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3-1-2012

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Library Philosophy and Practice 2012

ISSN 1522-0222

Facilitating ICT Adoption among Research Scientists in Ghana

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Introduction

Information in the modern context is considered as a strategic resource parallel in importance to land, labour, capital, and entrepreneurship – the traditional economic resources which are vital inputs for national development at all levels. Without information, the very functioning of society would come to a standstill. One institution which plays a vital role in the collection, processing, storage and dissemination of information is the library. Libraries of all types serve as information providers and aim at satisfying the information needs of their clientele.

In the present era new information technologies are used to perform library functions. The librarian of today is seen as an information resource provider, a resource centre manager, a human gateway to electronic resources, and a walking encyclopedia of quick reference sources (Asamoah-Hassan, 2003). This transformation is due to the fact that the librarian is able to use sophisticated gadgets; he/she operates in a modern era where libraries are not limited by walls; and where, with the touch of a mouse, he/she can access necessary information from anywhere in the world.

Adeya (2002) in a United Nations Economic Commission (ECA) 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'. ICT can thus be described as a diverse set of technological tools and resources used for creating, storing, managing and communicating information electronically.

Generally, ICT is a tool that any sector can use to deliver its services. The ICT revolution has turned the whole planet into a 'Global Village' where communication among people has become independent of physical distance and time. 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 provision. 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 any library 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.

Purpose of Study

This study examined the impact of ICT on information provision in six selected institutes of CSIR. The institutes involved in the study were the ones based in the capital city of Ghana, Accra namely: Animal Research Institute (ARI), Food Research Institute (FRI), Institute of Industrial Research (IIR), Institute for Scientific and Technological Information (INSTI), Science and Technology Policy Research Institute (STEPRI), and Water Research Institute (WRI). The participants were the research officers in the selected institutes.

On the whole, CSIR has thirteen institutes, in different regions of Ghana. The role of CSIR is to generate and apply innovative technologies which efficiently and effectively exploit science and technology (S & T) for socio-economic development in the critical areas of agriculture, industry, health and environment and improve scientific culture of the civil society (CSIR, 2008). The mandate of CSIR includes among others:

- to co-ordinate all aspects of scientific research in the country and to ensure that the Council, the research institutes of the Council and other organizations engaged in research in Ghana, co-ordinate and co-operate in their research efforts;
- to review, monitor and periodically evaluate the work of the institutes administered by the Council, in order to ensure that research being carried out by the institutes directly benefit identified sectors of the economy and is within the national priorities;
- to institute a system of contract research to ensure that research being carried out in the Council is relevant and cost effective;
- to encourage and promote the commercialization of research results; and
- to undertake or collaborate in the collation, publication and dissemination of the results of research and other useful technical information.
- The Council for Scientific and Industrial Research (CSIR) as an organization has not been left out in the ICT revolution. The Council, since 1990, has invested a lot of resources into ICT infrastructure building in the various institutes, and in the institutes' libraries to enhance communication and

information provision. However, a preliminary investigation revealed that the availability of some of services such as Inter-Library Lending and Document Delivery (ILL/DD) has not been publicized enough to create awareness among the research officers.

Another problem is the lack of adequate training and skills to enable the research officers access and use the ICT facilities and services available. In addition, some of the research officers cannot, by themselves, search the various online and CD-ROM databases to retrieve required information necessary for their work.

It is against this background that this study is being undertaken, to assess the impact of ICT on information provision in six selected institutes of the CSIR. The ICT components studied were computers, the Internet, databases, Inter Library Lending and Document Delivery (ILL/DD) and Online Public Access Catalogue (OPAC).

SIGNIFICANCE OF STUDY

The study is significant because previous studies on ICT use in Ghana have focused mainly on institutions of higher learning, university libraries, the health sector, and the banking sector. These include studies by Hinson and Amidu (2006), Amekuedee (2002), Afari-Kumah (2005), and Abor (2005). A few of the studies conducted in research institutions were undertaken outside Ghana. No study has as yet been cited on use of ICT by research scientists in CSIR. The research gap established, that requires to be filled, therefore, is the need for more studies on ICT-related issues in research institutions in Ghana. This study would contribute to knowledge, as no work has been carried out on ICT and information provision in CSIR. The findings of the study may also help other research institutions in Africa trying to enhance use of ICT among their researchers.

