TRAINING IN THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGY AND ITS IMPACT ON SEARCHING SKILLS AMONG RESEARCH OFFICERS IN THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, GHANA

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Abstract

This study looked at training in the use of Information and Communication Technology (ICT) and its impact on searching skills among research officers in six selected institutes of the Council for Scientific and Industrial Research (CSIR), Ghana. The libraries of the various institutes are responsible for providing training for research officers in ICT skills. The objective was to determine the extent of ICT training provided to the research officers, the level of skills acquired, and impact of the training on searching skills. Data was collected through the use of a questionnaire and interviews. The findings of the study revealed that the research officers were given training in the use of computers, the Internet, and databases. It also showed that generally, the level of skills acquired in the use of ICT was high. The research further revealed that the use of ICT enhanced work performance of the research officers. The basic conclusion of this study is that training in the use of ICT facilities among research officers has impacted positively on their searching skills.

Keywords: CONTINUING EDUCATION, INFORMATION LITERACY, SCIENTIFICRESEARCH, PRODUCTIVITY.

Introduction

Adeya (2002) in a United Nations Economic Commission report states that ICTs cover Internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services, and other related information and communication activities. He simplified the definition by describing ICT as an 'electronic means of capturing, processing, storing and disseminating information'. Alemna and Sam (2006) quoting Bartlett (2002), state that 'ICT refers to systems for producing, storing, sending and retrieving digital files'. According to Madu and Adeniran (2000), ICT is the coming together of computing and telecommunications for the purpose of handling information. ICT can thus be described as a diverse set of technological tools and resources used for creating, storing, managing and communicating information electronically.

Information and communication technology (ICT) is on the lips of everyone because it brings innovation into information seeking and knowledge acquisition (Obioha, 2005). Generally, ICT is a tool that any sector can use to deliver its services. The rapid breakthrough in the development and adoption of ICT in the last decade has revolutionized information access and delivery as well as knowledge acquisition worldwide. The ICT revolution has turned the whole planet into a 'Global Village' where communication among people has become independent of physical distance and time. According to Boohene (2002), ICTs have an important role to play to generate information and to apply knowledge for sustainable development.

Over the years, a number of initiatives have been made by governments of Ghana and other agencies to develop ICT infrastructure, so as to bridge the digital divide between Ghana and the developed world. For example, in response to global policy changes in the ICT industry, Ghana was among the first African countries to reform its ICT sector and establish the necessary legal and regulatory frameworks to support the growth of the sector (Alemna and Sam, 2006). Thus, the development of an ICT policy in Ghana since 1990 indicates the government's commitment to support ICT programmes in Ghana.

Modern ICTs are a source for the development of wealth and power when they are directed towards the well-being of humanity. The speed with which ICT is developing and its impact on socio-economic activities cannot be over-emphasized. ICTs, especially the Internet in which they all converge as a huge network, are transforming all human activities that depend on information, including library services. In this digital era therefore, the most appropriate technology used by libraries to enhance information provision is ICT.

In the library set-up, ICT has brought about considerable improvement in information management and provision. This is as a result of the ever increasing advances in computer technology, sophisticated storage techniques, high speed processing and transmission of data, as well as proliferation of databases and online networks (Effah, 2002). It has become cheaper to digitally store, process and access large amounts of information at greater speed. ICT has controlled the information explosion 'bomb' to such an extent that it is now possible to obtain information from libraries and resource centres anywhere in the world regardless of the geographical position of the user and the library.

There is no need for any library to attempt to acquire all publications. This is because, with suitable computer software, telecommunication equipment, memory facilities and input-output devices, a researcher in a remote outpost of civilization would be able to search the comprehensive electronic databases in the advanced developed economies, and be able to obtain needed information in electronic or hard copy format (Effah, 2002).

ICT facilities and services available in libraries include computers, access to the Internet and its resources, Local Area Networks (LANs), Compact Disc Read Only Memory (CD-ROM) databases, online databases, Online Public Access Catalogues (OPACs), fax machines, photocopiers, Inter Library Lending and Document Delivery (ILL/DD) services, computer laboratories, scanners, printers, micro-fiche readers and telephones, among many others.

The use of computers has revolutionized the way library functions are performed; and, according to Armah (1999), automation of library systems in Ghana has brought new life into library operations and has expanded user access to current information. In this electronic age, the Internet, especially the World Wide Web (WWW) resource, is extensively used to search information gateways in order to find relevant information for users (Anim-Dankwa, 2002). The use of the ICTs in libraries as a basis for the provision of information has resulted in the need for research institutions to access and exploit ICT tools in support of their research work (Dzandu, 2009).

