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Investigating Awareness and usage of Electronic Resources by Research Scientists in Ghana

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ABSTRACT

The study investigated the use of electronic resources/information by research scientists in Ghana. Specifically, to investigate the awareness and level of use of electronic resources; perceived reliance, benefits and impact of use of electronic resources on the research activities. The research design for the study was a survey. Questionnaire schedule was used to collect data from 103 scientists from selected institutes at the Council for Scientific and Industrial Research (CSIR), Ghana. The result revealed that majority of the scientists (92 %) used electronic resources. The most used type of resources were Electronic databases, electronic research reports and electronic journals. The purpose of use was mostly for research work (71 %). However only 34 per cent had had training in information literacy skills. Some of the impediments to accessing the electronic resources were poor ICT infrastructure (38 %) and lack of skills in accessing the resources (35 %). Generally, the use of electronic resources have improved research activities of research scientists It is recommended that continuous training (formal and informal) should be organised for research scientists to keep them abreast with new electronic applications and tools that will promote their level of competence and improvement in their research outputs. In Addition, ICT infrastructure should be improved in the various institutes for easy access to the electronic resources.

Keywords: Electronic resources; Research scientists; Information, ICT; Information literacy; Ghana.

1. INTRODUCTION

Electronic information resources has become essential in the provision of knowledge in research and development. Studies suggest that, scientists and development experts use Electronic Resources (e-resources) to access, communicate and support Research and Development activities[1]. Among other things, Electronic Resources often supplement print resources with added advantages including the elimination of geographical barriers, provision of up-to-date information; convenience and the potential to explore additional resources or related content[2-5]. E-resources are contributing immensely to information seeking and retrieval serving as a complement to print resources in traditional library settings[6], and a valuable alternative to print resources in academic and research domains

Electronic Resources are those information sources which are accessible only via computer access, and may include the use of a microcomputer, a mainframe, or other types of computers. They can be locally mounted or accessed remotely via the internet[7]. Graham[8], define electronic resources as that group of information sources explored through modern information and communication technology (ICT) devices. They can be stored in cyberspace and can be accessed simultaneously from different points by several people at the same time. The evolution of the concept and mode of presentation of information has introduced multimedia which involves the use of audio and visual forms and presents information in digital form/database often referred to as electronic form or electronic database[7]. E-resources may be delivered on Compact Disc Read-Only Memory (CDROM), on tape, via the internet[7]. The term electronic resources has broadly been defined as, information made available through a computer, which can either serve as bibliographic guides to other sources or as cited references in their own right[8]. Thus, documents which appear in electronic format and made available to users through any computer based information retrieval system are classified as electronic resources. Due to the fact that computers are the medium of access to e-resources, the internet is the most widely used channel (using search engines such as Google, Yahoo and Alta Vista) and then there are offline databases in Compact Disk/Digital Video Disc (CD/DVD) formats accessible without internet[9]. Electronic Information Resources like print resources must sometimes be acquired, organised, stored and disseminated hence the need for libraries to provide support.

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Research libraries are currently faced with the challenge of adjusting to the new trends in information by providing support to research and development activities. Library support include acquisition, marketing and training among other things. According to[10], the new technological order in information seeking and retrieval requires Information literacy skills in order to effectively access and use electronic sources. Libraries can organise training for library users to acquire Information Literacy skills. Agyei and Fianko[5], also maintain that libraries and research institutions try to acquire electronic resources that help in realizing research needs of the parent institutions. Again, due to the high demand for research publications including global access to research and scholarly content as well as displaying and marketing internally generated research output, libraries are increasingly conducting surveys of their users to keep abreast with their demands. Also, a noteworthy transformation has emerged in the collection development policies and practices in libraries with new technologies exploring alternative ways to reduce costs while improving ways to access information[3] and [11]. Research librarians like their academic counterparts are therefore expected to proactively find ways to engage scientists in the electronic resources revolution in order to provide information related services in a useful, convenient, timely, and reliable way. Conducting surveys constitute a critical part to assessing the needs and challenges of research scientists.