OBJECTIVES OF THE STUDY

The objectives of the study were:

a) To determine the levels of awareness, access to, and use of ICT facilities and services

by the research officers of the six institutes selected for the study;

b) To find out the extent to which the research officers are given training in the use of ICT

facilities and services and to determine the levels of skills acquired; and

c) To determine the effects of ICT use on research activities.

LITERATURE REVIEW

A number of studies have been conducted on ICT in research institutions in developed countries and in some developing countries outside Ghana. An attempt has been made to review some of the literature relevant to this study, with reference to the themes in the objectives of the study.

A study by Said (2006) investigated users' knowledge and awareness of the resources in a digital library program. The finding revealed that users were aware of the various databases available to them and used them to enhance research activities. Cobblah (2002) in his paper asserted that academics and researchers were aware of the ILL/DD service available to them, and therefore patronized it. Obioha (2005) also reiterated that researchers of the Nigerian Institute for Oceanography and Marine Research (NIOMR) have considerable awareness and exposure to ICT and its tools.

Bii and Wanyama (2001) in their study found out that most people had computers for their official use; and majority of those who did not have their own computers

were able to gain easy access to other terminals within the library. Adebayo and Adesope (2007) also stated that it is only when research scientists are aware of, have access to, and can use modern ICTs that they can effectively discharge their functions. They found out from their study that female researchers were aware of ICT but did not have adequate access to ICT facilities in order to enhance their work performance.

Similarly, Zawani and Majid (2000) observed that electronic resource usage had substantially increased, and they attributed the increase to the availability of more and better electronic resources, desktop access through networked workstations, and user-friendly interface design. This view is shared by Obioha (2005) who stated that sometime between 1994 and 1996, there was a shift in favour of electronic resource usage by research scientists; and the shift could be attributed to the increase in popularity and usability of the Internet itself, as well as the resources it contained.

Additionally, a study by Armah (2003) focused on the extent of awareness and use of IT services in the university libraries and extent of training received by the users. The findings revealed that CD-ROM databases for instance, provide a lot of literature for research work, and users find them very useful. Amekuedee (2002) also stated that most journals which used to be in print format are now available online and can be accessed electronically. He added that the role journals play in teaching, learning and research cannot be over-emphasized. An article by Adanu and Amekuedee (2009) reported that the UGCAT (University of Ghana Catalogue) was accessible to the library staff, researchers, the university community and the entire public via the Internet using the URL http://library.ug.edu.gh.

Research scientists need to be given adequate training in order to acquire the necessary skills to enable them use computers and other ICT facilities and services. Chisenga (2004) stated that there was the need for ICT users to be trained in how to use the resources. He reiterated that without such training, the ICT resources cannot be used effectively. Obioha (2005) reiterated the need for continuous training to be given to research officers to enable them use ICT effectively. Amekuedee (2005) also called for the need for librarians and users to be taught skills to equip them to handle automation issues in their libraries. He emphasized the need for such training programs to be continuous.

Bii and Wanyama (2001) reported that most library staffs had received training on various computerized library applications to ensure effective use of ICT. Similarly, Omotayo and Fadehan (2005), Cobblah (2002), and Markwei (2002), all indicated that some form of training should be given to researchers and librarians to equip them with some level of skills in the use of ICT. All of them emphasized the importance of continuous training in the use of computers, software, the Internet, databases, ILL/DD and OPAC among other ICT tools to ensure the effective use of these ICT facilities and services.

Contrary to the common view that training in the use of ICT is virtually inadequate for research scientists, Adebayo and Adesope (2007) and Said (2006) indicated that adequate training had been given to the research scientists and they had acquired sufficient skills in the use of ICT.

With reference to the effects of ICT use on research activities, Obioha (2005) stated that some of the achievements that could be ascribed to ICT tools usage include quick search and easy access to information, varieties of information, ease and speed in processing information, and increased knowledge. She stated that some achievements recorded by the institute in its research activities are partly credited to ICT use, which has played an immense role for the researchers of the institute in seeking out information through the Internet, the World Wide Web, and CD-ROM databases. However, some problems cited that militate against the effective use of ICT include inadequate funding; lack of adequate and stable power supply; constant breakdown of computers; Internet problems, inadequate training, and inadequate ICT centres among others (Amekuedee, 2005; Armah, 2003;

Chisenga, 2004; and Obioha, 20005).

