

The Impact of Information and Communication Technology on Research Output of Scientist in Two Selected Nigerian Agricultural Research Institutes

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ABSTRACT

This paper focuses on the impact of ICT on research output of scientists in selected research institutes in Edo State, Nigeria. Adopted for the study was the descriptive survey research design in which questionnaire was used as the main instrument for data gathering. The population of the study comprised of the scientists in two Nigerian Research Institutes (The Nigerian Institute for Oil Palm Research and Rubber Research Institute of Nigeria, Edo State of Nigeria). The study shows that usage of computer, television, GSM, internet and printer ranked highest among the ICTs tools in the Institutes, majority of the scientists parade very high level of proficiency in the use of ICT in rendering research activities in the Institutes, the positive influence of ICT and staff training on research outputs of the scientists was very high. The study therefore recommends among others, that sufficient funds should be made available for acquisition of standard ICT facilities in the institutes and that training and re-training of scientists should be intensified, for the purpose of skill acquisition that will result to productivity.

Keywords: *Information and Communications Technology; Information Literacy; Research Institutes; Research Output; Staff Training*

1. INTRODUCTION

Research has been defined as man's systematic and empirical investigation into existing but hidden elements in nature with a view to unearthing, restructuring and explaining such element for the purpose of development (Ifidon and Ifidon 2007) The formal mandate of the scientists in the Nigerian Research Institutes as stressed by Orewa (2009), is to conduct research into the production and products of oil-palm/rubber and other economic importance and transfer its research findings to farmers. The emphases of the research mandate are as follows namely to:

- a. Organize technical and vocational courses on agricultural products and related fields;
- b. Undertake agricultural extension services by liaison with federal and state agencies, primary agricultural producers, industries and other users of research results within the zone in collaboration with the National Agricultural Extension Research and Liaison Services (NAERLS);and
- c. Provide laboratory and other technical services to farmers, agro-based industries and other parties requiring these services, etc.

Prior to the introduction of Information and Communications Technology (ICT) into the establishment of the Nigerian Research Institutes, a lot of researches on the development of the entire agricultural industry in Nigeria had been undertaken but suffered major setback as a result of information explosion. It is germane to state that Information and Communication Technologies (ICTs) are crucial in facilitating communication and access to information for agricultural and rural development, since agriculture could be said to be one of

the potentially beneficial areas for the application of ICTs for economic transformation. The associated information overload and the need to be able to plough to morass of information, call for innovation/application of ICT that is already having wide-range effect across numerous domains of the society. Lafeber (1999) cited in Lallana (2002) considers ICT as a broad field that encompasses computers, communications equipment and the services associated with them in addition to the telephone, cellular networks, satellite communication, broadcasting media and other forms of communication.

The variability in definition notwithstanding, ICT is a combination of information technology (IT) and telecommunications technology. Under favorable conditions, ICT can be a powerful tool for increasing productivity, empowering marginalized groups, promoting dialogue among different stakeholders, improving the environment, and contributing to better education and healthcare for all (*Human Development Report, 2001*).

Today, the application of ICT has generally simplified research activities which used to be very cumbersome, for instance, ICT has provided vast amount of scientific and technical information for basic and adaptive research on root, stem and tuber crops. It packages information on economic improvement, rural development and food security in such areas as crop production techniques and processing, poultry farming and development of small scale enterprises. (Nwosu, 2009)

It is an established fact that ICT has provided an avenue for scientists to communicate with one another,

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exposing them to the collection of standard texts of monographs, journal articles (locally and internationally), annual technical reports, technical pamphlets, scientific reports and dissertations/theses and also enable them to participate in technical industrial fora in areas related to their fields. ICT has assisted the scientists in advancing their research works and knowledge and created room for effective management of agricultural knowledge and information, as such an organization of network of partners gets the right information to the right person(s) at the right time in a user-friendly and accessible manner so that they can perform their jobs effectively.

On the other hand, training (staff training/ in-service training,) is required in industrial development so as to acquire the skills, right attitude, awareness and knowledge for the scientists to do their jobs. This is true at all levels in various institutions, from the new recruit on how to use the till and interact with clientele to the manager who needs to know how to motivate the staff and to make effective decision. Akande (2000), stated that training is an integral part of technological development, and it should be done on a continuing basis as a regular activity. It should also lead to upgrading the social status and prospect of technologists since the competence of a firm correlates significantly with available skills. He stressed further that training brings about awareness and good communication skills which enhance research activities.

In addition, staff training as a means of Information Literacy is seen to be very crucial to the success of any information system. Unless staff at all levels of an organization know how to use the new technology/information systems effectively, investment in the information systems can be a waste of money. Therefore, managers who fully understand the benefits and problems associated with the use of information technology are likely to make better decisions in establishing a corporate information systems strategy; appraising advice from ICT professionals either within or outside the organizations and allocating resource to information systems.