Globally, several studies have sought to investigate the awareness and use of e-resources. In Ghana, a literature search on the awareness and use of e-resources vastly focus on academia and university libraries with emphasis on faculty and students' acceptance and use of e-resources. As at the time of conducting this study, no evidence of the awareness, use and impact of e-resources on research scientists' productivity was found in Ghana.The Council for Scientific and Industrial Research (CSIR) is one of the biggest research organisations in Ghana. Mandated to conduct scientific and technological research, has 13 semi-independent Institutes coordinated by a Head Office. CSIR in its present form was established in 1996 by an Act of the Parliament of Ghana. All 13 Research Institutes have libraries which provide support to the specific research and development activities of the Institute. The purpose of this study was to assess the level of awareness, use and impact of electronic resources on research output of scientists at the Council for Scientific and Industrial Research, Ghana. The specific objectives of this study included: to measure the extent of awareness and level of use of electronic resources; assess perceived reliance and impact of use of electronic resources on research work and productivity of research scientists and to identify challenges faced by researchers while using electronic resources.

1.1 Theoretical Framework

The technology acceptance model (TAM) was selected as a guide to investigate the awareness, use and impact of e-resources among scientists of CSIR, Ghana. TAM was propounded by Fred Davis in 1989 and proposes that external factors often influence perceived usefulness, perceived ease of use, attitude and behavioral intent. These factors interplay to produce the final outcome of actual use. According to [12], Actual use is directly influenced by behavioral intention to use or the effort or desire to use new technology, Behavioral Intention is also influenced by perceived usefulness(what can the new technology do or achieve) and perceived ease of use(how much effort is needed to use the technology. The lesser the effort the easier the new technology is perceived to be. Ultimately, external factors such as social influence, organisational context, age, gender, accessibility/awareness among others are the determining sources of perceived usefulness and perceived ease of use. Malhotra and Galletas[13], argued that ascertaining the impact of social influences is critical because it determines the commitment of the user towards the acceptance and the use of the new technology. Figure 1 illustrates the technology acceptance model.

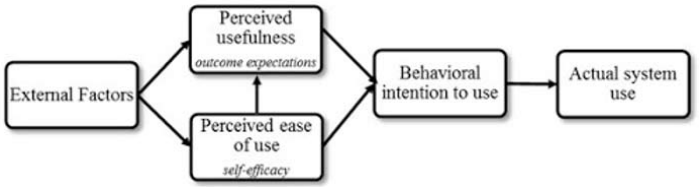

Figure 1. Technology acceptance model (Davis, 1989).

As applied to this study, external factors refers to organisational factors including ICT Infrastructure and library awareness creation, other things which often affects users' perceptions and intention to use new technology. Thong, Hong and Tam[14], for instance, found that organisational context has great influence on both perceived usefulness and perceived ease of use of a digital library. Behavioral intention refers to effort made by the individual to make use of new technology including computer literacy skills and other forms of training suitable to improve e-resources use. Perceived ease of use refers to the accessibility, availability and challenges faced by scientists in their quest to use e-resources while perceived usefulness refers to the impact or expected outcome of using the new technology which would predict the behavioral intention.

2. RESEARCH METHODOLOGY

2.1. Sampling, Questionnaire Design and Administration

A survey was conducted in five research institutions of the Council for Scientific and Industrial Research (CSIR) based in the Ashanti, and one in the Eastern Regions of Ghana. A structured questionnaire was designed, pre-tested on participants at an E-resource training held at CSIR-Crops Research Institute, Kumasi, Ghana on 24-26th April 2016 and administered to the randomly selected scientists from the five research institutes. Questionnaire administration involved a two-stage sampling methodology. First, the Institutes namely, CSIR-Building and Road Research (BRRI), CSIR-Crops Research (CRI), CSIR-Forestry Research (FORIG), and CSIR-Soil Research (SRI) in Kumasi, Ashanti Region, and CSIR-Plant Genetic Resources Research Institute (PGRRI) in Bunso, Eastern Region were purposively selected. A list of research scientists in each of these institutes was then compiled. Scientists within each institute were randomly selected by

Table 1. Distribution of respondents

Institute	No of scientists in the institute	No of respondents	Percentage
CSIR-Building and Road Research Institute	38	23	22.3
CSIR-Crops Research Institute	68	27	26.3
CSIR-Soil Research Institute	23	13	12.6
CSIR-Forestry Research Institute of Ghana	32	23	22.3
CSIR-Plant Genetic Resources Research Institute	22	17	16.5
Total	183	103	100

Table 2. Demographic characteristics of respondents

Variables	Frequency	Percentage
Sex		
Male	85	82.5
Female	18	17.5
Age		
31-40	54	52
41-50	36	35
50 above	13	13
Education		
Highest Qualification		
Master's Degree	49	48
PhD	54	52
Rank		
*Technologist	29	28.2
Research Scientist	45	43.7
Senior Research Scientist	18	17.5
Principal Research Scientist	6	5.8

**Technologists (Technologists in CSIR hold Master's degree in their field of work, they undertake research as research scientists, meanwhile the entry qualification for research scientist is PhD)*

selecting every third scientist on the list. A total of one hundred and three (103) research scientists were randomly selected from the five institutes (Table 1).

