

AN ASSESSMENT OF CHOICES OF AREAS OF SPECIALIZATION OF COMPUTER EDUCATION STUDENTS IN FIELDS OF INFORMATION AND COMMUNICATION TECHNOLOGY IN UNIVERSITIES IN SOUTH EASTERN NIGERIA.

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Abstract

This study sought to review the choices of areas of specialization of Computer Education students in fields of Information and communication technology with their influential factors in South Eastern Nigerian Universities. This study adopted descriptive survey research design. The population of the study comprised all the public universities in Nigeria with a population size of 2280 Lecturers and Students. The sample size is 520 comprising 90 Lecturers and 430 Students of Computing Technology field from all the public Universities in the south-eastern part of Nigeria that offer Computer Education. The findings revealed that choice areas like Data processing, Database management, Computer programming and Computer networks are highly offered by a large number of the students while areas like Artificial Intelligence, Computer Information System, Knowledge Engineering and Neural Networks are only offered by very few students. Also from the findings, it was identified that some influential factors in students choice of Areas of specialization are Fund, Ignorance of nature and cost of programs and Institutions offering them and Coping phobia.

Keywords: Assessment, Specialization, Computer Education, Universities, Southeast Nigeria.

Introduction

Information generally refers to whatever is capable of causing a human mind to change its opinion about the current state of the real world. Information according to Samonas and Coss (2014) is a collection of relevant data needed to give knowledge in certain or various fields. Information and Communication technology is a set of computers and/or devices capable of generating, processing and disseminating information and possibly receiving a feedback Information and communication Technology (ICT) which is driven on the wheels of computers and by the engines of Computing has without doubt completely altered the trends

of every human endeavors. Onah et al (2016) refers to ICT as techniques, equipment or tools used in generating and communicating information. Information and Communications Technology (ICT) is an extensional term for Information Technology (IT) that stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals) and computers, as well as necessary enterprise software, middleware, storage, and audiovisual systems, that enable users to access, store, transmit, and manipulate information (Murray, 2011). Information and Communication Technology (ICT) is the synergy between computers and communication devices commonly referred to as computing, and forms an important part of the modern world

Computing can be defined as any activity using the computers to generate, manage, process, and communicate information. It includes development of both hardware and software. According to Peter (2012), Computing is a critical, integral component of modern industrial Information and communication technology. computing includes designing and building hardware and software systems for a wide range of purposes; processing, structuring, and managing various kinds of information; doing scientific studies using computers; making computer systems behave intelligently; creating and using communications and entertainment media; finding and gathering information relevant to any particular purpose.

ICT and the Modern world

Modern information and communication technologies have created a “global village” in which people can communicate with others across the world as if they were living close doors. Owing to this, ICT is often studied in the context of how modern communication technologies affect society. Owing to the overwhelming characteristics of the ICT tools, many functions in information generation and dissemination are performed in extra ordinary fashion. As a result, the ICT has affected every aspect of human life. It has affected the way people think, work, read, learn, teach, keep record, communicate etc (Rajaraman, 2013). ICT has gone deep into people’s day to day business dealings, and a host of other aspects of human activities. Much more of ICT and the associated tools and the society are seen below on the diverse area of applications.

All modern communications such as operating telephone switching systems, coordinating satellite launching and operations etc are made possible through ICT tools. Through the modern ICT tools, special effects for movies can be generated and equipment in both radio and television broadcasts perfectly controlled. By means of Local Area Network (LAN), different computers with other ICT tools in separate departments of businesses or universities can be linked together for proper communication. Devices in different distant locations can be linked up for communication by means of a network type referred to as wide area network (WAN). WAN is a computer network that covers a broad area i.e. any network whose communications links crosses metropolitan, regional, or national boundaries. Less formally, a WAN is a network that uses routers and public communications links across countries and regions.

