



Entomologists' Utilization of Electronic Information Resources at Makerere University, and National Agricultural Research Organization, Uganda

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Abstract

The concept of electronic resources had tremendously been adopted by most societies due to its associated value. Technology advancement has been a major driving force for this dynamic shift of access to information. Such a technology requirement may be in the form of hardware such as computers, tablets, and mobile phones, or software. These resources help researchers and scholars to access information conveniently at any time and from any location. Insects are a major component of the ecosystem. Some insects are very destructive such as giant looper, caterpillars and locusts, while others such as bees and grasshoppers are beneficial. While agriculturalists continue to experience losses due to pests, some solutions already exist and can be accessed online. It is therefore the role of experts like entomologists who should retrieve the technical information from various sources and provide meaningful solutions to the local farmers. This paper aims to address the gap in information services provided by institutions and information personnel, for improved utilization of electronic resources by teachers, researchers, and postgraduate students, of Entomology at Makerere University and National Agricultural Research Organization (NARO). The study employed a mixed-methods research paradigm. An Interview guide, questionnaire, and observation guide were used to collect data from Entomologists. Data was captured using Epidata (V. 3.1), analyzed using descriptive statistics in SPSS (V.21) to obtain the frequencies and relationships in response to the research questions. Data were presented in tables and graphs for appropriate interpretation. Results from the study indicated that Entomologists were aware of the availability of E-Resources at their institutions. It was also established that the internet was largely utilized in the search for information, and searches from Google Scholar and AGORA databases were more prominent. The majority of the Entomologists were found to prefer E-Resources to print resources and that they mainly depended on E-Resources under their institutional subscriptions. Entomologists were found to have a diversity of information needs, but they largely searched for information on the biology and physiology of insects. The major challenge encountered by Entomologists in the use of E-Resources was the slow internet speed resulting from limited bandwidth. This study practically and theoretically, contributes to Information services at institutions. It isolates Entomologists from other researchers and provides conclusive solutions to societal problems resulting from hindrances to information access.

Keywords: E-Resources, Entomologists, Agricultural Research, Insects, Pests.

1. Introduction

The use of electronic information resources is a key aspect of the success of teaching and research in the modern world. According to Omona and Ikoja-odongo (2006), advances in electronic-based information and communication technologies (ICTs) are rapidly transforming social and economic conditions across the globe. Libraries are at the forefront of the new developments in information access and delivery in academic and research institutions, thus defining the new roles of librarians (Moyo, 2004). According to Stewart, Narendra, and Schmetzke (2005) students and teachers in higher institutions are expected to retrieve information and apply it in their chosen fields of study, however, it is prudent to analyze the appropriateness of the electronic information before being applied (Saparova & Nolan, 2016). In today's technology-rich academic environment, much of this information is retrieved with the help of web-based indexes and databases.

Tredoux and Smith (2006) argue that to bolster external validity the researcher must carefully define the participant population and other key aspects of the research. Electronic resources and services are, therefore, defined as a variety of electronic and digital sources of information available to teachers and learners within an academic context (Swain & Panda, 2009). According to Haridasan and Khan (2009) e-resources are resources in which information is stored electronically and which are accessible through electronic systems and networks. However, Graham (2002) broadly defines electronic resources as all computer-mediated resources. E-resources is a very broad term that includes a variety of different publishing modes, including OPACs, CD-ROMs, online databases, e-journals, e-books, internet resource, print-on-demand (POD), e-mail publishing, wireless publishing, electronic link, and web publishing, etc. (Haridasan & Khan, 2009).

In the modern world of technology, electronic resources provide a much faster means of accessing information. Therefore, electronic resources and services are very important in teaching and research (Ibrahim, 2004), and enhance decision making in problem-solving situations (Hewitson, 2002).

In their study to determine the use of electronic resources in business school libraries in an Indian state, (Hewitson, 2002) considered electronic resources like mines of information that are accessed through modern ICT devices, refined and redesigned and more frequently stored in the cyberspace in the most concrete and compact form and can be accessed simultaneously from infinite points by a great number of patrons. This is advantageous in a way that it saves library space and user time (Kenchakkanavar, 2014).