RESEARCH METHODOLOGY

A research strategy based on the case study approach was adopted. This study carried out in October 2010 used questionnaires and interviews to elicit information from the respondents. There were questions on the awareness, access to, and use of ICT facilities and services; training and skills acquired by the research officers in the use of ICT facilities and services, and finally, effects of ICT use on the research activities of research officers.

Interviews were held with the directors and librarians of the institutes. The interviews were conducted to corroborate the views or to detect any inconsistencies in the responses from the questionnaires.

The total population for the study was two hundred. To ensure a fair distribution of the respondents across the six institutes, the selection of the respondents 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 (ARI)	28	14
Food Research Institute (FRI)	34	17
Institute of Industrial Research (IIR)	38	19
INSTI	22	11
STEPRI	10	5
Water Research Institute (WRI)	68	34
Total	200	100

Source: Field survey, 2010.

RESULTS AND DISCUSSION

A total of one hundred questionnaires were administered. Out of the one hundred questionnaires, eighty were returned, giving a response rate of 80%.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	100.0

Source: Field survey, 2010.

All the six directors were available for the interviews, and this resulted in a response rate of 100%. Eight out of nine librarians were available for the interviews, resulting in a response rate of 88.8%.

Access to Computers

The researchers sought to find out whether the research officers had personal computers for their official duties. In response, the majority (88.8 %) affirmed they had computers for their official duties. In the interviews with the directors, the researchers also enquired if every research officer had a computer to work with. The response to this question was to corroborate the question in the questionnaire which enquired from the research officers whether they had computers for their official duties. In response to this interview question, all the 6 directors answered in the affirmative. It was found out that the majority had access to computers for their official duties.

Publicity of ICT Facilities and Services at the Institutes

We sought to find out from the respondents the various means through which the ICT facilities and services were publicized. All the options provided in the questionnaire - posters, seminars, institutes' websites, brochures, newsletters, demonstrations, flyers, colleagues – were ticked as means through which ICT facilities and services were publicized. The majority, however, indicated that they became aware of these through seminars and their colleagues.

The librarians were also interviewed on issues relating to publicity of electronic resources. They were asked if they publicized the electronic resources available in their institutes in order to create awareness among the research officers. The responses showed that all the librarians did publicize the electronic resources so as to create awareness among the research officers and increase patronage of the resources.

Use of ICT Facilities and Services and Frequency of Use

The question required respondents to indicate whether they used ICT facilities and services; and if yes, to indicate the frequency of use of the facilities and services. A high proportion (98.8 %) indicated they used computers. On the frequency of use, an overwhelming majority (96.2 %) stated they used them daily; whilst very few (3.8 %) said they used them every other day.

With reference to the Internet, the majority (97.5%) said they used it. Out of this number, most of the respondents (96%) said they used it daily, whilst a few (4%) said they used it every other day.

With regard to databases, a reasonable number of respondents (72.6 %) indicated they used them. On frequency of use, 46.2 % said they used them daily; 35.9 % said they used them every other day; whilst 17.9 % said they used them twice a week.

For ILL/DD service, fewer respondents, (40 %) indicated they used the services. Out of this number, 10 % said the service is used daily; 40 % said they used it

every other day; and 50 % said they used it twice a week.

With regard to the OPAC, a lower number of respondents (40.5 %) indicated they used it. On frequency of use, 40 % of this number said they used it daily; 10 % said the service is used every other day; and 50 % said they used it twice a week.

The majority of the respondents indicated that they used computers, Internet services and databases; and virtually used them every day. On the contrary, the ILL/DD and OPAC appeared to be rarely used by the research officers, and most of them did not respond to the questions relating to ILL/DD and OPAC.

Relevance and currency of databases, and availability of full text materials in the databases

We also enquired whether the databases available to the research officers were relevant to their specific area of interest, and whether they were often updated and therefore current. The respondents were also required to state whether full text documents were most often available in the databases.

As regards the relevance of the databases to their specific area of interest, majority of the respondents, (69.9 %) responded in the affirmative. With regard to currency, quite a number (66.7 %) responded positively. As to whether there were full text documents available in the databases, most of them, (56.1 %) answered in the affirmative.