Owing to the growth of ICT in different aspects of human endeavours, diverse career opportunities exist in the field of Information and Communication Technology. Career opportunities are the progress and actions taken by an individual throughout a lifetime, especially those related to that person’s occupations. A career opportunity is often composed of the jobs held, titles earned and work accomplished over a long period of time, rather than just referring to one position (Osuala, 2009). While employees in some cultures and economies

stay with one job during their career, there is an increasing trend for employees to keep changing jobs severally in their careers. Virtually, all tertiary institution in Nigeria offer one or more ICT career training programmes at different levels ranging from two years to four years undergraduate and graduate training programmes. Equally there exist some non-formal training centres and trainings by some professional organizations still on ICT and its related courses. The possibilities for specialization within the computer science and thus with ICT are wide and new areas of specialization continue to evolve as advances are made in both computer Hardware and Software and more ICT facilities are discovered.

Advances in ICT follow closely the advances in Computing since it has been identified that ICT is driven on the wheels and engine of computers and Computing (computer technology) (Ugwu, 2016). Various areas of specialization exist in ICT field among which one can make choice of study. Many areas of specializations were identified by IEEE CS (2011) as detailed in the following paragraphs.

Artificial Intelligence (AI) is a complex, highly interdisciplinary area of computer science that attempts to incorporate the principles of human intelligence and reasoning into computing systems (Poole and Mackworth, 2010). Cognitive Science is another branch of computer science that is concerned with understanding, simulating, and enhancing both natural and artificial intelligence (Verela et al, 1991). Robotics is an area of computer science that applies artificial intelligence and engineering concepts to create and program mechanical devices (robots) that are able to perform a variety of tasks including some previously performed by humans (Nocks, 2007). Computer vision is a field of ICT that includes methods for acquiring, processing, analyzing, and understanding images and, in general, high-dimensional data from the real world in order to produce numerical or symbolic information. Computer graphics is yet another broad area which being related to graphic design and the visual arts, combines video and computer technologies to produce two-, three-, and four-dimensional graphic images (such as those seen in video games and computer- animated films) using computers (Behrouz, 2006) .

Other areas include Computer Engineering and Computer Information Systems. Computer Engineering is a compound field that combines the fields of computer science and electrical engineering. Computer engineering emphasizes the theory, design, and development of computers and computer-related technology including both hardware and software while Computer Information Systems which is closely related to management information systems and information science, integrates the computer applications of data processing with problem solving to improve the efficiency of organizations. Pinker & Bloom (1990) views Knowledge Engineering/Expert Systems as a subfield of artificial intelligence that produces a type of computer system called an expert system. Expert systems are computer programs designed to perform at the level of the human expert and solving problems that are beyond the capability of conventional computer systems.

Other more popular areas include Computer programming and Software Engineering. Computer programming involves the study of how to instruct computers to perform certain tasks and how to write detailed instructions that list the steps a computer must follow in order to solve a problem. Such study also involves testing computer programs for problems ("debugging" them) while Software Engineering is a compound and technical discipline based on computer science, computer technology, management, and engineering economics. It is concerned with the cost- effective development and modification of computer software components (Bebbington, 2014). Computer Network is an area of study that looks into the principles of communication between computers and with other associated devices.

According to Forouzan (2006), Computer Network otherwise called Data Network is a telecommunication network field which allows computers to exchange data along network links using either cables or wireless media.

There still exist other choice Areas of specialization like Computer Servicing Technology dealing with the study of how to install, repair, and maintain computers and related equipment. Data Processing is a choice area encompassing a wide range of fields involving the study of how data is stored in computers (for example, stacks, queues, and files) and how data can be processed to solve accounting and management problems., Management Information Systems (French, 1996). Neural Networks is a choice area dealing with the study of computer systems modeled after the biological nervous system. Neural networks are designed to imitate the workings of the human brain and are used in areas such as voice and pattern recognition and speech synthesis (Minsky and Papert, 1996).

Some other choice areas include Database Systems. According to Okeke (2014), Database system is a multi-component system that interacts with the user, other applications and the database itself to capture and manipulate data. Database Systems involves the study of systems, known as *databases* that can efficiently store, manipulate, and retrieve substantial quantities of information using some software known as data base management system. Information Science is a rapidly expanding interdisciplinary choice area that examines the nature of information itself as well as the processes by which information transfer occurs. Some other unpopular areas are Systems Analysis that deals with the analysis of existing computer systems and the design of new systems that meet the specific information needs of an organization, and Tele-communications Engineering that joins computer technology with information processing and distribution. Telecommunications engineering involves the analysis and design of all systems in a network communication (i.e. that receive, transmit, and deliver information).

