2011; Hensley and Kern, 2011; Ovadia, 2011), few number of researchers investigated for error rate of RMS (Eichorn and Yankauer, 1987; Vargas-Origel *et al.*, 2001; Mohta and Mohta, 2003; Gupta *et al.*, 2005), others have investigated their use among students (Emanuel, 2013; Salem and Fehrmann, 2013), or how faculty perceive them (Martin, 2009). In addition, a range of short reviews of different packages of RMS have been provided, for example, for Mendeley (Medaille, 2010), Zotero (Arellano, 2010), EndNote (Reichardt, 2010a), CiteULike (McMullen, 2010), RefWorks (Reichardt, 2010b).

Maryam and Afsaneh (2014) investigated the familiarity and usage of RMS by library and information science (LIS) faculties in Iran. The study identified factors that lead to the application and choice of a particular RMS. The research revealed that over half of the respondents had a good familiarity with various citation software and knew how to use them; 35% of respondents have learned how to use these packages through formal education. "Endnote" was the most popular software among respondents. Also, respondents confirmed the need to offer some educational programs on how to use these softwares to bachelor students, and nominated the "Academic Writing" course as the proper place for teaching this topic.

Cibbarelli (1995) also conducted a survey about the usage of RMS. The researcher asked her respondents to rate different aspects of the softwares (such as available documentation, ease-of-use, reliability, etc.) on a scale from 0 to 10. The results seemed positive, setting the average rating around 8, and the comments provided by the respondents seem encouraging towards a stronger attention for the subject. Her survey was addressed to the customers of the software companies; she questioned people who were already using such a tool, but study did not calculate the level of popularity.

Mehrbakhsh *et al.* (2016) adopted a fuzzy logic approach to assess the features of RMS from the researchers' perspective and to show which features influenced the Researchers' Selection of RMS. The features selected were Miscellaneous Features (MIF), Ease-of-Use Features (EUF), Citing Features (CIF), Collaboration Features (COF), View/Search Features (VSF), Editing Features (EDF), Data Format Features (DFF), Import Features (IMF), and Technical Specification Features (TSF). The results of the proposed expert system showed the ability of fuzzy logic in evaluating the RMS features. The results also showed that the Researchers' Selection of RMS is more influenced by EUF and CIF features and they are more important than other features of RMS with maximum levels of about 0.823 and 0.875 in relation to the other RMS features.

Ram and Anbu (2014) conducted an online survey to assess the perception, awareness and use of BMS by the LIS professionals in India. Results showed that there was the need to strengthen the awareness of BMS at the institutional level and also hands-on experience was needed for library professionals to help in the process of

research writing and advocate for adopting correct referencing style (citation style) while writing scholarly articles.

Haglund and Per (2008) in their study found that Swedish researchers do not have deep knowledge of the up-to-date digital tools that could enhance research and information management. A similar lack of awareness is shown by Ollé and Borrego (2010) according to their study at Catalan Universities, researchers described their techniques as "primitive" or "rudimentary". Only 25% of their sample use some kind of personal bibliographic tool. In their survey conducted in five American universities, Niu (2010) found that "information-seeking and information-handling habits of researchers are very personal" and inconsistent behaviours can emerge even though the usage of an RMS is widespread.

Steele (2008) claims that citation management softwares have existed since 1980 and are widely used today, but does not give any reference for that. A survey by Francese (2013) about the popularity and usage of RMS among researchers and scholars of the University of Torino, Italy, revealed that knowledge of RMS is high among the respondents, but their adoption is not. EndNote is the most known and used RMS while the other alternatives are more scarcely considered. The research also revealed that, because of time constraints, scholars rely on old habits of managing literature and are very unlikely to discover new ways to manage the literature they need. Virtual collaboration is absent from the common research practice.

A study by Madhusudhan (2016) to find out the citation management and the needs of students of Department of LIS, University of Delhi, and how online citation tools fit into their academic and research process showed that all the respondents were aware of online citation tools and used them occasionally. EasyBib was the popular online citation tool among respondents. The survey results also show that most of the respondents learned the online citation tools through the department's website. The purpose of using these online citation tools was for their academic and research work. Most of the respondents were accessing online citation tools from the Delhi University Computer Centre. The findings of the study also revealed that respondents had not received any formal training for creating online citations. The benefits of using citation tools were simplified and easy bibliography and automatic creation of references list. Some respondents, however, wanted training in using online citation tools for creating efficient references.

A survey by Osmani *et al.* (2016) at a research university in Malaysia to observe how much RMS are used, which softwares are most known and used, and the reasons and the approaches behind their usage, revealed that majority of the respondents know about RMS. Only 6.5% of the respondents do not know about RMS. Again, only 10.2% of them do not use any RMS. 92.6 % of respondents know and use EndNote, making it the most used and known software, this was followed by Mendeley with 47.2%. Overall, RMS is used by 83% of users among the scientific community. Information about user behaviour and the reasons behind it suggests that, softwares are mostly used because it is provided by the institution (26%) or used by the rest of the community (24%).

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The above-mentioned literature suggests that, in other parts of the world, research relating to RMS, citation and BMS have been carried out mostly in the field of LIS. The main aims of these studies have been the role of libraries and information professionals in training others on how to use these software tools. The literature also shows that work has been done in relation to the awareness and usage of RMS by faculties, students and library and information professionals within the context of universities. However, no research was found to have been done to ascertain the level of awareness and usage of RMS by researchers in a non-academic scientific research institution in Ghana. The present study is an attempt in filling that gap in the literature.