In the information chain, it is the role of librarians to create awareness and to provide information access points to researchers. According to the findings from a study conducted by Raven and Yeates (2007), most scholars are not aware of the services that the library offers and generally do not consult librarians regarding their information needs. The provision of vital information is thus preceded by studying the information-seeking behaviors and information needs of the intended users. According to Kuruppu and Gruber (2006) understanding the information needs, information-seeking behavior, and information use of academic science scholars is challenging. They (Kuruppu & Gruber, 2006) add that in the current dynamic information environment, information-seeking behaviors of users change and evolve with emerging technologies and information dissemination systems. It is, therefore, important to determine certain characteristics upon which we can base to understand them.

Accessibility of entomological electronic information at Makerere University is usually through password protected e-books, the full-text journal databases such as Access to Global Online Research in Agriculture (AGORA), Online Access to Research in the Environment (OARE), HINARI, American Society of Agricultural and Biological Engineers (ASABE), CAB abstracts, International Forestry Review, JSTOR ("Makerere University Library," n.d.), The Essential Electronic Agricultural Library (TEEAL), Plant Resources Of Tropical Africa database (PROTAbase), CD-ROMs, Google Scholar, OPACs, Institutional repositories, and other Internet resources. Zenger and Walker (2000) emphasize that access to journal articles via the Web is more convenient and certain than requesting reprints or going to a research library, finding issues, and making photocopies. On the other hand, access to e-resources by Entomologists in National Agricultural Research Organization (NARO) is usually through subscription to their information system; the Agriculture

Research Extension Network (ARENET), including publications from local and international publishers. Other sources include the Open Access resources on the internet.

The availability of entomology course units in the Makerere University curricula of Forestry, Agriculture, Environment, Zoology, Botany and Veterinary Medicine depicts a vast distribution of entomologists in the Colleges of Agriculture and Environmental Sciences (CAES), Natural Sciences (CONAS) and Veterinary medicine, Animal Resources and Bio-security (COVAB). These curricula are, therefore, supported by both the print resources in the libraries and the electronic resources which Makerere University subscribes for, directly to the publishers or through the Consortium for Uganda University Libraries (CUUL). Other databases such as PROTAbase are full-text, open-access databases, accessible through the internet.

NARO comprises Public Agricultural Research Institutes, divided into two categories; the National Agricultural Research Institutes (NARIs) and the Zonal Agricultural Research and Development Institutes (ZARDIS). There are six NARIs entrusted with the responsibility of managing and carrying out agricultural research of a strategic nature and national importance, they include; National Crops Resources Research Institute (NaCRRI) at Namulonge, National Agricultural Research Laboratories (NARL) at Kawanda, National Fisheries Resources Research Institute (NaFIRRI) in Jinja, National Forestry Resources Research Institute (NaFORRI) at Kifu, National Livestock Resources Research Institute (NaLIRRI) in Tororo, and National Semi-Arid Resources Research Institute (NaSARRI) at Serere. The ZARDIs are nine with two not yet operational. The operational ones include; Abi, Bulindi, Kachwekano, Mukono, Ngetta, Nabuin, and Mbarara. The non-operational include; Buginyanya and Rwebitaba (NARO, 2012). For the study to cover entomologists from a larger agricultural scope, this study focused on entomologists from Makerere University and three NARO institutes of NaCRRI, NARL, and NaLIRRI, with an entomologist population of 40, i.e. Makerere University 20, NaCRRI 9, NARL 7, and NaLIRRI 4.