According to the College Research Libraries (2003) Information Literacy is an intellectual framework for identifying, finding, understanding, evaluating and using information. It includes determining the nature and extend of needed information; accessing information effectively and efficiently; evaluating critically information and its sources; incorporated selected information in the learner's knowledge base and value system; using information effectively to accomplish a specific purpose; understanding the economics, legal and social issues surrounding the use of information and information technology; and observing laws and regulations, and institutional policies related to the access and use of information. The success of research works depend to a large extend on the skills and strategies employed in managing appropriate information from the

information system, respondents or from experiment to its destination.

The usefulness of ICT and staff training as means of information literacy in order to enhance the research output of the researchers/scientists has been established in extant literature. In spite of this, a lot of problems exist that are associated with research and related activities which had so far led to low quality of output to the dissatisfaction of the people that the Research Institutes were established to support. It is with a view to finding solutions to the problems that this research was conducted.

This study therefore focuses on the use of ICT on research output of scientists at the Nigerian Research Institute for Oil Palm Research and Rubber Research Institute of Nigeria, Edo State of Nigeria. The overall objective of the study is to evaluate the use of ICT and staff training on research output of scientists at the research institutes. To achieve this, the following specific objectives were design to:

- a. Determine the range of ICT available for use by scientists in the Research Institutes in Edo State with a view to enhancing research output.
- b. Find out the level of ICT proficiency of the Scientists in the Research Institutes.
- c. Determine the computer literacy level of Scientists in the Research Institutes.
- d. Evaluate the extent to which the application of ICT and staff training has affected the level of research output of scientists in the selected Research Institutes

2. REVIEW OF RELATED LITERATURE

The term Information and communication technology (ICT) and information technology (IT) can be used interchangeably. Within half a century, ICT has changed the world and affected millions of lives in ways that no one could have foreseen. The late 20th century has become known as the "information age". It would be impossible to conduct modern day business and other activities without the use of ICT such as the telephone, computer, fax machine, etc. Adewumi (1992) stressed that information is the major tool of agricultural scientists as it is required to empower them to carry out further research in their area of specialization, know what is on ground and what has been done in order to avoid unnecessary duplication of efforts and results. Agunbiade (2003) opined that IT means the convergence of computer and telecommunications to enhance the job activities of the organization or individual. Adewumi (2003) further stressed that the scientists use ICTs to create, manipulate, classify, store, retrieve and disseminate relevant information that provide research development in the services and production activities in the agricultural sector. Such developments are:

- a. Provision of information and advice relating to production and products of the various economic

palms through training, publicity and development and use of modern and effective methods for transferring the results of research to farmers.

- b. Development by breeding techniques of improved planting materials which have the potential to produce uniform and high yielding products.
- c. Development of effective methods of crop husbandry and protection at all phases of management, thereby ensuring that early fruition and sustained high yield under various conditions of soil and climate.
- d. Development of efficient methods and quality control in large and small scale processing.
- e. Development in the area of palm wine studies. After a series of research a very reliable method for the preservation and bottling of palm wine has been developed (Uboma, 2005)

At this juncture, is germane to state that the place of training in technological development and research productivity cannot be overemphasized. Training is an integral part of technological development, and it should be done on a continuous basis as a regular activity. It should also lead to up-grading of the social status and respect of technologist, since the competence of a firm correlates significantly with the available skills (Akande, 2000). Training could be provided through the organizations in which we work and through educational institutions (both public and private), professional associations, human study, television, and other media. The growing field of training serves human beings and organizations in a myriad of ways. It contributes both directly and indirectly to the wellness and success of individuals and organizations.

Summarily, there are different methods by which users can gain expertise in the use of ICT (software and hardware) facilities. These are;

- a. Computer based training
- b. Watching a video training course
- c. Interactive video training
- d. Online tutorials
- e. Step-through guides; and
- f. Formal, instructor- led training course

Training brings about good/effective communication skills and awareness which give the scientists the opportunities to use the various systems and sources of information (print or non print) effectively. These skills involve the use of computers and other ICT tools systematically and correctly to identify, locate, obtain, access and produce accurate, timely and useful information/results to its destination at the right time. The skills also have to do with contacts amongst individuals both in and outside organizations. These contacts can consist of face-to-face conversation, letters, memos, telephone, e-mail, reports, speeches, etc. through which information is sent and received (Akande, 2000).