3. Research Methodology

This study uses a descriptive survey with a qualitative approach. This method was chosen because a descriptive survey helps a researcher to examine the status of an event and learn more about the research community. According to Kumar (1992) as cited by Maryam and Afsaneh (2014), a survey method is appropriate for examining an issue at present time and therefore using this research method allows one to investigate current conditions as a means of predicting future trends. Again, an underlying assumption of a survey method is that through the study of a sample population, employing scholarly methods, one may arrive at conclusions regarding a larger research community.

3.1. *Data collection*

The data for this study were collected using an online researcher-made questionnaire. The online questionnaire was designed using LimeSurvey (http://www.lime-survey.org), a free and open source web-based software survey management tool. To ensure the validity and reliability of the questionnaire, the link to the web-based questionnaire was sent to researchers of the Food Research Institute of the Council for Scientific and Industrial Research (CSIR) — one of the 13 institutes of the CSIR for pre-testing. Online surveys are advantageous because respondents can answer the questions and submit their responses during a single visit to the website link, thus avoiding the additional step of mailing the survey. Web-based surveys are also inexpensive. It does not also require interview time and allows respondents to maintain their anonymity and reconsider their responses.

The survey questions were categorised into four sections. Section A consists of demographic information, section B consists of questions about the awareness and usage of RMS, section C asked questions about the purpose and benefits of using RMS and finally section D is comprised of questions about training and support.

3.2. *Study population and sample size*

The population of researchers in CSIR as of August 2016 was 339. Out of this number, the researchers were able to identify 200 e-mail addresses which constituted the sample size. Respondents of the study therefore included all the 200 researchers

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of the 13 research institutes of the CSIR across the country. The e-mail addresses of these researchers were found in the past proceedings of the Research Staff Association. Some e-mail addresses were also obtained through personal communication. An e-mail of invitation with a reference to the link in the online questionnaire was sent to the e-mail addresses of 200 researchers in September 2016. Subsequently, a follow-up e-mail was sent after every two weeks until the link to the questionnaire expired in December 2016.

3.3. *Data analysis*

This study was conducted from September–December, 2016, and out of 200 invitations sent, 142 responses were received. However, after careful analysis, 32 of the responses received were found to be incomplete, giving a response rate of 55% and a completion rate of 77.5%. The incomplete responses and non-responses could be attributed to the difficulties in accessing the Internet in some part of the CSIR Institutes studied. In all, 110 completed responses were therefore subjected to data analysis. IBM SPSS Statistics version 24 and Microsoft Excel 2016 were used for the data analysis.

4. Findings/Results and Discussion

4.1. *Demographic information of respondents*

Table 1 presents the demographic information of respondents. According to the table, majority of the respondents were males (74.5%) and 66.4% of the participants have Master's degree qualification. Also, 33.4% of the resp0ndents have 11–15 years of research experience. In terms of age, majority of the respondents (37.3%) were above 51 years.

Table 1.   Demographic information of respondents.

Variable	Categories	Frequency	%
Gender	Female	28	25.5
	Male	82	74.5
Age (years)	20–30	1	0.9
	31–40	40	36.4
	41–50	28	25.5
	Above 51	41	37.3
Education	PhD	37	33.6
	Master's Degree	73	66.4
Research experience (years)	Less than 1	1	0.9
	1–5	22	20.0
	6–10	37	33.6
	11–15	18	16.4
	16–20	14	12.7
	21–30	16	14.5
	Above 30	2	1.8

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4.2.   *Awareness of RMS*

Section B of the questionnaire asked about the awareness and usage of RMS, the results show that an overwhelming majority of the respondents are aware of RMS, however, the awareness levels among a specific RMS differ. Figure 2 shows the general awareness of RMS among respondents. From Fig. 2, 80% of the respondents are aware of RMS while 20% are not aware or have not heard of the existence of RMS. The high level of awareness of RMS among researchers of CSIR confirms the results of other research work done by Osmani *et al.* (2016); Francese (2013); Maryam and Afsaneh (2014) and Madhusudhan (2016).

In terms of the knowledge of a specific RMS tool, Fig. 3 shows that 58.2% of the respondents are familiar with Mendeley which turned out to be the most known RMS tool among the respondents, this was closely followed by EndNote, which was also known by 53.6% of the researchers. Again, 31.8% know Zotero, 10% are aware of Reference manager, Refworks and Endnote basic, other known RMS included Papers, Citavi, CiteULike, WizFolio and Docear. 15.5% do not know any of the RMS tool.

4.3.   *Where researchers got to know about RMS?*

The third question of the questionnaire solicited information about how researchers got to know about RMS. Figure 4 shows that 59.1% became familiar with RMS through training workshops and seminars, 39.1% from colleagues, 13.6% through mentors/supervisors, 13.6% through the Internet. Other sources included institutional library and website, social media, newsletters/newspapers and from other institutions.
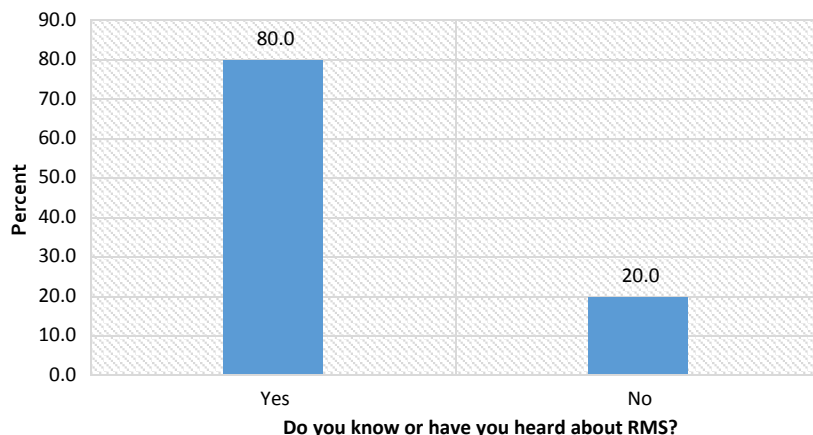