An Entomologist by definition is a person that collects and/or studies insects (Boden, 2010). He/she studies the problems caused by insects and attempts to solve these problems (Gordh, 2000). Webster's third new international dictionary (2002) simply defines an entomologist as a student of insects. Therefore, from the adoption and modification of the above definitions; an entomologist is a scientist, who studies the biology, ecology, and economic value of insects promotes their positive attributes in the environment and reduces the harm caused by their ecological interactions with the environment. Categories of entomologists for this study include; teachers of entomology, graduate students specializing in entomology research, and practitioners of entomology, at Makerere University and National Agricultural Research Institutions in Uganda. Entomology encompasses the agricultural, biological, and environmental sciences, related to insects and their interactions with humans (Boden, 2010), and the different types of entomology include Forensic Entomology, Medical Entomology, Agricultural entomology, and Research entomology (Painter, 2011). In entomology, there are several areas of investigation which are likely to affect the use of electronic information resources. These areas of investigation include but not limited to studies about benefits of insects, especially as a source of food, in pollination and biological control (Akhtar & Isman, 2018; Laxmi Rai, Sharma, & Kushwaha, 2015; Mariod, 2020; Van Huis, 2016); studies on the effect of pesticides on pests and the environment (Bajwa & Sandhu, 2014), changes in the behavioral patterns of the insects including their feeding, mutations, and adaptations which would lead to pesticide resistance, new technologies in control of pests, criminal investigations in forensic entomology, studies in medical applications, and biological control. According to Raven and Yeates (2007), other elements include; invasive species, habitat conversion, and climate change. All such elements would require entomologists to access timely and updated information which is best provided through electronic sources such as the internet and online journal databases.

2. Research problem

The agriculture sector in Uganda employs about 66% of the working population (M.A.A.I.F, 2011:5; M.O.F.P.E.D., 2011:92). Insects significantly affect agriculture in both positive and negative ways. The zoophagous insects prey on animals and others may transmit diseases and eventually leading to death, causing agricultural loss to farmers. In an attack of the giant looper caterpillar pest to

several districts in Uganda, Muzaale and Miti (2012) reported that these pests, which are a larval stage of a particular species of a moth, destroyed crops, pasture, and forests. Due to a lack of appropriate control by the affected farmers, they resorted to drastic control measures of burning the bushes and forests surrounding their gardens. M.A.A.I.F. (2010) regards pests, diseases, and vectors as the major cause of losses in the agricultural sector in Uganda. On the other hand, many insects are beneficial because they are edible and contain high nutritional content for example the desert locust (*Schistocerca gregaria*) was found to have an energy content of 179 kcal/100g and protein content of 14 to 18g/100g of fresh weight (Mariod, 2020). Therefore, entomologists ought to play a major role in the reduction of the losses and, they should be supported by the information systems available to them. Studies have been done to assess the use of e-resources across disciplines (Agaba, Kigongo-Bukenya, & Nyumba, 2004). Research is one of the principal objectives envisioned in most research institutes, and the Makerere University Vision and Mission, in addition to teaching, outreach, and solutions to societal challenges. Despite the several training for staff and researchers, both at the different Agricultural Research Institutes and at Makerere University, in information searching skills, the use of electronic resources is still not effectively satisfactory (Kinengyere, 2007; Kinengyere & Olander, 2010). However, Kim (2011) affirms that users across disciplines utilize different sources of information for their information needs because of epistemological differences; consequently, the use of library electronic resources may differ. Thus the information searching behavior of Entomologists may differ from that of Social Scientists, Engineers, Medical Doctors, Lawyers, etc. because of the varying information needs and sources, and therefore ought to be studied in isolation to establish their use of the available resources to solve societal problems.

3. Aim of the study

This study aimed to assess the utilization of electronic information resources by the entomologists at Makerere University and NARO. This was achieved through the following specific objectives:

- establishing the level of awareness of the e-resources by entomologists at Makerere University and NARO;
- determining the frequency of use of electronic resources available through the library web portals by entomologists at Makerere University and NARO;
- identification of the information needs of entomologists;
- establishing the problems faced by entomologists in accessing electronic resources;
- identification of the strategies that could enhance the use of electronic information resources.