Justification for the Study

The Council for Scientific and Industrial Research (CSIR) of Ghana, as an organization, has not been left out in the ICT revolution. The CSIR, since 1990, has invested a lot of resources into strengthening ICT infrastructure in the various institutes, and in the institutes' libraries in order to enhance communication and information provision for the research officers and other senior officers in the various institutes.

However, for effective usage of the ICT infrastructure, there is the need for training in the use of the ICT facilities. Problems can arise in the use of ICT if the research officers are not adequately trained. The libraries of the various institutes are responsible for providing training for research officers in the use of ICT facilities such as computers, the Internet, electronic databases; and in effective searching skills. As such, the librarians are expected to ensure that the research scientists are adequately trained to acquire enough skills to effectively use the ICT facilities available in the institutes.

This study was, therefore, geared towards assessing the extent of training in the use of ICT and its impact on searching skills among the research officers in six out of the thirteen institutes of the CSIR. The institutes selected for the study are:

1. Animal Research Institute (ARI),
2. Food Research Institute (FRI),
3. Institute of Industrial Research (IIR),
4. Institute for Scientific and Technological Information (INSTI),
5. Science and Technology Policy Research Institute (STEPRI), and
6. Water Research Institute (WRI).

The six institutes were selected because they are all located in Accra; and the researcher felt it would be more convenient in terms of cost and time, to restrict the study to the Accra-based institutes, rather than extend it to cover the other institutes in Kumasi, Kade, Bunso and Tamale. As a result, the findings of this study cannot be generalized to cover the other CSIR institutes. This is a limitation on the study. The participants were the research officers in the selected institutes.

Objectives of the Study

The objectives of this study were:

1. To explore the extent of ICT training provided to research officers in six selected institutes of the CSIR, with specific reference to computers, the Internet, and electronic databases;
2. To determine the level of skills acquired in ICT use; and to assess the impact of the training on their searching skills.
3. To identify the challenges which militate against the effective use of ICT facilities and services by the research officers; and
4. To make recommendations for improving the use of ICT facilities and services by the research officers in CSIR.

Methodology

The instruments used for the data collection were the administration of a questionnaire and interviews. The total population for the study was two hundred. To ensure a fair distribution of the participants across the six institutes, the selection of the participants was done proportionally to the population; that is, 50% of each population was selected for the study. This resulted in a sample size of one hundred as shown in Table 1.

Table 1: List of institutes and the number of research officers sampled

Name of institute	Population	Sample size
Animal Research Institute	28	14
Food Research Institute	34	17
Institute of Industrial Research	38	19
Institute for Scientific and Technological Information	22	11
Science and Technology Policy Research Institute	10	5
Water Research Institute	68	34
Total	200	100

Source: Field Survey, 2009.

The questionnaire was designed to cover the objectives of the study. There were pre-coded as well as opened-ended questions. There were questions to elicit information on the background of the respondents in terms of demographic data, and included variables such as name of institute, gender, age, highest educational qualification, and length of service. There were also questions on training received in the use of ICT, skills acquired by respondents from the training programmes, impact of the training on work performance, problems militating against effective use of ICT, and recommendations for improvement in the use of ICT facilities. The study was carried out between April and June 2009.

In all, one hundred copies of the questionnaire were distributed at the various data collection sites. Copies of the questionnaire were personally delivered to the research officers. The researcher also used interviews to supplement the questionnaire. The Directors and the librarians of the respective research institutes were interviewed on issues relating to training provided for the research officers to enable them easily access and use the electronic resources. The interviews were conducted to corroborate the views or to detect any inconsistencies in the responses from the questionnaire.

Results and Discussion

Out of the one hundred copies of the questionnaire administered, eighty were returned, giving a response rate of 80%. Twenty copies of the questionnaire were not returned despite the number of follow-ups by the researcher. The response rate is illustrated in Table 2.

Table 2: Institutes of respondents and response rate

Institutes of respondents	Frequency	Percent
Animal Research Institute (ARI)	11	13.8
Food Research Institute (FRI)	13	16.2
Institute of Industrial Research (IIR)	13	16.2
Institute for Scientific and Technological Information	11	13.8
Science and Technology Policy Research Institute	5	6.2
Water Research Institute (WRI)	27	33.8
Total	80	100

Source: Field survey, 2009.