Fig. 2.   General awareness of RMS.
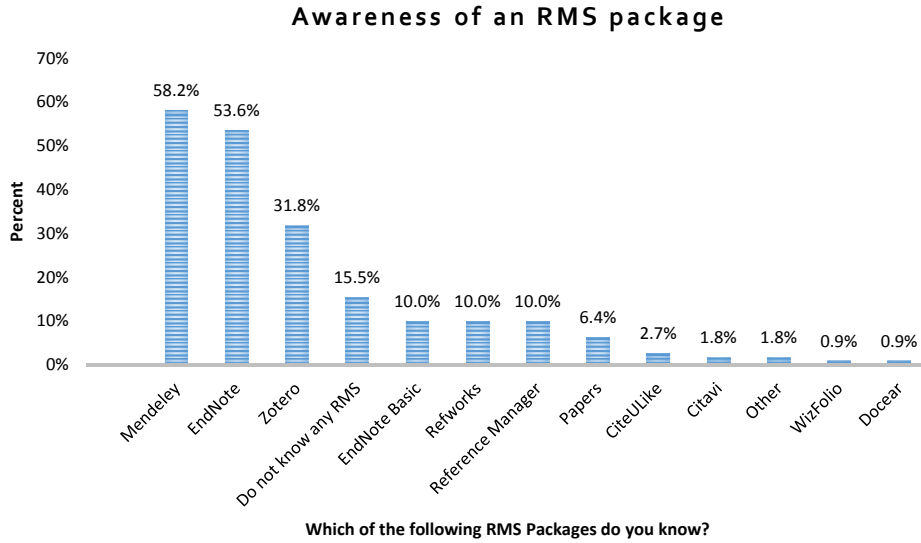
Awareness of an RMS package

Fig. 3.   Type of RMS known by respondents.
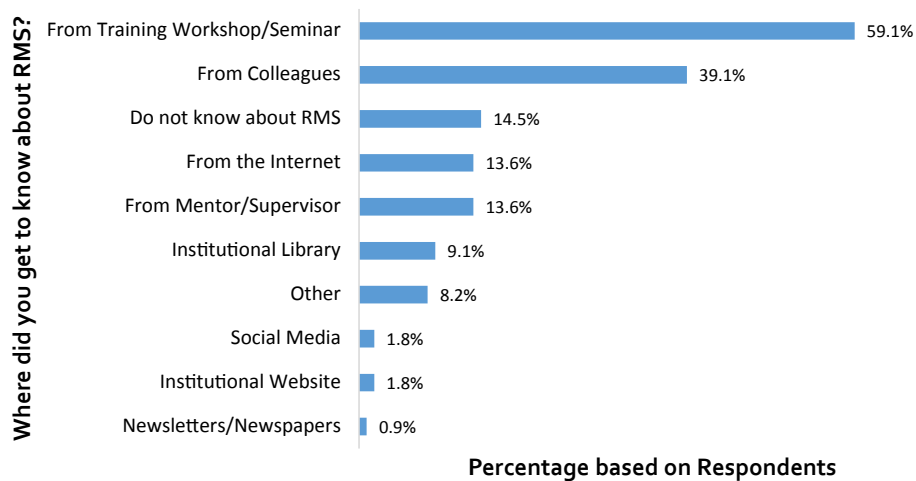

Fig. 4.   How researchers got to know about RMS?

4.4. *Usage of RMS*

4.4.1. *Types of RMS packages used by researchers*

Respondents were also asked to indicate the type of RMS packages used. The researchers provided a list of some popular RMS packages including EndNote, Mendeley, Zotero, EndNote Basic, Refworks, CiteULike, Papers, Reference
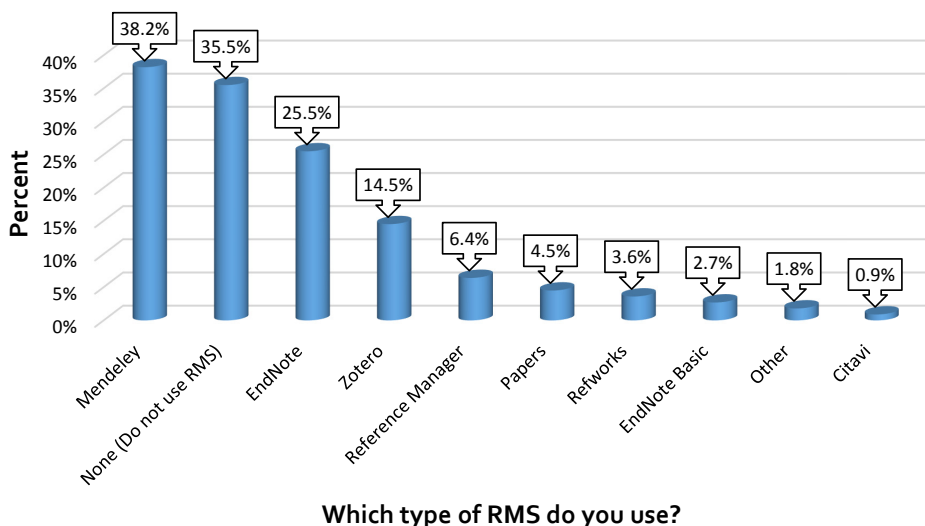
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Which type of RMS do you use?

Fig. 5.   Types of RMS used by respondents.