The questionnaire consisted of 18 questions in the following categories: Demographics, use of e-resources, access to e-resources., competencies and training, challenges and benefits of e-resources among others. There were also two open-ended question that asked respondents about the impediment and improvement to e-resources in their institutes' libraries. In all 120 questionnaires were distributed to the scientists but 103 were received. The response rate was 86 per cent. Statistical package for social sciences (SPSS version 20.1) was used to analyse the data.

2.2 Data Collection Procedures and Analysis

Questionnaire were personally administered to selected participants by the researchers. Questionnaire were retrieved by paying periodic visits to individual scientists. All questionnaire were successfully retrieved within four weeks of distribution. Descriptive and inferential statistical tools including percentages and charts were employed to analyse data collected. The probit model was used to examine the determinants of electronic resources utilisation among sampled research scientists. Results were presented mainly in tabular form.

3. RESULTS AND DISCUSSIONS

3.1 Socio-Demographic Characteristics of Respondents

Results in Table 2 presents socio-demographic characteristics of respondents in the study. The study revealed that 82.5 per cent of the respondents were males while 17.5 per cent were females. This results indicated that there were more males in the research institutes in Ghana than females. Furthermore, it was revealed that, 87 per cent of the respondents had their ages ranged between 31 and 50 years and only 13 per cent had their ages above 50 years. The study again discovered that more than half (52 %) of the respondents hold PhD while (48 %) had Master's degree (Table 2). Research Scientists and Senior Research Scientists (61.2 %) formed majority in the research grade and were followed by Technologists (28.2 %). Only 5.8 per cent of the respondents were in the Principal Research Scientists grade. The findings in Table 2 shows that most of the researchers were still in their prime thus were capable of using electronic resources for research and development.

3.2 Awareness and Access to Electronic Resources

All respondents (100 %) indicated that they were aware of e-resources. This finding is similar to observations by[15], [16, 17]and [5] that there was an increasing of awareness of e-resources. Not similar to the findings of [18] that awareness of e-resources was rather low.

The study revealed a very high level of access of electronic resources among researchers at CSIR. That is, 92 per cent of researchers at CSIR have access to electronic resources while 8 per cent indicated that they did not have access to electronic resources in their institutes. Eight 8 per cent of the respondents who did not have access to electronic resources blamed it on the lack of inadequate internet infrastructure in their various institutes.

3.3 Means of Accessing the Electronic Resources

Most of the respondents (85 %), accessed electronic

resources on the internet using search engines like Google and Google Scholar. (Table 3). This finding is similar to findings of [5], which revealed that the most popular e-resources among students were search engines, and online databases. Only 29 per cent had indicated access through their Institutes' libraries which had subscribed to databases and had provided institutional username and password to e- resource. This finding is in contrast to Ali (2005) who revealed that a greater number of respondents were aware of e-services provided by the Institution's library.

Table 3. Means of accessing the electronic resources

Source	Yes (%)	No (%)
Institute's Library Website	30 (29.1)	73 (70.9)
Internet (Open source)	87 (84.5)	16 (15.5)
Other Academic Institutions' Websites	10 (9.7)	93 (90.3)

Table 4. Electronic resources used by respondents

Type	Yes	No	Total
E-Books	87 (84)	16 (16)	103
E-Journal	98 (95)	5 (5)	103
E-Maps	41 (40)	62 (60)	103
E-Bibliographic data	37 (36)	66 (64)	103
E-Research Report	99 (96)	4 (4)	103
E-Theses	45 (44)	58 (46)	103
E-Database	101(98)	2 (2)	103
Offline Database (TEEAL/CD/DVD)	84 (82)	19 (18)	103

