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## Towards Enhancing Computer Science Graduates Employability: Critical Success Factors

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### ABSTRACT

Graduate employability is worrisome to the Nigerian government and even governments of other nations. A 2013 survey revealed that graduate employability rating has been on the decline in the last twenty years. In Nigeria, reports have it that university graduates are half baked. This means that they lack what is required for them to get jobs or employ themselves. The objective of this study is to investigate and identify the key factors responsible for the poor essential skill acquisition for a particular profession that affect graduate employability, especially the part played by tertiary institution in the poor employability. The focus of the study is the employability critical factors of computer science graduates. Participants were employed and yet to be employed computer science graduates; and computer science students of two universities in Edo state, Nigeria. The survey data was gathered adopting the simple random sampling method by means of questionnaire. Descriptive statistical analyses the using SPSS package, version 20 was used to analyze the data. This analysis determined the critical factors of student employability and the part played by tertiary institutions under study. The assessment was based on respondents perception of the availability of these facilities in the cases studied.

**Keywords:** coding skills, computer laboratory, scripting, hardware, graduate employability



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## 1, INTRODUCTION AND BACKGROUND OF STUDY

University education for courses that are technical like computer science, is expected to provide the critical skills required to enhance employability. Masura et al. (2011) identified two major factors responsible for the large number of unemployed graduates and they are: oversupply of graduates in the job market, and graduates inability to meet the skills needed by the industry.

Akanmu (2011) stated that there are generally two ways to address the issue of graduate employability: one way is to ensure that graduates are competent in their chosen career, and the other is to increase the capacity to employ. The focus of this study is on the former option. According to Hapidah and Mohd (2011), the former option stated by Akanmu (2011) involves acquiring the relevant skills and knowledge required to be successful in a chosen career to be able to join the job market. Having a good degree grade should help in being shortlisted for a job interview but it does not guarantee getting employed. To be employable, a graduate need to have acquired and develop the capacity to either create work or acquire work. Reports have it that 20% of unemployed youths in Nigeria are graduates of tertiary institutions and a large number of them are unemployable. For courses like computer science that require the acquisition of special skills, which include the problem solving skill and the understanding of the essential scripting languages of the computer. This involve the design, development and analysis of software and hardware used to solve problems in a variety of business, scientific and social contexts. Computing requires and develops capabilities in solving deep, multidimensional problems requiring imagination and sensitivity to a variety of concerns. It is therefore expected that each student majoring in computer science should be able to, at the time of graduation, design, implement, test and document a significant software system. This is what a student is supposed to demonstrate as his final year project with a faculty member serving as guide and mentor. To ensure the acquisition of these very essential skills, the National Universities Commission (NUC) stated that of the three hour unit course in computer science, one hour should be spent on the practical aspect of computing. Universities are therefore supposed to provide well equipped and functional computer laboratories where students can acquire this skill of problem solving and implementing the solution by means of scripting and coding languages (Adeyemi and Osunde, 2005; Abimbola, 2013).

### **1.1 Statement of Problem**

Problems in science, engineering, health care, crime and so many other areas can be solved by computers. Using computers to solve these problems require the writing of computer codes by computer scientists who are proficient in the language of the computer which enable them communicate efficiently with the system. The courses taken by computer science students are expected to expose them to ability to acquire problem solving skills which can be applied to solving real life problems upon graduation. Many of the graduates from tertiary institutions have been found to lack the required practical skills that would enable them to be work ready at the time they graduate (Douglas and Voogt, 2010). In a survey on employability of computer science graduates by Masura et al. (2011), 53.2% graduates indicated that poor coding skills is a major factor militating against their being employed. The lack of skill in the latest software recorded second highest with 46.8% graduates agree with that problem. The employers who participated in the survey believe that computer science graduate employability can be improved if graduates acquire scripting or coding skills in modern languages and have basic experience of the fundamentals of programming which include ability to develop flowcharts and algorithms. Many graduates are only good in theory but lack practical skills (Salleh et al., 2010; Wu et al., 2007; Yang et al., 2006). This study is focused on how higher education institutions can produce graduates that are employable for the available jobs created. The study therefore identified the key factors affect graduate employability and the part played by Nigeria's higher education institutions.

### **1.2 Objective of Study**

There are a number of factors which influence students level of computer students analytical/problem solving skill and scripting proficiency. These factors are used in the study to get respondents perception of the level of importance, availability and usage in their institutions. The objective of this study is to determine the factors that are critical to enhancing computer science graduate employability as perceived by computer science graduates and student; and the actual state of the tertiary institutions that prepare these graduates for the job market and how they contribute to the unemployability situation. The study also determined the ability of students to code in current scripting languages and analytical/problem solving skills acquired.