Manager, and others so that respondents could choose the RMS tools that they used. Results showed that (Fig. 5) Mendeley was the most popularly used RMS, attracting 32.8% of the respondents. EndNote was the next most used RMS package among scientists with 25.5% of them using it. Other RMS packages used by respondents are Zotero (14.5%), Reference manager attracting (6.4%). The other software tools appeared to be scarcely used. The high usage of Mendeley could be attributed to training workshops and seminars organised in various institutes about the use of Mendeley. It may also be attributed to the open source nature of the software. This study has revealed that the three most popular RMS tools are Mendeley, EndNote, and Zotero. This finding conforms to those of other research studies, Maryam and Afsaneh (2014), Francese (2013), Osmani *et al.* (2016).

RMS distribution per age shows different usage levels among scientists. From Fig. 6, the percentage of non-usage is higher among the older scientists (22% for over 51 years), and very low among younger and middle-aged scientists (9% among people from 31 to 40 years and 8% among scientists between the ages of 41 and 50 years).

Although the literature suggests that there is a positive relationship between awareness and usage of RMS by researchers, the findings of this study proved otherwise. Results show that large number of researchers are aware of RMS, but only small percentage of them are using these RMS tools. This negative relationship between awareness and usage of RMS could be attributed to the fact that the CSIR as a research institution seems not to recognise such an important tool and has not made any effort to officially acquire these softwares for use by researchers. From the authors' point of view, until CSIR adopts an RMS for official use for research work,
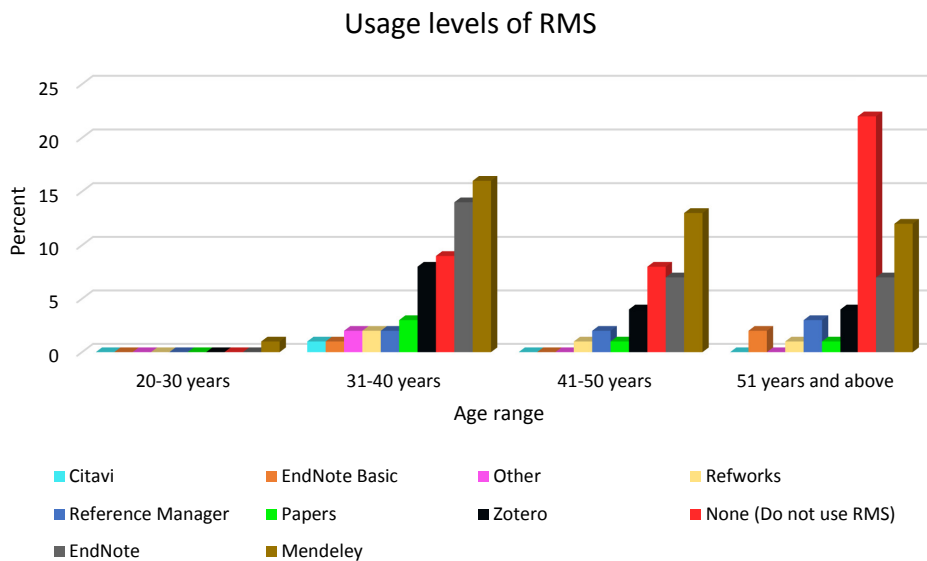
Fig. 6.   RMS distribution per age.

researchers may not be encouraged to use them. The few researchers who are using these tools acquired them through their own personal efforts. Also, these researchers do not have the needed technical know-how in order to fully maximise the full benefits of the RMS.

4.4.2.   *Frequency of usage of RMS*

One important factor to consider with the usage of RMS is the regularity. In view of this, respondents were asked to indicate the frequency of RMS usage. Figure 7 shows that 41.8% of scientists occasionally use RMS, 7.3% use it daily, 5.5% use it on a weekly basis (2–3 times in a week, once in a week). In the open-ended part of this question, other respondents indicated that they use RMS when writing research paper or preparing a research report. Very few use RMS on a monthly basis. The results also revealed that 33.6% of respondents do not use RMS at all.

4.4.3.   *Experience with the use of RMS*

The findings show that 19.1% and 13.6% of respondents are long-time users, also, 13.1% have less than 1 year of RMS usage experience. Also, 32.7% do not use RMS (Fig. 8). This is an indication that majority of respondents do not have much experience with RMS usage.

4.4.4.   *RMS features mostly used by researchers*

Respondents were asked to identify the most important features of RMS packages that they used. Results indicate that respondents mostly use RMS for saving of