4. Conceptual framework

In the following scheme includes the awareness of the availability of the electronic information resources, the availability of adequate ICT infrastructure, the entomologists' attitudes towards electronic information resources, the information needs of entomologists and the barriers to information access all affect the frequency of use of electronic information resources by entomologists. The barriers to access to electronic information resources are likely to be enhanced by awareness of the electronic information resources and ICT adequacy. The overall use of Electronic Information Resources is dependent on all the variables but is likely to be affected by the subscription levels for the information resources by the institutions.

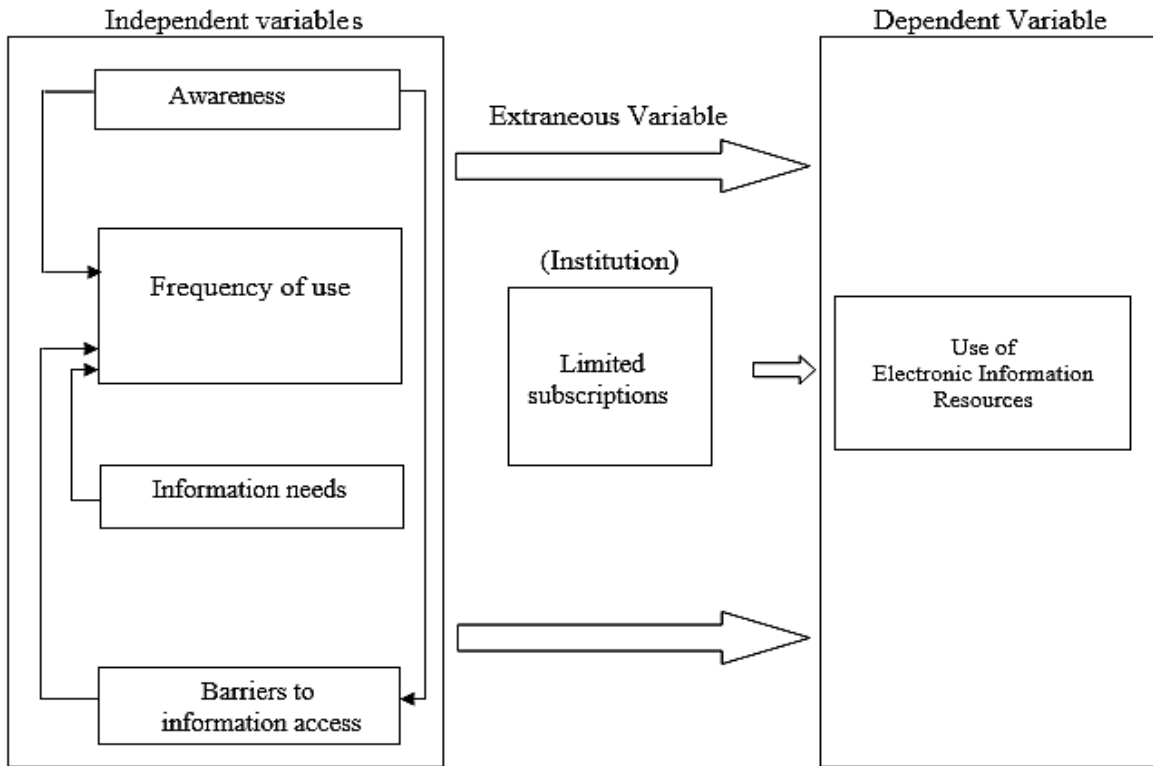


Fig.1. Conceptual Framework

Source: Adopted and modified from Oso and Onen (2005)

5. Methodology

The study exhibited a mixed research paradigm that provided more evidence for investigating the research problem, thereby answering questions that could not be answered by either qualitative or quantitative approaches alone (Creswell & Clark, 2011). This study was a case study naturalistic research associated with investigations of Entomologists' use of E-resources at Makerere University and NARO. The survey field methods used to acquire data comprised a combination of techniques such as observation of the e-resource characteristics in some areas, interviews of respondents, and a questionnaire. The value of this triangulation was to allow an accurate description of situations or relationships between variables, information adequacy, and efficiency. Copies of the questionnaire containing both structured and unstructured questions were hand-delivered to Makerere University, NACCRI, and NARL and collected by the researcher, except for NALIRRI whose questionnaire was designed using the Survey Monkey tool and delivered electronically. The electronic mail addresses of the Entomologists were provided by one of the researchers at NALIRRI, although of the 4 Entomologists to whom the online questionnaire was delivered only 2 responded. The interview method was optional and only 3 respondents preferred this to the questionnaire.