According to Onah et al (2016), available statistical records show that Science Education students of Nigerian Universities who take programmes relating to ICT have their specialization interest tilted towards a few choice areas of specialization. By this indication, their choice areas of study and resultant career opportunities are narrowed down to a few options and are never diversified. There is a need for a review of choice of areas of study and specialization of students of Computer Science Education in Information and Communication Technology fields in Universities. It seems that many more Computer Science Education students choose areas like Data Processing, Computer Engineering, Computer Graphics, Computer Programming, etc while areas like Artificial Intelligence, Cognitive Science, Knowledge Engineering, etc are not considered to be of interest.

Also several factors were attributed to the biased and tilted choice of area of specialization in the ICT fields. It seems as though fund is a major cause of bias in the choice of students as pointed out by Bezed (2018) that financing and ignorance is the major setback in students taking any kind of learning that will be suitable for one's own schedules yet not as serious as health issue. In addition, some other factors were pointed by Nivre (2017) as hindrances to students' choice of area of specialization. The author included gender considerations, ignorance of nature of program and the institution offering them and the fear of coping. The previous author further noted that conservative mentality and gender issue is a major factor influencing learning is a developing society like Nigeria.

Statement of the Problem

The field of ICT has indeed opened diverse areas of specialization in Computing from which a student of ICT has very many options for specialization and career development. These varied areas of specialization have in turn opened up a variety of career opportunities among graduates who are in the computing faculty. Again as computing technology has permeated every aspect of our human endeavor, different specialist in various areas are required to meet up with the needed expertise in those fields.

In view of this, there ought to be graduates in large numbers from different areas of specialization to be able to fill the vacant positions in the different areas of specialization. In addition, there ought not to be large number of unemployable graduates from the ICT fields considering the very many career opportunities open to the ICT graduate.

Unfortunately, the students of Computer education and Computer science are biased in their choice of area of specialization. Many Nigerian ICT students have often graduated to join the labour market and also to increase the percentage of unemployed graduate, whereby there are diverse specialized IT job opportunities. These unemployed IT graduates had not got skills in those areas that are needed by employers who would rather seek the help of experts abroad than employing the graduates of Nigerian Universities. Thus, their choice of area of specialization is tilted towards only a few areas of specialization whereby many other needed areas are not considered by the students.

Therefore a gap exists between what is and what ought to be and that is what this study addressed by assessing the choices of areas of specialization of Computer Education students in fields of Information and communication technology, with their influential factors

Objectives

The study seeks to assess the choices of areas of specialization of Computer Education students in fields of Information and communication technology, with their influential factors in Nigerian Universities. Specifically, the study seeks to:

- i. determine the relative proportion of graduates in different ICT Areas in Nigerian Universities
- ii. identify the factors that influence ICT students choices of areas of specialization in Nigerian Universities.

Research Questions

1. What are the relative proportions of graduates in different ICT Areas in Nigerian Universities?
2. What are the factors that influence ICT students' choices of areas of specialization in Nigerian Universities?

Method

This study adopted descriptive survey research design to elicit response from Lecturers, Instructors and IT students in the Federal Universities in Nigeria. Abdulsalami et al (2016) refers to survey research as activities that are concerned with studying a part of population that is generally large, by selecting sample chosen from the population in order to discover the relative distribution and relationships between its variables. The design was found appropriate since data was collected from a sample of Lecturers, Instructors and Science Education students of Information and Communication Technology field.

The population of the study comprised all the public universities in Nigeria having a population size of 2280 Lecturers and Students of Information and Communication Technology field. The researcher purposively sampled all the public Universities that offer computer education in the south-eastern part of Nigeria which comprise five states namely: Abia, Anambra, Ebonyi, Enugu and Imo States. The sample size is set to 520 comprising 90 Lecturers and 430 Students. The choice of this area was based on the fact that the people share the same cultural background of hardworking with the same skills in ICT such as Computer programming and other related areas. It is expected that the review of the choice of Computer Education students in Information and Commutation Technology fields will enlighten the students in their choice of area of specialization, thereby making them know the more and the less crowded areas. This also will make them be more relevant for employment in their choice area. The researcher developed a structured questionnaire of 23 items for collecting data from the respondents. The questionnaire was validated by three experts from the Departments of Computer Science and Computer Science education. The instrument was pilot tested on 20 respondents who are not a part of the sample but have some similar features with the study area. Then, Cronbach alpha method was used to determine the internal consistency yielding a co-efficient of 0.83. The questionnaire was administered by the help of 11 research assistants. Before the instrument was administered, the research assistants were briefed on the rudiments of questionnaire administration. A total of 386 instruments were retrieved out of the 400 which signifies 96.5 per cent return rate.