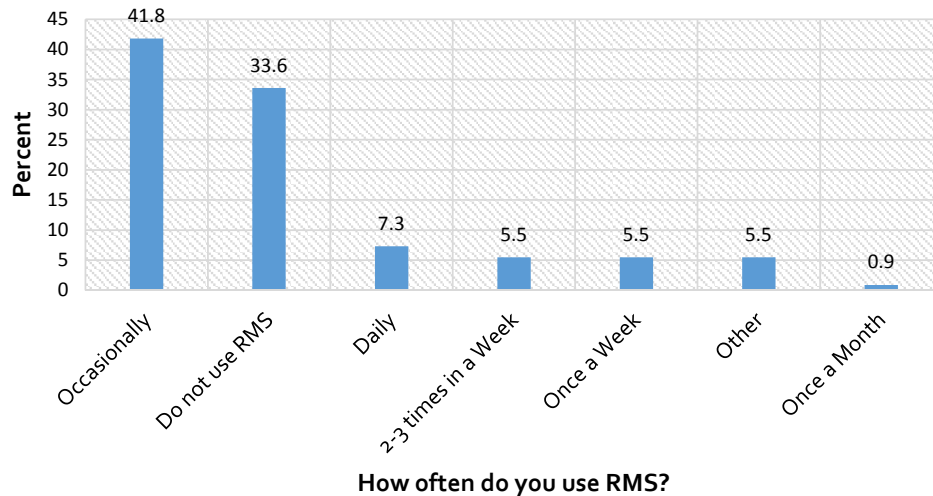*K. A. Bugyei, R. K. Kavi and G. Obeng-Koranteng*
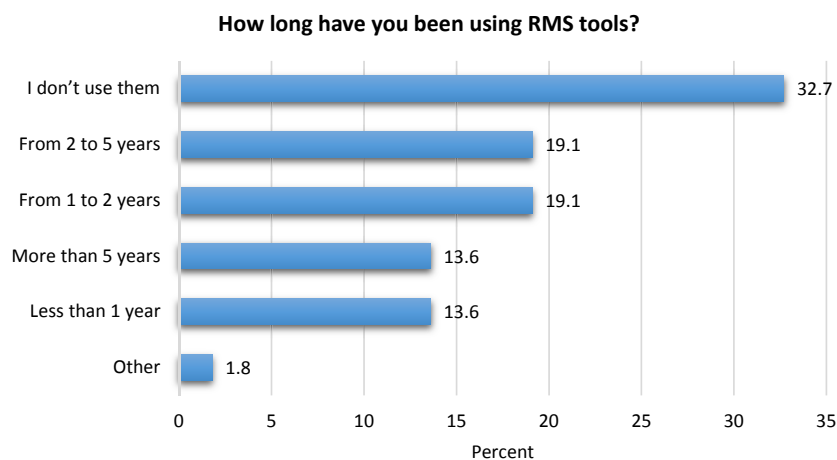

Fig. 7.   Frequency of RMS usage.

Fig. 8.   Experience with RMS usage.

citations (50.9%). The next most used feature is "inserting citations into my research paper" (42.7%). Other features include "Organising of references for ease of retrieval" (27.3%), "Creating bibliographic list" (24.5%), "Editing citations according to the required citation style" (22.7%), "Organising full-text papers of articles" (12.7%), "Discovering new references" (11.8%) and "Sharing of references with others" (6.4%). It is also worth noting that 33.6% of respondents do not use RMS package (Fig. 9).

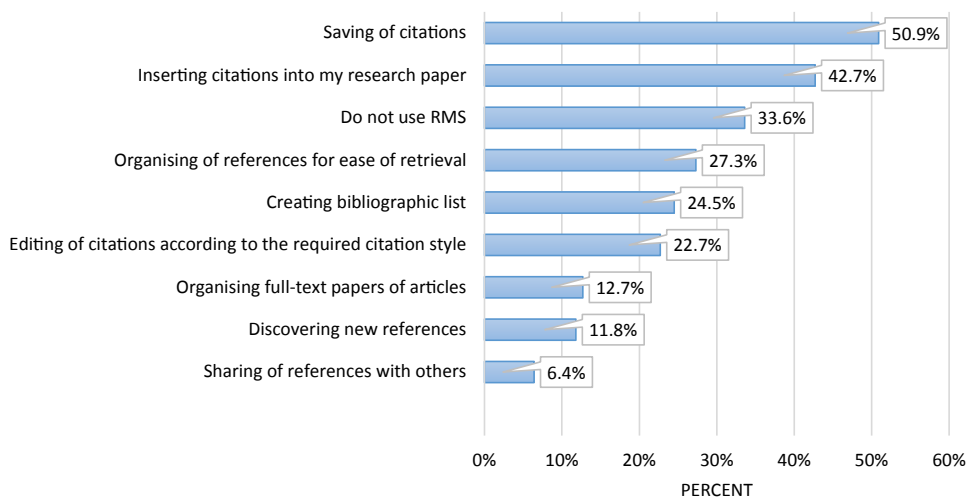*Assessing the Awareness and Usage of RMS*

Fig. 9.   Features of RMS mostly used.

4.4.5.   *Reasons for choosing a particular RMS*

Respondents were asked to mention their reasons for choosing an RMS. According to the findings, respondents mostly (17.3%) use a particular RMS because it is the best performing tool for their research needs, 16.4% also indicated that it is the tool used or suggested by other colleagues, 11.8% of respondents use it because it is free of cost. Other identified factors include "It is purchased or provided by my institution", "It is open-source", "I read an article about it". In the open-ended part of this question, respondents have cited "It was the tool introduced at a training workshop", "It was mandatory for PhD studies", "It is the only tool known" as their reasons for choosing an RMS. Further, 33.6% indicated non-usage of RMS (Fig. 10).

4.4.6.   *References saved by RMS*

Various RMS packages offer some degree of references and citations saving functionality, depending on whether the package is free or paid. Respondents were therefore asked to indicate the number of references saved in their chosen RMS tool. Results show that 21.8% of respondents-chosen RMS allows them to save less than 50 references (Fig. 11), 11.8% can save 51–100 references. Only 4.5% of respondents can save more than 2,000 references in their RMS package.