The researcher made observations at Makerere University, NARL, and NACCRI, to gain an understanding of certain aspects of the study, which included the availability of ICT resources. The researcher physically gained access to the E-resources accessible at institutions, as provided and claimed by the respondents, except for NALIRRI. This method was very useful in verifying the information offered to the researcher by the respondents (Sarantakos, 2005).

Of the targeted 40 Entomologists 35 responded to the survey, recording a response of 87.5 percent. Thirty-two Entomologists were subjected to the questionnaire and only 3 interviewed.

Makerere University had the highest respondents (21) followed by NACRRI (7), NaRL (5), and then NaLIRRI (2). Of the other 5 (12.5%) targeted entomologists who did not participate in study 3 (7.5%) respondents were from NaRL whereas the 2 (5%) were from NaLIRRI. The majority of the respondents (42.9%) were researchers followed by academic staff (31.4%) and postgraduate students (25.7%) as summarized in Table 1.

Table 1: Entomologists who participated in this study and their primary roles

| <i>Institutions</i> | | <i>Primary roles</i> | | | <i>Total</i> |
|---------------------|------------|-----------------------|-------------------|------------------------------|--------------|
| | | <i>Academic staff</i> | <i>Researcher</i> | <i>Postgraduate students</i> | |
| Makerere University | Count | 11 | 2 | 8 | 21 |
| | % response | 52.4 | 9.5 | 38.1 | 100.0 |
| NaRL | Count | 0 | 5 | 0 | 5 |
| | % response | 0.0 | 100.0 | 0.0 | 100.0 |
| NACRRI | Count | 0 | 6 | 1 | 7 |
| | % response | 0.0 | 85.7 | 14.3 | 100.0 |
| NaLIRRI | Count | 0 | 2 | 0 | 2 |
| | % response | 0.0 | 100.0 | 0.0 | 100.0 |
| Total | Count | 11 | 15 | 9 | 35 |
| | % response | 31.4 | 42.9 | 25.7 | 100.0 |

From the study, it was established that none of the Entomologists was engaged in teaching only at their institutions. The majority of the Entomologists (52.4%) at Makerere University were engaged in both teaching and research whereas the rest were engaged in research only. At NARO the Entomologists were found to be exclusively researchers.

6. Results and discussion

6.1 Awareness of library e-resources at institutions

All Entomologists at Makerere University, NaRL, and NaLIRRI, who participated in this study, were found to be aware of the availability of E-resources at their institutions. Only 1 (16.7%) of the Entomologists at NaCRRI, who participated in this study, were not aware of the availability of E-resources at the institution, as summarized in Table 2.

Table 2: The awareness of E-resources by Entomologists (N=35)

| <i>Institutions</i> | <i>Awareness responses</i> | | <i>Total</i> |
|---------------------|----------------------------|----------|--------------|
| | Yes | No | |
| Makerere University | 21 | 0 | 21 |
| NACRRI | 6 | 1 | 7 |
| NaRL | 5 | 0 | 5 |
| NaLIRRI | 2 | 0 | 2 |
| Total | 34 | 1 | 35 |

The majority of the Entomologists (97.1%), who participated in the study were aware of the availability of E-resources at their institutions whereas only 1 Entomologist (2.9%) from NACRRI was not aware whether the Institution subscribed to E-resources. The high percentage awareness

could be attributed to recommendations and advice from colleagues, teachers, and friends, whereas the lack of awareness by the Entomologist at NACRRI, could be attributed to either lack of current awareness services at the institution or driven by one's attitude towards E-Resources. The study further revealed that the majority of Entomologists (32.9%), who participated in this study, gained awareness of E-resources through colleagues. It is also revealed that the use of brochures is the least effective (2.9% response rate) at creating awareness of E-resources. Two (2.9% response) Entomologists gained awareness through channels other than colleagues, institutional websites, librarians, brochures, and E-resources training. It was implied from the study that there are sufficient communication and information flow between professionals and that there is information support from the institutional librarians.