Gender of Respondents

The responses to the question of the gender of respondents revealed that 56 (70.0 %) were male, whilst 24 (30.0 %) were female. Thus, the majority of the respondents were male.

Age of Respondents

The responses to the question on the age of respondents revealed that 11 (13.9 %) respondents each were within the age ranges of 20 to 30 years, and 51 to 60 years; 19 (24.1 %) respondents were between the ages of 31 and 40 years; whilst close to half, that is, 38 (48.1 %) respondents were between the ages of 41 and 50 years. Table 3 shows the responses.

Table 3: Age of respondents

Age of Respondents	Frequency	Percent
20 to 30 years	11	13.9
31 and 40 years	19	24.1
41 and 50 years	38	48.1
51 to 60 years	11	13.9
Total	79	100

Source: Field survey, 2009.

Generally, all the respondents were within the working age limit of 20 to 60 years, but most of them were in the middle ages of 41 – 50 years.

Highest Educational Qualification

Respondents were also asked to indicate their highest educational qualification. Responses obtained revealed that 14 (17.7 %) respondents had a Bachelor's degree, 51 (64.6 %) respondents had a Master's degree, 12 (15.2 %) respondents had a Doctorate degree, and 2 (2.6 %) respondents indicated they had a Post Graduate Diploma. Table 4 illustrates the distribution.

Table 4: Highest educational qualification

Highest Educational Qualification	Frequency	Percent
Bachelor's degree	14	17.7
Master's degree	51	64.6
Doctorate degree	12	15.2
Post Graduate Diploma	2	2.6
Total	79	100

Source: Field survey, 2009.

Thus, the majority of the respondents had Master's Degree.

Length of Service of Respondents

Respondents were required to indicate the number of years they had been working with the CSIR. This was to determine whether the number of years at post had any influence on the training received in the use of ICT facilities. The responses obtained indicated that 26 (32.5 %) respondents had worked in the organization for less than five years; 16 (20.0 %) had worked for a period between five and ten years; and 38 (47.5 %) respondents had worked in CSIR for more than ten years. This is illustrated in Table 5.

Table 5: Length of service of respondents

Length of Service	Frequency	Percent
Less than five years	26	32.5
Between five and ten years	16	20.0
More than ten years	38	47.5
Total	80	100

Source: Field survey, 2009.

The majority of the respondents had worked for over ten years in CSIR.

Adequacy of Training Received in the Use of ICT

Respondents were required to indicate whether they received training in the use of ICT facilities (computers, Internet, database); and if yes, to indicate further, the adequacy of the training received. Out of the 80 respondents, 50 (64.1 %) indicated they received training in the use of computers, whilst 28 (35.9 %) said they did not receive any training in the use of computers. In response to the question on adequacy of the training received in the use of computers, 26 respondents, representing (53.1 %) said it was very adequate; 19 (38.8 %) said it was adequate; whilst 4 (8.2 %) said it was fair.

With regard to the Internet, 44 respondents, representing 57.9 % said they received some training; whilst 32 (42.1 %) said they did not receive any training. On the adequacy of training received, 16 (34.8 %) said it was very adequate; 26 (56.5 %) said it was adequate; 3 (6.5 %) respondents said it was fair; whilst 1 (2.2 %) said it was inadequate.

As regards the databases, 35 respondents, representing 55.6 % said they received some training; whilst 28 (44.4 %) said they did not receive any training. On the adequacy of training received in the use of the databases, 11 (31.4 %) said it was very adequate; 14 (40.0 %) said it was adequate; 7 (20.0 %) said it was fair; 2 (5.7 %) said it was inadequate; and 1 (2.9 %) said it was very inadequate. Table 6 illustrates the responses on the adequacy of training received.

Table 6: Adequacy of training received in the use of ICT

Adequacy of Training	Computers	Internet	Databases
Very adequate	26 (53.1 %)	16 (34.8 %)	11 (31.4 %)
Adequate	19 (38.8 %)	26 (56.5 %)	14 (40.0 %)
Fair	4 (8.2 %)	3 (6.5 %)	7 (20.0 %)
Inadequate	-	1 (2.2 %)	2 (5.7 %)
Very inadequate	-	-	1 (2.9 %)
Total	49 (100 %)	46 (100 %)	35 (100 %)

Source: Field survey, 2009.

Most of the respondents indicated that they received some form of training in the use of computers, the Internet, and databases. They stated further that the training was generally adequate. The responses revealed that some research officers did not receive any training in the use of computers (35.9%), the Internet (42.1%), and databases (44.4%). This implies that some of the research officers may not have been at post during the periods of the various training sessions, hence their negative responses. The responses also revealed that the majority did not respond to the second part of the question, that is, the adequacy of the training received.