From the literature, RMS is said to be an important aspect that is essential for all levels of researchers, however, findings from this study suggest that researchers do not regard RMS as essential as they do not use it very much. This could be attributed to the fact that majority of respondents are using the free version of RMS which has citation saving limitation. This is indicated by the highest number of

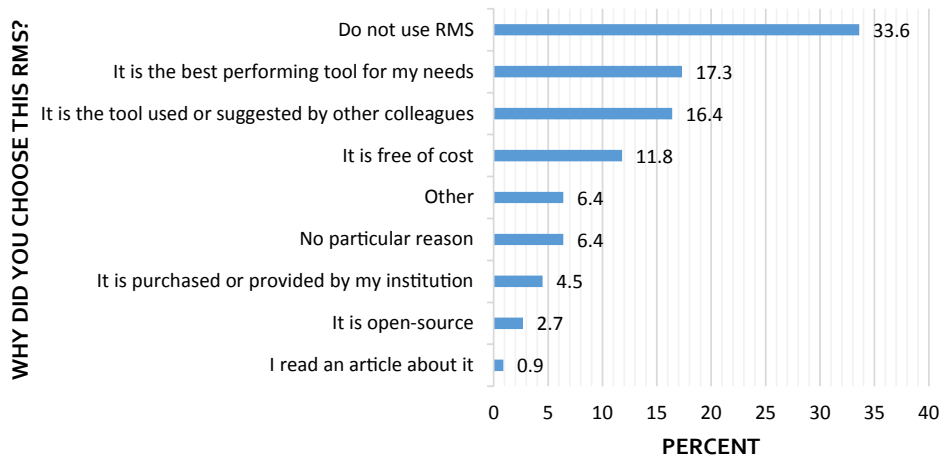*K. A. Bugyei, R. K. Kavi and G. Obeng-Koranteng*
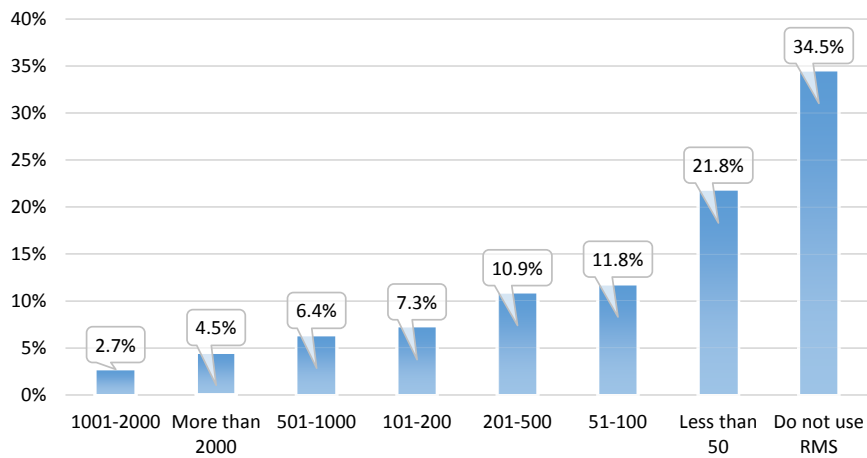

Fig. 10.   Reasons for choosing RMS.

Fig. 11.   Number of references saved in RMS.

respondents (21.8%) indicating that their RMS tools allow them to save only up to 50 references.

4.4.7.   *Ease-of-use of RMS by researchers*

Survey respondents were asked to ascertain whether RMS tools are easy or difficult to use. To this end, five Likert-scale responses were provided in the questionnaire to solicit responses from the respondents. The study revealed that majority of respondents (30%) found the usage of RMS tools to be quite easy (Fig. 12), 15.5%

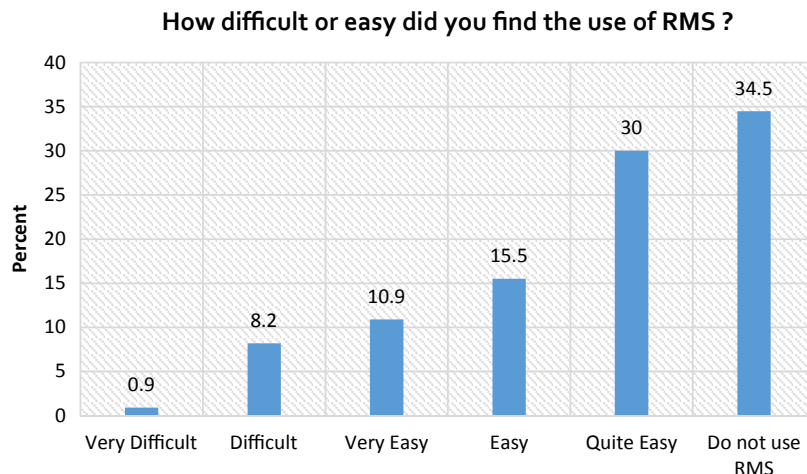**How difficult or easy did you find the use of RMS ?**

Fig. 12.   Ease-of-use of RMS tool.

said it is easy to use RMS, 10.9% found it to be very easy. Only 0.9% of respondents found the usage of RMS to be very difficult. In spite of the smaller percentage of respondents finding the usage of RMS to be very difficult, it is worth mentioning that quite a significant (8.2%) number of people still finds it difficult to use RMS tools. Again, 34.5% do not use RMS at all. The results therefore affirm that some respondents need training and support to overcome the difficulty associated with the use of RMS tools.

4.4.8.   *Purpose and benefits of using RMS*

The purpose of using RMS tools differs from one respondent to another. The questionnaire provided four major purposes for respondents to indicate the purposes for which they use RMS packages. Figure 13 shows that 54.5% of the respondents use RMS tools for research work, followed by literature review (50%), and for publishing article (49.1%). Only 7.3% of respondents use RMS tools for seminar presentation. Again, 29.1% of participants who responded to this question do not use RMS. This therefore suggests that majority of respondents use RMS tools for research work.