3. RESEARCH METHODS

In this study, the survey research design was employed, whereby questionnaire was used to elicit information from the respondents. The total enumeration technique was adopted whereby a total of 80 respondents representing 100% of the research scientists in the selected research institutes were used. The research institutes comprised the Nigerian Institute for Oil Palm Research (NIFOR) and Rubber Research Institute of Nigeria (RRIN), Edo State of Nigeria. Questionnaire was the major instrument employed for the study. The questionnaire consisted of two parts with section A, designed to elicit demographic information from the respondents while section B was designed to elicit information on the impact of ICT on the research output of respondents. Out of the 80 copies of the questionnaire administered, 72 copies were retrieved and found useable, giving a response rate of 90%. Data gathered from respondents were condensed into tables and charts for effective analysis using simple percentage, frequency counts and tables

4. RESULTS

Table 1: Summary of Response rate of the Respondents

| Institutes | Questionnaire Administered | Questionnaire Retrieved | Percentage |
|--------------|----------------------------|-------------------------|------------|
| NIFOR | 43 | 38 | 47.5 |
| RRIN | 37 | 34 | 42.5 |
| TOTAL | 80 | 72 | 90 |

Source: Field Survey, 2011

The table shows that out of 72 copies of questionnaire administered at the institutes, 38(47.5%) copies were retrieved from NIFOR and 34(42.5%) copies were retrieved from RRIN giving a total number of 72 (90%) response rates. All the retrieved copies of questionnaire were found useable; this therefore constitute the basis for the analysis of this research work

Table 2: Distribution of Respondents by Qualification

| Qualification | Frequency | Percentage (%) |
|---------------|-----------|----------------|
| B.Sc/HND | 5 | 7 |
| M.Sc | 26 | 36 |
| Ph.D | 41 | 57 |
| Total | 72 | 100 |

Source: Field Survey, 2011

Table 2 reveals that respondents with Ph.D. qualification were found to be more in the institutes with 41(57%). Those with M.Sc. were 26(36%) as against 5(7%) respondents that had first degree.

Table 3: Range of ICT available to Scientists

| RANGE OF ICT | YES | % | NO | % |
|-------------------|-----|-----|----|---|
| Personal computer | 72 | 100 | – | – |

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|-----------------------|----|-----|----|----|
| Laptop | 70 | 97 | 2 | 3 |
| Scanner | 57 | 79 | 15 | 21 |
| Fax | 9 | 13 | 63 | 87 |
| Internet connectivity | 72 | 100 | – | – |
| Photocopier | 52 | 79 | 15 | 21 |
| Telephone Landline | 32 | 44 | 40 | 56 |
| GSM | 72 | 100 | – | – |
| Printer Colour | 34 | 47 | 38 | 53 |
| Monochrome | 60 | 83 | 12 | 17 |

Source: Field Survey, 2011

Table 3 shows the range of ICT available to scientists in the research institutes in Edo State. The ICT tools which would be considered mostly available to the scientists for use as indicated by respondents include computer, Global System of Mobile telecommunication (GSM) and Internet connectivity. The table further indicated that 70(97%) respondents claimed to have laptop as against 2(3%) who claimed otherwise. The availability of the printer (monochrome) rated third with 60(83%) while scanner and photocopier rated fourth with 52(79%), colour printer, 34(47%) while telephone (landline) followed with 32(44%) in that order. The least available ICT tool was fax machine with only 9(13%) of the respondents answering in the affirmative.

Table 4: ICT Tools Usage

| ICT Tools | YES | % | NO | % |
|------------|-----|-----|----|-----|
| Internet | 72 | 100 | – | – |
| Intranet | – | – | 72 | 100 |
| Extranet | – | – | 72 | 100 |
| Multimedia | 60 | 83 | 12 | 17 |

Source: Field Survey, 2011

Table 4 shows that 100% of the respondents indicated internet as the most available ICT tool to scientists in the Institutes: 60% indicated multimedia, while 17% answered the same question in the negative. This reveals that the most available ICT tool for usage in the institutes as indicated by the respondents was the internet as well as multimedia.

Table 5: Computer Literacy Level of Respondents

| Options | YES | % | NO | % |
|--|-----|-----|----|----|
| Computer literacy | 72 | 100 | – | – |
| High degree of knowledge of ICTs | 86 | 94 | 4 | 6 |
| They required ICT skills | 69 | 96 | 3 | 4 |
| Efficiency in the use of ICTs | 72 | 100 | – | – |
| Satisfaction of institutions' ICT management | 57 | 79 | 15 | 21 |

Source: Field Survey, 2011

Table 5 shows that all the respondents were computer literates and conversant with the use of ICT, 86(94%) of respondents exhibited high degree of knowledge of ICT and 69(96%) had the required ICT

skills. This simply shows that majority of the scientists in the Institutes have high degree of knowledge of ICT and were satisfied so far with the way ICT was being managed in the institutes.