Frequency of Training and Extent to which it has Helped Research Officers to Access and Use ICT

The study attempted to find out how often training in ICT was provided; and also the extent to which the training had helped the research officers to access and use the ICT facilities. One respondent each, representing 1.8 % stated that they received training four times in a year, and three times in a year; 2 (3.6 %) indicated they received it once in a year. As many as 48 (85.7%) research officers indicated that the training was provided occasionally, whilst 4 (7.1 %) said they never received any training. This is shown in Table 7.

Table 7: Frequency of training given to research officers

Frequency of Training	Frequency	Percent
Four times in a year	1	1.8
Three times in a year	1	1.8
Occasionally	48	85.7
Once in a year	2	3.6
Never	4	7.1
Total	56	100

Source: Field survey, 2009.

The fact that most research officers (85.7%) indicated that the training was provided occasionally implies that there is the need for the research officers to be provided more regularly with training programmes in the use of ICT infrastructure.

In response to the question on organizing training for the research officers, one librarian answered: "*this is done on request most of the time because most of the research officers are knowledgeable in ICT*". Further probing during the interviews showed that the librarians wished the training programmes were organized regularly and frequently, to update and upgrade the skills of both the providers and the users of the information.

With regard to the extent to which the training has helped the research officers to use the ICT facilities in the library and on the job, 26 respondents out of the 62 who responded, representing 41.9 % said it had helped to a large extent; 21 (33.9 %) said it had helped to an appreciable extent; 6 (9.7 %) said it was average, and 9 (14.6 %) said it was to a minimum extent. This is illustrated in Table 8 below.

Table 8: Helpfulness of ICT training to research officers

Extent of Helpfulness of ICT Training	Frequency	Percent
Large extent	26	41.9
Appreciable extent	21	33.9
Average extent	6	9.7
Minimum extent	9	14.6
Total	62	100

Source: Field survey, 2009.

The responses revealed that training was provided occasionally. Nevertheless, most of the respondents felt that the training provided had, to a large extent, helped them to access and use ICT facilities in their research activities.

To cross-check with the responses from the questionnaire, the researcher enquired from the librarians of each institute through interviews, whether they organized training programmes for the research officers to enable them search the electronic databases and also access the libraries' catalogues relatively easily. The librarians were also required to state the forms the training programmes took. Similarly, the Directors were also asked whether training was provided for the research officers.

All the librarians indicated that training programmes were organized for the research officers, but they added that these were occasional. In other words, the programmes were organized when the libraries had new resources. They all indicated that the training took the form of

demonstrations, seminars, workshops, and hands-on practical sessions. The responses from the Directors also confirmed that training programmes were organized for research officers.

Level of Skills in Accessing and Using ICT Facilities

The views of the respondents were sought as to whether they had acquired adequate skills to enable them access and use ICT facilities. They were to rate the level of skills acquired. Out of the 80 respondents, 61 (83.6 %) replied in the affirmative whilst 12 (16.4 %) replied in the negative. This implied that most research officers felt they had acquired enough skills to enhance their use of ICT infrastructure.

In response to the question on level of skills acquired, 24 respondents out of the 66 who responded, representing 36.4 % indicated it was very high; 29 (43.9 %) said it was high; 11 (16.7 %) said it was medium; whilst 1 (1.5 %) respondent each said it was low, and very low. Table 9 illustrates this distribution.

Table 9: Level of skills in accessing and using ICT

Level of skills	Frequency	Percent
Very high	24	36.4
High	29	43.9
Medium	11	16.7
Low	1	1.5
Very low	1	1.5
Total	66	100

Source: Field survey, 2009.

It was found that the majority (61 respondents or 83.6 %) had acquired adequate skills to enable them access and use ICT facilities. Most of them were also of the opinion that the level of skills acquired was generally high. The implication of these responses is that the high level of skills acquired could result in high level of usage of the ICT infrastructure by the research officers.

Extent to which ICT Use has Enhanced Work Performance

The respondents were also required to indicate whether the use of ICT facilities had positively affected their work performance; and if yes, to state the extent to which it had enhanced their work performance. Out of the 80 respondents, an overwhelming majority of 77 respondents, representing 98.7 % stated that the ICT facilities had positively affected their work performance, with only one (1.3 %) respondent giving a negative response. Two participants did not respond.