Data collected from the respondents were analyzed using mean, standard deviation and ordinary percentages. The mean and percentages were used to answer the research questions. Any item with a grand mean rating of 2.50 and above was regarded as **Large** proportion, while any item with a grand mean rating less than 2.50 was regarded as **Small** proportion in research question 1. In research question 2, any item with a grand mean rating of 2.50 and above was regarded as agreed while any item with a grand mean rating less than 2.50 was regarded as disagreed.

Result

The results of the study were obtained from the research questions answered. They are hereby presented in the following Tables 1 & 2.

Research Question 1

What are the relative proportions of graduates in different ICT Areas in Nigerian Universities?

Table 1

Mean ratings of Teachers and Students on the relative proportions of graduates in different ICT Areas in Universities in South Eastern Nigerian.

S/NO	ICT Choice Areas	X _L	X _S	X _G	SD	Percentage (%)	Remark
1	Artificial Intelligence	2.09	2.30	2.14	0.73	38	Small
2.	Cognitive Science	2.16	2.02	2.13	0.83	46	Small
3.	Computer Engineering	3.45	3.34	3.43	0.57	68	Large
4.	Computer Information System	2.64	2.45	2.58	0.74	44	Small

5.	Computer Graphics	3.52	3.27	3.47	0.62	65	Large
6.	Data Processing	3.43	3.49	3.44	0.50	74	Large
7.	Database System	3.09	3.30	3.14	0.73	73	Large
8.	Computer Programming	3.16	3.02	3.13	0.83	78	Large
9.	Computer Network	3.64	3.45	3.60	0.74	75	Large
10.	Information Science	2.52	2.27	2.47	0.62	40	Small
11.	Knowledge Engineering/Expert System	2.43	2.49	2.44	0.50	36	Small
12.	Management Information System	3.09	3.30	3.14	0.73	65	Large
13.	Neural Network	3.06	3.02	2.49	0.83	26	Small
14.	Robotics	2.45	2.34	2.43	0.57	45	Small
15.	System Analysis and Design	3.64	3.45	3.60	0.74	78	Large
16.	Telecommunication Engineering	2.52	2.27	2.47	0.62	45	Small

Key: X_L =Mean of Lecturers, X_S =Mean of Students, X_G =Grand mean of Respondents, SD=Standard Deviation of Respondents

The data presented in table 1 indicates that Choices Areas like Artificial Intelligence, Cognitive Science, Computer Information system and Information Science are offered by very few ICT students. They all have low grand mean ratings of below 2.5. Other career opportunities offered by very small proportion of students are knowledge Engineering/Expert System, Neural Network, Robotics and Telecommunication Engineering. The table also presented some Career Choice Areas that students like to choose, like Computer Engineering, Computer Graphics, Data Processing, Computer Programming, Database System, Computer Network, Management Information System and System Analysis and Design all having grand mean ratings of above 2.5. Percentages were also used to analyze the data as shown in the line chart presented in Figure 1.

The percentage ratings of the respondents on the different ICT choices Areas are shown in the figure 1 below. The percentage of any choice Areas on the Chart indicates the proportion of the total respondents (386) that rates Students' Choice of that career choice Areas **HIGH**.