## 2. MATERIALS AND METHOD

The study conducted survey to collect data from both graduates and students of two universities in Edo state, Nigeria. The graduates include both employed and yet-to-be employed computer science graduates. The data collected covered the state of their computer science laboratory, the quality of practical programming skills they were able to acquire. The employed computer science graduates also provided information on what they perceived contributed to enhancing their being employed. Students and graduated of two universities participated in the survey. They are: University of Benin (a federal government owned tertiary institution) and Benson Idahosa University (a private owned tertiary institution).

The students who participated in the survey were 300 level and 400 level Computer science major students. Data for the study was gathered by means of questionnaires using simple random sampling method. A total of 230 questionnaires were distributed and 204 responses were found to be properly completed and usable. Fifteen of the respondents were employed, while ten were not-yet-employed computer science graduates. The collected data was coded and analysed by means of SPSS package, version 20. The questions covered: the lab environment; software and hardware availability for the task at hand; quality of support provided by lab personnel; adequacy of practical time allocated to each student; activities outside school curriculum that enhanced or could enhance employability. The questionnaire was in a Likert scale format where each question is rated on a scale of 1 to 5 on perceived importance of each item and availability/level of satisfaction of item in the case institution. A score of 5 indicate "Extremely important" or "Extremely satisfied". A score of 1 indicate "Not important" or "Not satisfied". The study measured the importance as well as level of satisfaction of each item.

The questions were grouped into five categories of:

- a. State of computer laboratory environment;
- b. Modern software availability
- c. Hardware availability
- d. Quality of support provided by lab personnel
- e. Adequacy of practical time allocated for practical

Interviews were conducted to understand the extra effort made by employed computer science graduate to enhance their employability. In addition, interviews were used to solicit information from the employed graduates on the strategies they used to improve their employability.

### 3. DATA ANALYSIS AND RESULTS

Based on the analysis of the data gathered as shown in Table 1, a total of 110 students and graduates from the two institutions - the University of Benin and the Benin Idahosa University participated in the study. Also 15 currently employed graduates and 10 unemployed graduates were also respondents in the survey. The males that participated were 126 forming 61.8% while females were 78 (38.2%). The age of participants range from 18years to 29 years for both students and graduates. Table 1 shows the demographic detail of participants in the survey.

**Table 1: Socio-demographic characteristics of respondents**

	<b>Variable</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Institution</b>	Public owned	62	56.4
	Private owned	48	43.6
	Total	110	100.0
<b>Gender</b>	Male	63	57.3
	Female	47	42.7
	Total	110	100.0
<b>Age (years)</b>	18-20	22	20.0
	21 and above	88	80.0
	Total	110	100.0
<b>Current status of respondent</b>	Students	85	77.2
	Unemployed	10	09.1
	Employed	15	13.6
	Total	110	100

This study was conducted in two representative schools of public and private universities in Nigeria. From table 1, the public university had a higher representation in the study sample with 56.4% while the private accounted for 43.6%. In addition, gender distributions of the respondents reported male having 57.3% and female 42.7% respectively. Since the study population was predominantly among students of higher level, and graduates (employed and unemployed), it was not surprising that the proportion of students aged above 21 years reported 80.4%, while only 20% was below 21 years.