6.2 E-resources known to Entomologists at Makerere University and NARO

The majority (18.1% and 17.4%) of Entomologists who participated in this study are, respectively, more familiar with the Internet and AGORA. However, the International Forestry Review and PROTA are largely uncommon amongst Entomologists, each with 0.6 percentage response, as shown in table 3.

Table 3: E-resources databases known to Entomologists

| E-Resources databases | Responses | |
|------------------------------|------------------|----------------|
| | N | Percent |
| Internet | 28 | 18.1 |
| AGORA | 27 | 17.4 |
| Google Scholar | 22 | 14.2 |
| HINARI | 17 | 11 |
| E-books | 17 | 11 |
| OARE | 14 | 9 |
| CAB Abstracts | 14 | 9 |
| TEEAL | 7 | 4.5 |
| JSTOR | 7 | 4.5 |
| IFR | 1 | 0.6 |
| PROTA | 1 | 0.6 |
| Total | 155 | 100.0 |

The reasons for which some databases are uncommon amongst Entomologists may be due to the irrelevance of information contained in them or to lack of awareness of the databases and the skills to access them.

6.3 Access to library e-resources at institutions and frequency of use

Entomologists were asked to state whether they had access to E-resources at their institutions and 33 (94.3%) of the 35 Entomologists responded to the question. Thirty (85.7%) agreed that they had access and actually utilized the resources, whereas only 1 from NACCRRI insisted that there was no access and, therefore, did not utilize the E-resources. Two (5.7%) of the respondents also from NACCRRI were not sure and, thus, did not know whether there was access to E-resources at their Institution. This implies that most Entomologists depend on E-resources for their information support. In this study Internet searches and Google scholar are more frequently used, and on a daily basis compared to AGORA with a monthly frequency of use more prominent.

Among the E-resources databases known to Entomologists, the American Society of Agricultural and Biological Engineers (ASABE) and Plant Resources of Tropical Africa (PROTA) database are not at all utilized. This is probably because they lack the information desired by Entomologists or the users don't know how to access them. The other prominent databases include the Research4Life programs of OARE and HINARI, as well as CAB Abstracts. The usage of OARE and HINARI indicates that 14.3% of the total number of users of each database access these databases prominently on a weekly basis, whereas, of the 15 Entomologists who utilize E-books the access frequency is distributed evenly.

When Entomologists were asked to state whether they accessed E-resources other than those subscribed for by their Institutions, results in figure 4 indicate that 11 Entomologists declared to have used other E-resources and among these were; Mobile internet, E-books, WHO, UNDP and FAO reports, and National Resources Institute (NRI) subscribed resources. 21 Entomologists entirely depend on E-resources provided by their Institutions whereas 3 Entomologists from Makerere and NACRRI did not know whether they accessed E-resources other than those subscribed for by their Institutions. The study reveals that whereas Entomologists from other Institutions seek alternative sources of Electronic Information Entomologists from NALIRRI entirely depend on resources provided by their Institution. The dependency of the majority (60%) of Entomologists on the E-resources provided by their institutions could be attributed to lack of awareness of alternative sources of information or to the adequacy of the E-resources provided by institutional libraries. Responses to alternative sources of information are as summarised in table 4.

Table 4: Other channels through which Entomologists acquire Information.

| Channels | Responses | |
|-----------------|------------|--------------|
| | N | Percent |
| Textbooks | 27 | 21.1 |
| Print Journals | 26 | 20.3 |
| Reports | 20 | 15.6 |
| Newspapers | 17 | 13.3 |
| From Colleagues | 17 | 13.3 |
| Magazines | 16 | 12.5 |
| Others | 5 | 3.9 |
| Total | 128 | 100.0 |

The utilization of alternative channels of acquiring information by Entomologists is as a result of the challenges with E-resources and having the information being scattered in too many sources. This is as ascertained by Tahir, Mahmood, and Shafiqu (2010).