Table 6: The level of ICT proficiency of the Respondents

| Level of Proficiency | Frequency |
|----------------------|-----------|
| Low | 1 |
| Moderate | 10 |
| High | 28 |
| Very high | 29 |
| Outstanding | 4 |
| Total | 72 |

Source: Field Survey, 2011

Table 6 shows that 57(79%) of respondents were proficient in the use of ICT, 10(14%) with moderate level while 4(6%) claimed to have outstanding level of proficiency in the use of ICT. It could be inferred from this that majority of the scientist paraded "very high" level of proficiency in the use of ICT in rendering research services in the Institutes.

Table 7: ICT, Staff Training and Research Outputs of Respondents

| S/N | Influence of ICT on S.T. | A | % | D | % |
|-----|---|----|-----|----|----|
| 1. | My research efforts have been remarkably enhanced by my acquisition of ICT skills in recent times | 72 | 100 | – | – |
| 2 | I have found information literacy skills very useful in the improvement of research output as a scientist | 72 | 100 | – | – |
| 3. | My research institute has invested so much on staff training for the acquisition of ICT skills | 59 | 49 | 13 | 18 |

Source: Field Survey, 2011

Table 7 shows that all the respondents agreed that their acquisition of ICT skills in recent times have remarkably enhanced their research efforts. In the same vein, 100% of respondents agreed that they have found information literacy skills very useful in the improvement of their research, while 59(49%) agreed that the Institutes have invested so much on staff training for the acquisition of ICT skills, and 13(18%) disagreed with the same statement. These revealed that the application of ICT and staff training through information literacy programme have remarkably enhanced research outputs of the scientists in the Institutes, and both factors have positive influence on research output in the institutions and the society at large.

5. DISCUSSION OF FINDINGS

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It is an established fact that ICT has provided an avenue for scientists to communicate with one another, exposing them to the collection of standard texts of monographs, journal articles (locally and internationally), annual technical reports, technical pamphlets, scientific reports and dissertations/theses and also enable them to participate in technical industrial fora in areas related to their fields.

This study has revealed from its findings that the predominant ICT tools available to the scientist for use in the selected institutes comprised computers, telephones, internet, laptops, and printers. This could probably be as a result of the fact that ICT in the recent times is synonymous with research productivity. This is corroborated by the findings of Edem (2008) which states that today, the internet and computer are some of the modern ICT tools used to process and disseminated information; it is now the fastest medium for transferring and receiving information about on-going researches, results of research and publication of all kinds.

In an attempt to evaluate the level of proficiency of the scientists in the use of ICT in the study areas used for this study, it could be inferred that majority of the Scientist paraded "very high" level of proficiency in the use of ICT in their research activity as well as in rendering research services. This agrees with the findings of Kumar (1997) which states that the spurt of ICT in the 21st century has brought dramatic changes in research activities. The scientists as intermediaries have to be experienced and proficient to be able to cope with the knowledge explosion and ICT will be capable of meeting the high expectation of users.

The application of ICT and staff training through information literacy programmes have remarkably enhanced research outputs of the scientists in the institutes studied, and both factors have positive influence on research output in the institutes as well as the society at large. This finding is in conformity with the views of Cole (2004) who states that the primary goal of in-training in an organization is to produce outstanding quality service, to achieve total customer satisfaction, aggressive sales growth and optimum profits. Information literacy has a significant influence on research activities, as it enables the scientists to determine the extent of information needs, access the required information effectively and efficiency, evaluate information and its sources and understand the economic, legal and social issues surrounding the use of information, as to accomplish a specific goal.

It is germane to state here that majority of the scientists in the Institutes possess high degree of knowledge of ICT use and application. This could be attributed to the acquisition of ICT skills by majority of the scientists.

6. RECOMMENDATIONS

There is no doubt that the application of ICT in the research institutes has simplified research activities

that use to be very cumbersome. With the application of ICT, research and production activities have been improved tremendously. With information literary skills, scientists can effectively access the vast amount of scientific and technical information available online for basic and adaptive research on root, stem, tuber and crops, including information on economic improvement, rural development and food security in such areas as crop production techniques and processing, poultry farming and development of small scale enterprises.

Based on the research findings, the following recommendations were made:

- a. Sufficient funds should be provided and allocated to the research departments in the selected institutes for the development and maintenance of ICT facilities for effective rendering of research services.
- b. Sufficient funds should also be made available towards the in-service training programs (Information Literacy) to train staff in the use of ICT facilities in information retrieval, data processing, electronic publishing, information dissemination etc for the purpose of research development in the institutes.
- c. The board members, directors and management of NIFOR and RRIN should organize seminars and workshops periodically to create awareness among the scientists and the authorities about the benefits of using ICTs in the institute. And they should ensure that training and re-training programs in the institutes are intensified.

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