It was found out that majority felt the databases were relevant and were often updated and therefore current. Most of the research officers also stated that the databases contained full text documents.

Responses to Information Requests through ILL/DD

This question required the respondents to indicate whether they usually received quick response to their information requests through the ILL/DD service. In response, only a few, (23.8 %) stated 'yes'. Most research officers probably did not use the ILL/DD service and therefore did not respond to the questions. The few who used it indicated they did not receive quick responses to information requests through this service.

Training and Skills Acquired in the Use of ICT

We sought to elicit information about ICT training provided to the research officers and the skills acquired in the use of ICT. The librarians were also interviewed on issues relating to training provided to the research officers to enable them to easily access and use the electronic resources.

Adequacy of Training Received in the Use of ICT

Respondents were required to indicate whether they received any training in the use of ICT facilities and services and if yes, to indicate further, the adequacy of the training received. More than half of the respondents, (64.1 %) indicated they received training in the use of computers. In response to the question on adequacy of the training received in the use of computers, a simple majority (53.1 %) said it was very adequate; 38.8 % said it was adequate; whilst very few (8.2 %) said it was fair.

With regard to the Internet, a reasonable number of them (57.9 %) said they received some form of training. On the adequacy of training received, a few of the number, (34.8 %) said it was very adequate; a greater number, (56.5 %) said it was adequate; very few, (6.5 %) said it was fair; whilst 2.2 % said it was inadequate.

As regards the databases, more than half, (55.6 %) said they received some training. Out of this number, 31.4 % said the training received in the use of the databases was very adequate; 40 % said it was adequate; 7.2 % said it was fair;

5.7 % said it was inadequate; whilst 2.9 % said it was very inadequate.

With regard to ILL/DD, less than half, (24 %) said they received some training. On the adequacy of training received, 17.6 % of the number said it was very adequate; 23.5 % said it was adequate; 41.2 % said it was fair; 11.8 % said it was inadequate; whilst 5.9 % said it was very inadequate.

With reference to the OPAC, only a few of the respondents, (20.4 %) said they received some training. Out of this number, 30.8 % said training received in the use of the OPAC was very adequate, and the same percentage said it was adequate; 15.4 % said it was fair, and the same number said it was very inadequate; 7.7 % said it was inadequate.

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. Very few research officers, however, stated that they received some training in the use of ILL/DD and OPAC. In their estimation, the training was generally adequate. 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 in ICT

The researchers sought to find out how often training in ICT was provided. 1.8 % stated that they received training four times in a year, another 1.8 % said they received it three times in a year; and 3.6 % indicated they received it once in a year. As many as 85.7 % indicated that the training was provided occasionally; whilst 7.1 % said they never received any training. The responses revealed that training was provided occasionally.

To cross-check with the responses from the questionnaires, the researcher enquired from the librarians in an interview whether they organized training programmes for the research officers to enable them search the electronic databases and also access the libraries' catalogues relatively easily. They were also required to state the forms the training programmes took. All the respondents 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.

Level of Skills in Accessing and Using ICT Facilities and Services

The views of the respondents were sought as to whether they had acquired enough skills to enable them access and use ICT facilities and services. If they had, they were to rate the level of skills acquired. The majority of respondents (83.6 %) replied in the affirmative. In response to the question on level of skills acquired, 36.4 % indicated it was very high; 43.9 % said it was high; 16.7 % said it was medium; whilst 1.5 % respondent each said it was low, and very low.

It was found that the majority had acquired enough skills to enable them access and use ICT facilities and services. Most of them were also of the opinion that the level of skills acquired was generally high.

Extent to which ICT Use has Enhanced Work Performance

The respondents were required to indicate whether the use of ICT facilities and services had positively affected their work performance; and if yes, to state the extent to which it had enhanced their work performance. An overwhelming majority, (98.7 %) stated that the ICT facilities had positively affected their work performance. Respondents were then asked to indicate the extent to which ICT facilities had enhanced their work performance. In response, a reasonable number, (65.8 %) said the facilities had enhanced their work performance to a large extent;

29.1 % said 'to an appreciable extent'; and 5.1 % felt that the extent to which ICT facilities had enhanced their work performance was average.