6.4 Preferences of Information Resources

During the study, Entomologists were asked to state what form of information resources they preferred, and results revealed that of the 32 Entomologists who responded to the question 27 (84.4%) preferred Electronic Resources to Print Resources and the 5 (15.6%) preferred print resources. The preference of E-Resources to Print by 84.4% of Entomologists was associated with a number of reasons as follows; 16 Entomologists preferred E-Resources because they are easily accessible and this accounts for 45.7% of the responses for preference to E-Resources. Other reasons include; portability, ease to sieve out relevant information, saves time, provides a wider scope, provides up to date information, convenience, easy to manipulate, and, are cheap. On the other hand, 50% of the respondents who preferred print resources based on the fact that Print

resources provide much detailed information material compared to E-Resources. The other reason was that print resources are much more available and reliable compared to E-Resources. One of the respondents who preferred Print Resources based his preference to his health status that his eye condition could not allow overstay on computers. Some Entomologists, however, could not particularly tell why they preferred Print Resources to E-Resources and the others had no particular preference, as the choice could depend on the available circumstances. From this study, it is thus deduced that whereas Entomologists have access to E-resources at their Institutions, they actually utilize them and prefer to use them (E-resources) to Print Resources.

6.5 Information needs of Entomologists

The need to access electronic information resources in institutions is very important as this enhances a breakthrough in research findings (Omeluzor, Madukoma, Bamidele, & Ogbuyi, 2012). Therefore, academics and researchers seek information to support their teaching and research information needs. The information-seeking behavior of Entomologists is determined by the nature of the information they seek. Table 5 presents results from this study, showing the information needs of Entomologists.

Table 5: Information needs of Entomologists (N=233)

| <i>Information needs</i> | <i>Responses</i> | |
|--|------------------|--------------------|
| | N | Percent (%) |
| Biology and physiology of insects | 29 | 12.4 |
| Integrated Pest Management | 27 | 11.6 |
| Insects in biological control | 23 | 9.9 |
| Economic importance of insects | 22 | 9.4 |
| Effects of pesticides on pests and environment | 21 | 9 |
| Changes in the behavioral patterns of insects | 18 | 7.7 |
| Pest resistance | 17 | 7.3 |
| Medical applications of insects | 15 | 6.4 |
| Habitat conversion and climate change | 15 | 6.4 |
| Apiculture | 13 | 5.6 |
| Invasive species | 12 | 5.2 |
| Insects as food for plants and animals | 9 | 3.9 |
| Others | 8 | 3.4 |
| Criminal investigations in Forensic Entomology | 4 | 1.7 |
| Total | 233 | 100.0 |

More information needs from the open-ended questions of the survey include information on; the different products from insects, insects, and biodiversity, insect vectors, pollination, advances in medical entomology, population genetics, medical geography (in disease vectors), molecular and genomic approaches of insects, functional genomics, biotechnological applications, ecological databases of insects and insect genetic resources. Therefore, it is upon the above information needs that academic and research libraries base their priorities for collection development and information dissemination for Entomologists.

6.6 Challenges in accessing e-resources

The IT integration in teaching and research requires sophisticated software and hardware to access electronic information resources. During the study, the research question to determine the challenges encountered by Entomologists enlisted interesting results as summarized in Table 6.

Table 6: Challenges faced in accessing e-resources

| Challenges to use of E-Resources | Responses | |
|--|------------------|--------------------|
| | N | Percent (%) |
| Slow internet speeds (Limited bandwidth) | 28 | 23.7 |
| Copyright restrictions of access | 25 | 21.2 |
| Lack of sufficient ICT infrastructure such as computer terminals | 15 | 12.7 |
| Information scatter (Info. not being consolidated in one place) | 11 | 9.3 |
| Resources are very expensive | 7 | 5.9 |
| Lack of time | 6 | 5.1 |
| Lack of adequate IT skills | 5 | 4.2 |
| Others | 5 | 4.2 |
| Constant change in technology | 4 | 3.4 |
| Lack of technical support | 4 | 3.4 |
| Lack of awareness | 2 | 1.7 |
| Too much information retrieval | 2 | 1.7 |
| Information explosion (i.e. too much information being published) | 2 | 1.7 |
| Uncooperative information personnel | 1 | 0.8 |
| Language barrier (i.e. Most information being in foreign language) | 1 | 0.8 |
| Total | 118 | 100.0 |