Respondents were then asked to indicate the extent to which ICT facilities had enhanced their work performance. In response, 52 (65.8 %) said the facilities had enhanced their work performance to a large extent; 23 (29.1 %) said 'to an appreciable extent'; and 4 (5.1 %) felt that the extent to which ICT facilities had enhanced their work performance was average. Thus, the majority (75 respondents or 94.9 %) were of the opinion that the use of ICT facilities had positively affected their work performance.

Challenges Encountered in the Use of ICT Facilities in the Institutes

The respondents were also required to indicate some of the challenges they encounter in the use of ICT facilities in their various institutes. Some of the challenges mentioned by the respondents include constant breakdown of computers, frequent power cuts, slowness or congestion of the Internet, inadequate funds, irregular maintenance and virus infection.

A similar question on the barriers hindering the effective use of ICT facilities in the institutes was put to the directors during the interviews. The responses revealed that the major barriers hindering the effective use of ICT facilities in the institutes were inadequate funding, frequent breakdown of computers and delays in repairs, and bandwidth problems. In the same vein, in enumerating some of the challenges that militate against effective use of ICT in information provision during the interviews, the librarians also mentioned, among others, low bandwidth, frequent power cuts, inadequate funds and virus infection.

Summary of Findings

Research scientists need to be given adequate training in order to acquire the necessary information technology skills to enable them use computers, software, databases, and other ICT facilities and services. This study revealed that most of the research officers had received some form of training in the use of computers, the Internet, and databases. It was further revealed that the training was generally adequate to ensure effective use of the stated resources.

The study further established that the training was provided occasionally. This is corroborated from the interviews with the Directors; and also, the librarians who indicated that they organized training for research officers but added that the training was occasional and most often organized when the libraries had new resources.

During the interviews by the researcher, one librarian stated that he sometimes tries to learn more about accessing information on the Internet and the databases on his own. He explained that this action helped to equip and update him to access electronic resources so that he could easily assist research officers who come to the library to seek electronic information to enhance their research activities.

The evidence established in the study revealed that research officers were given some training in the use of ICT, and the level of skills acquired by most of the research officers in the use of computers, the Internet and databases was high. Majority of the research officers were also of the opinion that the training in the use of ICT had positively impacted their searching skills while the use of ICT facilities had positively affected their work performance.

Conclusion

Technology offers speed, accuracy and efficiency in the processing and retrieval of relevant information. According to Dulle et al. (2004), effective access to information is an essential requirement for the success of any research system. Therefore, for a research-based organization such as CSIR, there is the need for the research officers to be trained in order to acquire the necessary skills to be able to access and use ICT facilities. The use of the ICT facilities would, as a result, positively impact or affect the research activities and enhance the work performance of the research officers in CSIR.

For a resource to be used effectively there is the need for the user to acquire the necessary training and skills required for its use. It must be stated that a lot of information, both relevant and irrelevant, is made available to the user, especially from the Internet. Obtaining useful information depends on the users' ability to exploit available training programmes and information retrieval systems; otherwise the quality of information retrieved deteriorates (Dulle et al., 2004).

Recommendations

The study recommends that:

- Adequate training should be given to the research officers in the use of ICT facilities such as the computers and the Internet to ensure that they are effectively used to promote research activities;
- Research officers need to be trained frequently and adequately in techniques for searching online databases and Compact Disc Read Only Memory (CD-ROM) databases;
- The CSIR institutes should ensure that training programmes organized for research officers are provided frequently, rather than occasionally;
- The librarians should ensure that majority of the research officers are at post when they are organizing training programmes. Research officers on leave should be asked to endeavour to be present for all training sessions;
- Specific budgetary allocation should be given for training purposes to ensure that regular training is organized for all research officers;
- There is the need for periodic sensitization workshop/training for the research officers on new information resources available, in order to update their knowledge in the use of ICT resources;
- The institutes should endeavour to provide modern ICT equipment such as printers, scanners, and photocopiers, among others, in addition to the computers to enhance the work performance of the research officers;
- The computers in the institutes should be maintained regularly to avoid frequent breakdown;
- The institutes should periodically purchase and install quality anti-virus programs on the Local Area Networks (LANs) in order to control virus infections on the computers;
- Where there are none, the institutes should purchase generators in order to curtail the problems of power cuts; and uninterrupted power supply (UPS), to prevent loosing information during power cuts;
- The institutes should also acquire bigger bandwidth in order to increase the speed of the Internet in the institutes.
- The institutes should take commercialization very seriously so as to get higher Internally Generated Funds for better support of ICT infrastructure.

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