Thus, the majority were of the opinion that the use of ICT facilities and services had positively affected their work performance. Most of the respondents also stated that the use of ICT facilities and services had enhanced their work performance to a large extent.

Impact of ICT Use on the Research Activities of Research Officers

The researchers sought the opinion of the respondents as to whether the use of ICT facilities and services had impacted positively on their research activities. They were expected to agree or otherwise, to the statement: "ICT has been very useful to me; the use of ICT facilities and services has impacted positively on my research activities". The responses revealed that 59.5 % strongly agreed to the statement that the use of ICT facilities and services had impacted positively on their research activities; 39.2 % agreed with the statement, and 1.3 % indicated that he/she did not know.

Majority of the respondents strongly agreed with the statement that the use of ICT facilities and services had impacted positively on their research activities.

DISCUSSION

From the study, it was found out that most of the research officers were aware of, had access to, and used

computers, Internet service and databases. This evidence supports the findings of Said (2006), Armah

(2003), Zawani and Majid (2000), Bii and Wanyama (2001) and Obioha (2005); who all indicated that

when users are aware of, have access to, and use modern ICTs, their work performance would be

enhanced. Research scientists are expected to undertake research as part of their work. The ability to perform this task effectively is dependent on the availability of some ICT facilities and services.

The findings also revealed that most research officers used databases available to them. This assertion is confirmed by Armah (2003) and Amekuedee (2002). Also evident from the study was the fact that databases available to the research officers were relevant to their specific areas of interest. It must be emphasized that priority attention needs to be given to the information needs of the research officers. As such, in addition to ensuring that the databases are relevant and current, the librarians should also provide selective dissemination of information (SDI) services to the research officers. This can be done when the librarians keep profiles on their research interests so that from time to time; searches are done for the research officers. This can go a long way to ensure that current and timely information is made available to them to enhance their research activities. Also, since it is almost impossible for anyone library to be totally exhaustive and have every literature required by all their users, an efficient inter library lending and document delivery service would help the librarians deliver quality service to the research officers.

The findings also revealed that most of the research officers had received some form of training in the use of computers, the Internet, and databases. The findings of the study however established that the training was provided occasionally. This evidence is corroborated by the findings from the interviews with 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. The findings showed that research officers desired that training should

be continuous. Further probing during the interviews showed that the librarians also 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 This confirms the findings of Chisenga (2004), Amekuedee (2005), Omotayo and Fadehan (2005), Markwei (2002) and Cobblah (2002), who all indicated the need for continuous training.

Also evident from the analysis is the fact that only a few research officers had received any training in the use of ILL/DD services and OPAC. In the estimation of these few respondents, the training they received was generally adequate. The adequacy of training received as established in this study is in contrast with the findings of Chisenga (2004), and Amekuedee (2005), who stated that the training given in OPAC to researchers, librarians and users of ICT was inadequate and subsequently, called for adequate training to be given to users of ICT. It must be emphasized that, although training in the use of ICT facilities and services may be adequate as expressed by some of the respondents; revolutionary changes brought about by ICT require that training provided in the use of ICT should be continuous to ensure adequate skills at all times.

The findings of the current study further revealed that the use of ICT facilities and services had positively affected the work performance of the research officers and enhanced their research output. This evidence is supported by the findings of Armah (2003), Chisenga (2004), Amekuedee (2005), Obioha (2005), and Said (2006) who all stated that the use of ICT generally enhances the activities of academics and researchers; and consequently results in increased productivity. Interestingly, the findings of the study revealed that irrespective of the difficulties encountered in the use of ICT facilities and services, most research officers would still patronize the services. Four respondents provided the following responses as the reasons why they would continue to use ICT facilities and services even when they face challenges: '*I can't work without computer and Internet'; 'they are necessary evil for research work'; 'ICT cannot be disregarded in modern R & D'; and 'benefits of ICT as compared to conventional services are tremendous'.*

Recommendations

Though recommendations here are made for CSIR it is expected that the experiences would benefit other researchers in developing countries.

The librarians of the CSIR institutes should effectively publicize the ICT facilities and services available in the institutes so that patronage of the services would be increased.

Adequate training should be given to the research officers in the use of the ICT facilities and services; and the institutes should ensure that the training programs are provided frequently rather than occasionally.