The major impediments to the use of e-resources are ICT-oriented. However, Chapman (2000) notes that none of the Entomologists participated in the discoveries of these ICTs, and therefore, Entomologists are using technologies that originated outside their discipline. This explains why many Entomologists lack sufficient skills to optimally utilize the ICTs available to them. Despite the impediments, more respondents (Entomologists) utilize the E-resources as opposed to the findings by Agaba et al. (2004).

6.7 Strategies to improve the use of e-resources

To improve the usability of E-resources Entomologists suggested a series of strategies. Of the 35 Entomologists who participated in study 33 (94.3%) suggested ways of reducing the barriers and, therefore, increasing the use of E-resources amongst Entomologists. The responses are summarised in table 7.

Some of the strategies obtained from the study are specific to particular institutions where the Entomologists who raised them are found. However, the majority of the suggested strategies cut across institutions and are, therefore, generalizable. A study by Kinengyere and Olander (2010) emphasizes that to improve the use of E-resources more effort should be put in creating awareness and training of users as well as improving access to ICT, and these agree to the strategies resulting from this study to improve ICT infrastructure in general and improving awareness of E-resources availability.

Table 7: Strategies suggested by Entomologists to improve the use of E-resources

| Strategies | Responses | |
|--|-----------|--------------|
| | N | Percent (%) |
| Purchase more bandwidth | 13 | 22.8 |
| Institutions should install more wireless internet hot spot spots | 9 | 15.8 |
| Install more computer terminals | 8 | 14 |
| Increase awareness | 7 | 12.3 |
| Subscribe to more and diversified E-resources | 6 | 10.5 |
| Conduct training | 3 | 5.3 |
| Provide access to ICT for all | 2 | 3.5 |
| Avail usernames and passwords | 2 | 3.5 |
| Institutions should ensure that all researchers and teachers have sufficient IT skills | 1 | 1.8 |
| Provide standby generators | 1 | 1.8 |
| All-access to E-resources even to off-campus networks | 1 | 1.8 |
| Institutions should aid the purchase of their own hardware and software | 1 | 1.8 |
| Subscribe to key areas in Institutional research themes | 1 | 1.8 |
| Improve telephone network connectivity | 1 | 1.8 |
| All Information resources should be installed on a server | 1 | 1.8 |
| Total | 57 | 100.0 |

7. Conclusion

It is difficult to measure e-resources usage as well as the quality of research and the only available sources of information are the experience and feedback from the researchers and other information users (Kinengyere, 2007). It was established from the study that Entomologists were aware of the availability of most E-resources at their institutions and that this awareness mainly stemmed from cooperation and professional communication amongst them. It was further revealed that Entomologists utilized the internet on a daily basis to search for information in regard to their information needs. Additionally, a significant number of them made use of searches from Google Scholar and the AGORA database to obtain information suiting their information needs. The majority of Entomologists entirely depended on the E-resources under the subscriptions by their institutions. It was also established that Entomologists preferred to use E-resources to print resources. Entomologists had a diversity of information needs but mostly sought information to understand the insects better. This basically entailed information on the biology and physiology of insects. Other major information needs sequentially included Integrated Pest Management (IPM), application of insects in biological control, and the economic importance of insects. Despite the preference of E-resources Entomologists faced a number of challenges while using the E-resources. The major challenges faced included; slow internet speeds resulting from the low levels of bandwidth at the institutions and copyright restrictions of access. To improve the usage of E-resources Entomologists suggested a number of strategies but the most prominent are geared towards improving internet access.

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