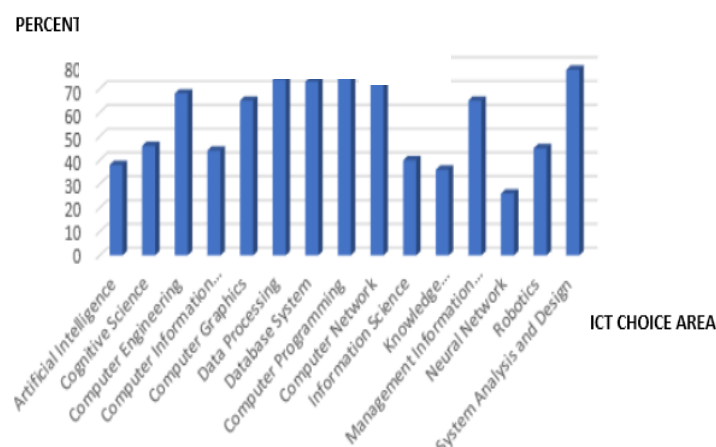


Fig 1. A column chart showing the percentage ratings of respondents on Students in different ICT choice Areas in Universities

Research Question 2

What are the factors that influence ICT students' choices of areas of specialization in Nigerian Universities?

Table 2

Mean rating of Teachers and Students are the factors that influence ICT students Choice of areas of specialization in Universities in South Eastern Nigerian

S/NO	FACTORS	X _L	X _S	X _G	SD	Remark
1	Health	2.45	2.34	2.43	0.56	Disagree
2.	Finance/Fund	3.62	3.58	3.60	0.73	Agree
3.	Gender issues	2.42	2.37	2.45	0.62	Disagree
4.	Distance/Location of Institution offering program	3.42	3.48	3.44	0.49	Agree
5.	Coping phobia	3.09	3.29	3.14	0.73	Agree
6.	Conservative mentality	2.16	2.02	2.13	0.43	Disagree
7.	Ignorance of nature & cost of programs and Institutions offering them	3.65	3.64	3.63	0.56	Agree

Data from Table 2 indicate that Fund and Ignorance of nature & cost of programs and Institutions offering them, are the greatest factors influencing students ICT choice area with grand mean ratings of 3.60 and 3.63 respectively. Also, distance (location) of institutions offering the program and Coping phobia are yet factors of influence with grand mean rating of 3.44 and 3.14. However, Health, Gender and Conservative mentality are not rated as outstanding factors influencing students' choices with mean ratings of 2.43, 2.45 and 2.13 respectively.

Discussion of Findings

The findings on Table 1 indicates that only seven out of the sixteen identified ICT choices Areas are offered by a large proportion of the students. Management Information System has a neutral mean response still indicating low choice rate among students. Eight career choices are not considered by the students. In other words, eight areas or disciplines lack students to enroll in them for skills acquisition. Such areas like Artificial Intelligence,

Cognitive Science, Computer Information system and Information Science are very important, skill demanding and needed personnel to manage. This is in line with Onah et al (2016) who noted that the students' choice is tilted to only a few ICT choice areas. Others like knowledge Engineering/Expert System, Neural Network, Robotics and Telecommunication Engineering lack students to enroll in and develop needed skills in them. This also is in line with Osuala (2009) who stated that only very few students graduate with the needed skills while a large number graduate with skills in areas that are already over crowded, thus making the graduate of this kind unemployable.

The findings on the factors that influence ICT students' choice of areas of specialization in Universities as identified in Table 2 reveal that even though Finance/Fund is one of the major factors influencing students ICT choices of areas of specialization, it is still far below the factor of Ignorance of nature & cost of programs and Institutions offering them.. A large number of students have the financial support to undertake on-line or distance learning programs but are ignorant of the nature of programs and the locations of institutions offering them and thus feel they cannot manage the distance of Institution. This is supported by Sharma (2012) who observed that a good number of the students are still apprehensive of the possibility of not coping with on-line/E learning/distance learning programs.

Conclusion

However, in view of the fact that students do not diversify their ICT choices of areas of specialization but tend to cluster in an overcrowded area, this assessment has helped to enlighten the students on areas that are very important and needed skill acquisition for students to be relevant in the world of work. Also the factors that influence students' choice were explored and student can know that not even what many think of as a barrier to making the right choice that hinders them most but ignorance. Students can now diversify and develop skills in a number of ICT choice areas of area of specialization to become relevant and gainfully employable.

Recommendations

The following recommendations based on the findings of the study were made:

1. Institutions of learning and good willed persons should organize an enlightenment programme for ICT students at the early stage of their ICT training for them to be aware of diverse lucrative and unexplored areas for relevance.
2. ICT Lecturers and Instructors should help and organize Workshops to make students understand various ways to manager influential factors and barriers to their career pursuit.

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