Library cooperation among all librarians should be strengthened so that delays in response to information requests through the ILL/DD system would be reduced; in addition, the ILL/DD service should be formalized and institutionalized so that it becomes binding on all libraries in Ghana to have ILL/DD units to enhance the sharing of library resources.

Conclusion

An overwhelming majority of the respondents were aware of ICT facilities and services in the institutes. Most of the respondents had access to and used the ICT facilities and services to enhance their research activities. Although most of the research officers had received training and had acquired some level of skills in the use of ICT facilities and services, it is important that such training programmes are conducted regularly to constantly update the knowledge of the research scientists.

The use of the ICT facilities and services would, as a result, positively impact or affect the research activities and work performance of the research officers.

It can be concluded from the findings of the study that the use of ICT facilities and services has impacted positively on the information provision for research officers in the six selected institutes in CSIR.

References

Abor, J. (2005). Technological Innovations and Banking in Ghana: An evaluation of customers' perceptions, Ife. *Psychologia* 13(1): 170-187.

Adanu, T., & Amekuedee, J. (2009). March 27, Changes in Legon Library System, *Daily Graphic* 11.

Adebayo, E.L., & Adesope, O.M. (2007). Awareness, access and usage of information and Communication Technologies among female researchers and extensionists. *International Journal of Education and Development using Information and Communication Technology* 3(1): 85-93.

Adeya, N.C. (2002). ICTs and Poverty: A Literature Review. UNESCO. Available: http://www.idrc.ca/en/ev-24718-201-1-DO_TOPIC.html

Alemna, A.A., & Sam, J. (2006). Critical issues in information and communication technologies for rural development in Ghana. *Information Development* 22(4): 236–239.

Amekuedee, J-O. (2002). Information and Communication Technology (ICT). for Teaching and Learning. Paper presented at the Biennial Seminar of Committee of University Librarians and their Deputies (CULD). at the Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. The University Press, KNUST. 13–14.

Amekuedee, J-O. (2005). An Evaluation of Library Automation in some Ghanaian University Libraries, The Electronic Library 23(4): 442-452.

Asamoah-Hassan, H.R. (2003). Information: The oil in the wheel of national development. *Ghana Library Journal* 15: 13.

Bartlett, A. (2002). ICT and IMPM, in: *Farmers, FAO, and Field Schools*, Rome: FAO 3.

Bii, H.K., & Wanyama, P. (2001). Automation and its impact on the job satisfaction among the staff of the Margaret Thatcher Library, Moi University. *Library Management* 22(6/7): 303-310.

Chisenga, J. (2004). *The use of ICTs in African public library service: A survey of ten countries in anglophone Africa*. Oxford: International Network for the Availability of Scientific Publications (INASP).

Cobblah, M.A. (2002). An assessment of IFLA/DANIDA -sponsored ILL/DD project in Ghana: The users' point of view. *Ghana Library Journal* (14): 48–53.

Council for Scientific and Industrial Research (CSIR) (2008). *Conditions of Service for Senior Members – CSIR*. Accra: CSIR Secretariat.

Effah, P. (2002). ICT in academic and research libraries in Ghana, keynote address presented at the Biennial Seminar of Committee of University Librarians and Their Deputies (CULD) at the Kwame Nkrumah University of Science and Technology, Kumasi. The University Press, KNUST 7-10.

Hinson, R., & Amidu, M. (2006). Internet adoption amongst final year students in Ghana's oldest business school. *Library Review* 55(5): 314-323.

Markwei, E.D. (2002). services, resources, and benefits of the Internet available to academics in Ghana. *Ghana Library Journal*14: 22–29.

Obioha, J. (2005). The role of information seeking and use amongst research officers in research institutes in Nigeria: the Nigerian Institute for Oceanography and Marine Research Experience. *The International Information and Library Review* 37(4): 303-314.

Omotayo, O., & Fadehan, O.A. (2005). Internet access and usage by Nigerian academics: A case study of the Obafemi Awolowo University, Nigeria. *Ghana Library Journal* 19: 97-98.

Said, A. (2006). *Accessing electronic information: A study of Pakistan's digital library*. London: INASP.

Zawawi, S., & Majid, S. (2000). The information needs and seeking behaviour of the IMR biomedical scientists in Malaysia. Available: http://majlis.fsktm.um.edu.my/document.aspx?filename=166.pdf