**Figures in parenthesis are percentages.*

Table 5. Reliance and access to various electronic resources

Type of resource	Frequency of Access					
	Daily	Weekly	Occasionally	$\chi^2_{(d.f)}$	*P*-value	Mean reliance
E-Books	33 (37.9)[#]	9 (10.3)	45 (51.7)	9.32	0.032**	2.84
E-Journal	44 (44.9)	21 (21.4)	33 (33.7)	44.23	0.000***	2.2
E-Maps	2(4.9)	6 (14.6)	33 (80.5)	7.43	0.053*	3.06
E-Bibliographic data	1(2.7)	7 (18.9)	29 (78.4)	2.16	0.234NS	3.16
E-Research Report	47 (47.5)	19 (19.2)	33 (33.3)	9.48	0.043**	2.45
E-Theses	3(6.7)	7 (15.6)	35 (77.8)	1.14	0.721NS	2.98
E-Database	76 (75.2)	13 (12.9)	12 (11.9)	34.32	0.000***	1.48
Offline Database (TEEAL/CD/DVD)	47 (56.0)	7 (8.3)	30 (35.7)	0.43	0.675NS	3.06

[#]Figures in parenthesis are percentages; *d.f* = degrees of freedom; the asterisks*, **, and *** denotes 10, 5 and 1% significant levels, respectively.

3.4 Use of Various Electronic Resources by Respondents

Respondents were asked to indicate the type of e-resources they used for their research work. One hundred and one respondents representing 98 per cent indicated they used e-database while only 2 per cent were not using E-database. Electronic Research report was the next highest used resources followed by E-journals, also 82 per cent used offline databases, especially The Essential Electronic Agricultural Library donated by Cornell University to the various agricultural research stations. E-bibliographic data was the least used among research scientist result may be influenced by the number of open source databases subscribed by the various institutions (Table 4).

3.5 Reliance on Electronic Resources by Research Scientists

This study also sought to examine the level of reliance on electronic by respondents. Significant differences were observed in frequency of access to E-books ($P = 0.042$), E-journals ($P < 0.0001$), and E-Database ($P < 0.0001$). In contrast, differences in frequency of access to e-maps, e-bibliographic data, e-database, e-theses and The Essential Electronic Agricultural Library (TEEAL)/CD/DVD were not significant ($P > 0.05$). It is also important to note that a number of scientists accessed e-books, e-journal, e-database, e-research report, and TEEAL/CD/DVD daily for their work (Table 5). The result is in agreement with a study conducted by[19], who found that Iranian faculty members were largely dependent on e-resources, and mostly preferred e-journals, followed by e-books, and online databases and least preferred e-reports. However, this study also revealed that, electronic research reports was one of the most used e-resources among researchers of the CSIR, Ghana.

3.6 Purposes for which Electronic Resources were Accessed

Research scientists were asked to indicate purpose(s) for which they accessed electronic resources. Majority (71 %) of the respondents access e-resources for their research work, 19 per cent for academic studies and 10 per cent for updating their knowledge in other relevant areas. This finding is similar to what[18], found in Nigeria where research activity was the most prominent reason for assessing e-resources among academic staff.

3.7 Computer and Information Literacy Skills of Respondents

Electronic information resources requires the acquisition of computer and information literacy skills given that it is a relatively new tool in information accessibility and retrieval. Respondents were requested to indicate their computer and information literacy competency. On a scale of 1-5, with 1 being the lowest and 5 highest, scientists were required to rate their computer literacy skills. Thirty-four percent scored

5 while 33 per cent scored 4; the rest of the respondent scored between 2 and 3 while none scored 1. This implies that all respondents had had some form of computer skills training. The researchers sought to determine if the respondents had ever had training on the use of electronic resources; 38 per cent indicated they had received training 1 to 3 times, while 62 per cent indicated they had not been formally trained. Among the reasons cited for non-trained participants, lack of awareness constituted the prime reason as to why they had never attended any training programme. Out of those who had received training in information literacy, 45 per cent indicated that the training had improved their accessibility and retrieval capabilities and were presently able to find information with much ease. 54 per cent thought training had improved their research outputs greatly. Among those researchers who had received training, 42 per cent were of the view that electronic resources training had also improved their referencingg skills. This finding indicates that users of electronic resources must be ready to evolve with the times and be ready to consciously acquire new technological skills to keep up and enhance their knowledge with the rapid information growth and its associated changes in the information society.

3.7.1 Access to Internet

The major source of electronic resources/information is the Internet. Therefore having access to the internet is very essential to the users of the electronic resources. Respondents were asked whether they could access the internet readily and how satisfied they were with the internet system. Majority (75 %) of the respondents indicated that they had access to the internet in their work place. However, 45.6 per cent were not satisfied with the internet infrastructure and its functioning in their institutes. In contrast, 22 per cent were satisfied with the internet infrastructure and function in their various institutes.