The respondents were asked to indicate the benefits derived from the usage of RMS. Their views regarding the benefits they derived from using RMS tools are depicted in Fig. 14. From Fig. 14, 60% of the respondents said that it generates references list automatically, this was followed by 40% who were of the view that it helps them create bibliographies electronically. Further, 32.7% said that it helps them change the referencing style with a click of button, the same percentage of people (37.2%) also said that it automatically numbers the references, 25.5% indicated that it is easy to download references. Other benefits included "create references word document" (23.6%), share references with other colleagues (19.1%), and save, print or e-mail the reference list (10%). In the open-ended section of this
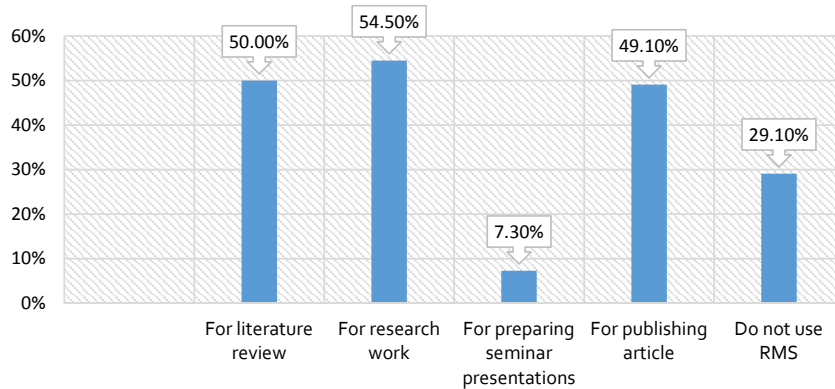
K. A. Bugyei, R. K. Kavi and G. Obeng-Koranteng

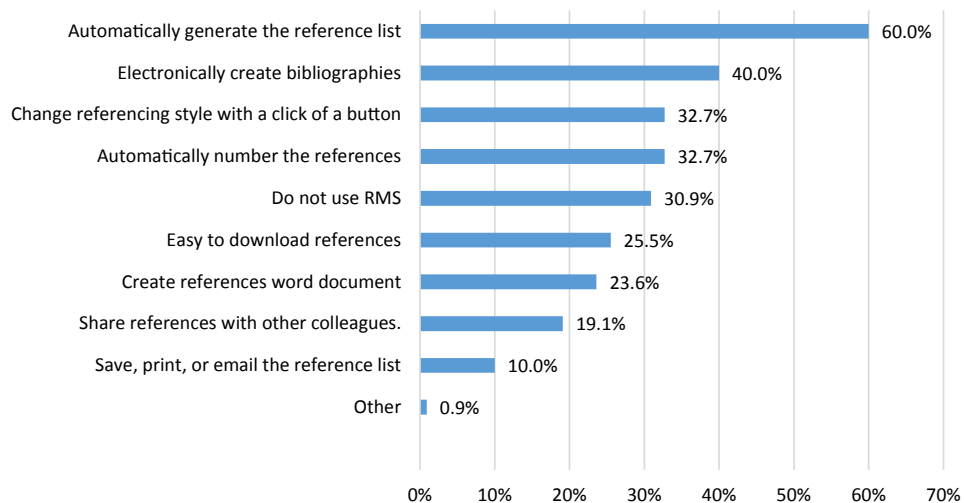Fig. 13.   Purpose of using RMS tool.

Fig. 14.   Benefits derived from using RMS.

question, one respondent said that RMS "allows me to input my own citation style and also organises my PDFs in a nice database which is retrievable even when I change my laptop". These results are consistent with the findings of Madhusudhan (2016).

4.5.   Training and support

4.5.1.   Support of preferred referencing/citation style

Respondents were asked whether RMS tools support their preferred referencing/ citation styles. Results showed that majority of the respondents (62%) said that it

supports it. However, 36% seems not to be happy with the support of their preferred citation style.

4.5.2. *Challenges of using RMS*

Respondents were requested to provide the details in respect of the difficulties faced while using RMS tools. Major difficulties faced by respondents with the use of RMS tools are depicted in Fig. 15. Figure 15 shows that the most obvious impediment is the slow Internet connectivity (38.2%), this was followed by lack of training (35.5%). Another major difficulty was the lack of technical support (26.4%). Other factors were lack of referencing/citation style knowledge (13.6%), instructions on the use of RMS are not clear (10%). Only 2.7% cited lack of basic computer skills as a challenge with the use of RMS. It is also worth noting that 2.7% of the respondents had no difficulties or challenges whatsoever in using RMS. Some other scientists (3.6%) have also indicated other difficulties such as "At times references are not cited correctly electronically and you need to insert mechanically", "Can't type a reference and import from work to software", "I prefer EndNote to Zotero because I understand EndNote better. I might use Zotero more if I get to know more about how to use it because it is a free software", "Sometimes the particular software does not allow for some styles". Also, 29.1% of the respondents said they have never used RMS before.

4.5.3. *Attendance of training workshop*

Respondents were asked to indicate whether they had attended a training workshop or seminar on the use of RMS. Results indicate that 56% of respondents had already been trained on how to use RMS. However, the percentage of respondents that has not received any training is quite high (44%).
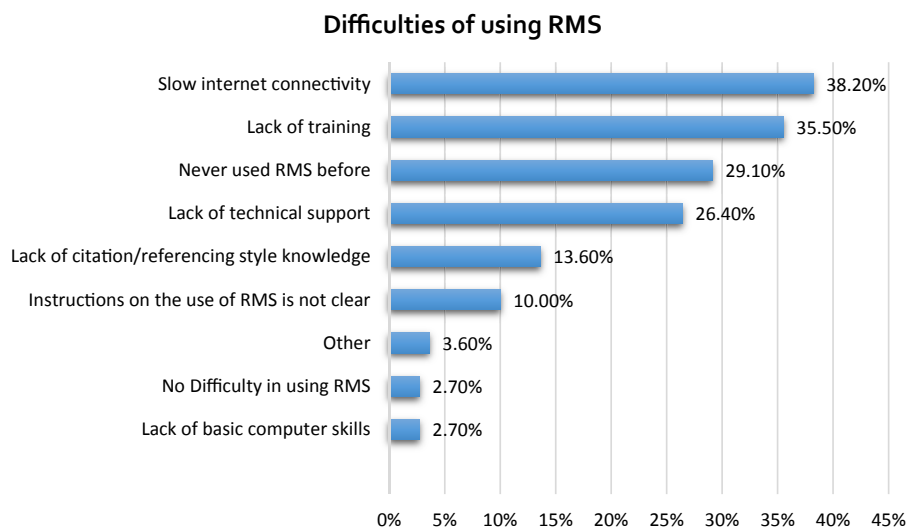