Table 6. Impediments in accessing electronic resources

Impediment	Frequency	Percentage
ICT infrastructure	39	38
Lack of Information Literacy skills	36	35
Copyright issues and payment systems	12	11
Lack of constant electricity power supply	16	16
Total	103	100

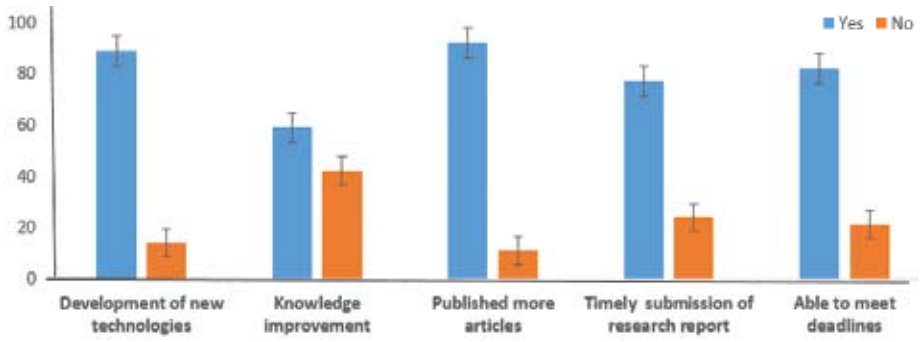

Figure 2. Benefits and impact of e-resources on research activities.

3.8 Impediments in Accessing Electronic Resources

Respondents were asked to indicate hindrances affecting their access to electronic resources. Since this was an open ended question. The analysis was done based on the highest response on an item and this was categorised into 4 main sections namely, Information Communication and Technology (ICT) infrastructure, lack of Information Literacy skills, copyright issues and payment systems and electricity power supply. Results from Table 6 indicated that 38 per cent respondents indicated that their major impediment to accessing electronic resources was lack of ICT infrastructure in the Institutes. This finding is in consonance with findings made by[2], [20, 5] and[21], which identified lack of IT Infrastructure and internet cost as major constraints to using e-resources. Other impediments were the lack of skills in information literacy and unstable electricity power supply. Additionally, 11 per cent of the respondents also specified that copyright issues and payment for articles online were impediments in their use of electronic resources. The results of the study corroborate a similar study by[22], which revealed some challenges of respondents as, lack of proper knowledge on information retrieval skills, insufficient user education, lack of computer knowledge and poor Information Communication Technology (ICT) infrastructure. Table 6 outlines the impediments indicated by scientists in CSIR.

3.9 Impact of Electronic Resources on Research Activities

Respondents were asked to indicate the benefits they had derived from the use of electronic resources. Majority (73 %) of scientists reported that the use of e- resources had had a positive impact on their research activities. Ninety-two (92) respondents, reported they had been able to publish more articles in reputable journals; 89 respondents indicated it had helped them to develop more research technologies. Eighty-two were able to meet deadlines, 72 also added that they were able to submit their research report on time while 59 indicated that electronic resources had improved their knowledge in their area of specialisation. The findings are similar to[23,5,21] which also revealed that users of e-resources accrued benefits including access to a wide range of research information and findings, improved research techniques, accessing up-to-date information on research topics, enhancing research skills and enabling researchers to find new research areas and frontiers. Figure 2 shows the impact of e-resources on scientists.

4. CONCLUSIONS AND RECOMMENDATIONS

This study investigated the awareness and use of electronic resources among scientists of the CSIR, Ghana. The study revealed that e-resources awareness and use is very common among research scientists. Scientists largely depend on e-resources to search, retrieve and

communicate research making e-resources an essential party to finding reliable, timely and relevant information. The use of electronic resources had also improved their research output. The most used electronic resources were e-databases and e-research reports and e-journals. However, considering the high investments made in acquiring these resources; perhaps, improvements in the infrastructure would lead to increased use of these resources by research scientists. In addition, continuous training on information literacy skills, emphasizing on electronic information retrieval would go a long way to enhance the effective use of electronic resources and the numerous benefits of electronic resources would be appreciated. User training is essential particularly for library users to enable them search independently unlike in traditional library setting where librarians could retrieve information for users.. Training on advanced search strategies controlled vocabulary and general internet use for scholarly and academic purposes should be organised to make electronic search processes much easier. Finally, computer knowledge and information retrieval skills must be frequently enhanced to keep up with evolving information communication technology.

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CONFLICT OF INTERESTS

The authors hereby declare that, there are no conflicts

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