Fig. 15.   Challenges with the use of RMS.
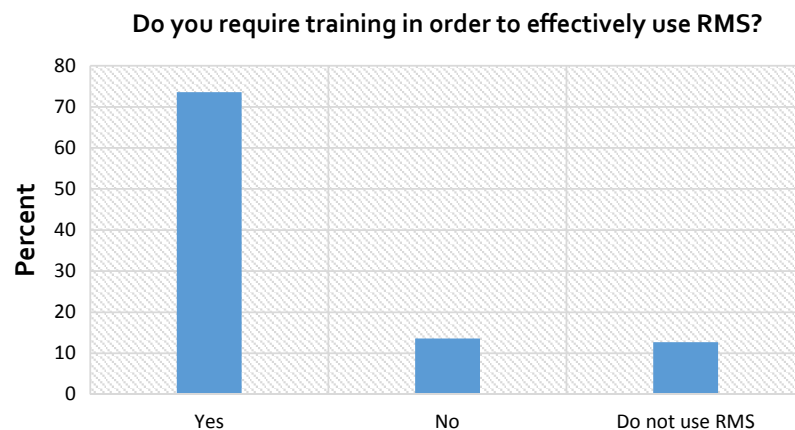
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Fig. 16.   Require training to use RMS?

4.5.4. *Do you require training in order to effectively use RMS?*

A plethora of RMS are available today, and each tool offers different capabilities. Some are more sophisticated with a lot of functionalities. For effective use of these tools, retrieving and searching skills are necessary for beginners and even advanced users. In view of this, scientists were asked whether they require training or not in order to effectively use RMS. Results indicate that 73.6% wanted training in order to use RMS efficiently. Only 13.6% stated that training is not required (Fig. 16), the reasons could be that they are already conversant with the use of these tools or have had training before and had the skills and techniques to use RMS.

5. Conclusion and Recommendations

This study has been conducted to establish the level of awareness and usage of RMS among researchers of the CSIR, Ghana. The results of this study showed that majority of scientists of the CSIR are aware of RMS, however, the adoption and usage levels of these softwares are very low. The percentage of non-usage is higher among the older scientists as against the younger researchers. There are quite significant number of respondents who are still not aware of RMS. The study also revealed that most of the respondents use RMS occasionally.

Although the literature suggests that there is a positive relationship between awareness and usage of RMS by researchers, the findings of this study proved otherwise. Results show that large number of researchers are aware of RMS, but only small percentage of them are using these RMS tools. This negative relationship between awareness and usage of RMS could be attributed to the fact that the CSIR as a research institution seems not to recognise such an important tool and has not made any effort to officially acquire these softwares for use by researchers. From the authors' point of view, until CSIR adopts an RMS for official use for research work,

researchers may not be encouraged to use them. The few researchers who are using these tools acquired them through their own personal efforts. Also, these researchers do not have the needed technical know-how in order to fully maximise the full benefits of the RMS.

The most popular and used software package is Mendeley, followed by EndNote, the other softwares are scarcely used. The survey results show that, majority of researchers got to know about RMS through training workshops and seminars. It was evident from the research that more than 30% of respondents do not use RMS at all. Respondents mostly use RMS packages for inserting and saving of citations, perhaps, that is the only feature known. Respondents should therefore be educated on the other equally important features of RMS, since these tools offer more functionalities. The study also revealed that scientists are mostly using a free version of these tools and therefore limiting the number of references saved in the chosen software. The main purpose of using these packages is mostly for research work and the literature review. These findings are consistent with Madhusudhan (2016).

Most of the respondents had not received any training and for those who had attended a training workshop or seminar, majority of them noted that it was very easy to use. Respondents also derived some benefits from the usage of RMS, the most notable ones were automatic generation of references list, electronic creation of bibliographies, referencing style can be changed by a click of a button. Other benefits that were indicated also included easy download of references, creation of references word document, and automatic numbering of references. In spite of the benefits that RMS offers to respondents, there were some challenges associated with the use of these packages. The major ones were slow Internet connection, and lack of training and technical support.

The following recommendations are proposed:

(I) Conscious effort must be made by CSIR management to mandate the information management team in various CSIR institutes to sensitise research scientists on the benefits of RMS.

(II) Scientists should be given the necessary training and technical support in order to effectively use these softwares.

(III) CSIR management should take the necessary decision to officially acquire either a commercial version or an open source version of RMS for use by researchers.

(IV) Management of various CSIR institutes should make the necessary effort to provide fast Internet connectivity for research work.

5.1. *Significance of this study*

(I) This study will inform researchers of CSIR as well as other research institutions to know about the existence and capabilities of RMS, and how RMS can help in referencing and citation as well as the role these softwares play in research and publication.

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 (II) The research will also be significant to the developers of these tools for them to
       include more features and reduce the complexity associated with its usage.
(III) It will also be beneficial to the management of CSIR of the need to officially
       acquire these tools for use by researchers.

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