**Table 2: Perception of importance of the attributes that influence programming skills acquisition**

Attributes	Importance					Total (%)
	EI (%)	VI (%)	MI (%)	I (%)	NI (%)	
<b>Environment</b>						
Layout of chairs, desk and computers	54(49.1)	22(20.0)	23(20.9)	11(10.0)	0(0.0)	110(100.0)
Laboratory cleanliness	55(50.0)	25(22.7)	28(25.5)	2(1.8)	0(0.0)	110(100.0)
Conducive temperature of lab for practicals	74(67.3)	24(21.8)	7(6.4)	4(3.6)	1(0.9)	110(100.0)
Good lighting	59(53.6)	38(34.5)	10(9.1)	2(1.8)	1(0.9)	110(100.0)
Comfort while in the lab for a long period	64(58.2)	33(30.0)	9(8.2)	2(1.8)	2(1.8)	110(100.0)
Clear direction to the computer lab	43(39.1)	23(20.9)	18(16.4)	17(15.5)	9(8.2)	110(100.0)
<b>Software availability</b>						
Availability of compilers to run program	72(65.5)	18(16.4)	14(12.7)	6(5.5)	0(0.0)	110(100.0)
Currency of software version	64(58.2)	22(20.0)	15(13.6)	8(7.3)	1(0.9)	110(100.0)
Computer speed to process information/data (O/S)	61(55.5)	28(25.5)	14(12.7)	5(4.5)	2(1.8)	110(100.0)
Speed of internet access	65(59.1)	28(25.5)	8(7.3)	4(3.6)	5(4.5)	110(100.0)
<b>Hardware Adequacy/Availability</b>						
Sufficient computers for students in a practical session	76(69.1)	13(11.8)	13(11.8)	5(4.5)	3(2.7)	110(100.0)
Networked computer system	61(55.5)	27(24.5)	14(12.7)	3(2.7)	5(4.5)	110(100.0)
Internet access availability	71(64.5)	23(20.9)	9(8.2)	4(3.6)	3(2.7)	110(100.0)
comfortable work space	65(59.1)	22(20.0)	17(15.5)	2(1.8)	4(3.6)	110(100.0)
Sufficient seats	73(66.4)	18(16.4)	12(10.9)	5(4.5)	2(1.8)	110(100.0)
Computer hardware in good working condition	75(68.2)	14(12.7)	15(13.6)	4(3.6)	2(1.8)	110(100.0)
LCD projectors screen display in good condition	60(54.5)	28(25.5)	9(8.2)	11(10.0)	2(1.8)	110(100.0)
<b>Service quality of laboratory personnel</b>						
Adequate laboratory personnel placed at each laboratory	49(44.5)	28(25.5)	28(25.5)	3(2.7)	2(1.8)	110(100.0)
Laboratory staff are accessible	45(40.9)	40(36.4)	18(16.4)	2(1.8)	5(4.5)	110(100.0)
Laboratory staff are knowledgeable to provide needed support	62(56.4)	30(27.3)	14(12.7)	2(1.8)	2(1.8)	110(100.0)
Laboratory staff are ready to help when needed	59(53.6)	30(27.3)	17(15.5)	1(0.9)	3(2.7)	100(100.0)
Laboratory staff provide assistance during practical	58(52.7)	26(23.6)	12(10.9)	3(2.7)	11(10.0)	110(100.0)
User safety while in the laboratory	55(50.0)	27(24.5)	20(18.2)	6(5.5)	2(1.8)	110(100.0)
Security of user personal belongings during practical	52(47.3)	26(23.6)	18(16.4)	6(5.5)	8(7.3)	110(100.0)
Emergency facilities re available (first aid box & fire extinguisher)	48(43.6)	26(23.6)	26(23.6)	8(7.3)	2(1.8)	110(100.0)
<b>Adequacy of computer practical time allocated</b>						
Power supply is available 24 hours	72(65.5)	14(12.7)	19(17.3)	4(3.6)	1(0.9)	110(100.0)
Computer lab operation hours in accordance with the needs of students	69(62.7)	16(14.5)	13(11.8)	5(4.5)	7(6.4)	100(100.0)
Lab is opened 24 hours daily	69(62.7)	12(10.9)	12(10.9)	12(10.9)	5(4.5)	110(100.0)
Computer is available for use at any time	68(61.8)	16(14.5)	8(7.3)	11(10.0)	7(6.4)	110(100.0)

**Table 3: Perception of the current situation of the attributes that influence programming skills acquisition**

Attributes	Satisfaction					Total (%)
	E (%)	VG (%)	M (%)	P (%)	VB (%)	
<b>Environment</b>						
Layout of chairs, desk and computers	13(11.8)	22(20.0)	58(52.7)	10(9.1)	7(6.4)	110(100.0)
Laboratory cleanliness	12(10.9)	29(26.4)	40(36.4)	23(20.9)	6(5.5)	110(100.0)
Conducive temperature of lab for practicals	16(14.5)	14(12.7)	34(30.9)	26(23.6)	20(18.2)	110(100.0)
Good lighting	12(10.9)	35(31.8)	39(35.5)	17(15.5)	7(6.4)	110(100.0)
Comfort while in the lab for a long period	13(11.8)	23(20.9)	30(27.3)	27(24.5)	17(15.5)	110(100.0)
Clear direction to the computer lab	11(10.0)	8(7.3)	42(38.2)	24(21.8)	25(22.7)	110(100.0)
<b>Software</b>						
Availability of compilers to run program	10(9.1)	17(15.5)	36(32.7)	19(17.3)	28(25.5)	110(100.0)
Currency of software version	6(5.5)	22(20.0)	27(24.5)	28(25.5)	27(24.5)	110(100.0)
Computer speed to process information/data (O/S)	10(9.1)	28(25.5)	37(33.6)	18(16.4)	17(15.5)	110(100.0)
Speed of internet access	6(5.5)	23(20.9)	24(21.8)	21(19.1)	36(32.7)	110(100.0)
<b>Hardware Adequacy/Availability</b>						
Sufficient computers for students in a practical session	8(7.3)	14(12.7)	27(24.5)	29(26.4)	32(29.1)	110(100.0)
Networked computer system	10(9.1)	18(16.4)	19(17.3)	25(22.7)	38(34.5)	110(100.0)
Internet access availability	9(8.2)	18(16.4)	24(21.8)	15(13.6)	44(40.0)	110(100.0)
comfortable work space	10(9.1)	18(16.4)	36(32.7)	19(17.3)	27(24.5)	110(100.0)
Sufficient seats	10(9.1)	25(22.7)	29(26.4)	15(13.6)	31(28.2)	110(100.0)
Computer hardware in good working condition	13(11.8)	17(15.5)	37(33.6)	23(20.9)	20(18.2)	110(100.0)
LCD projectors screen display in good condition	8(7.3)	15(13.6)	25(22.7)	21(19.1)	41(37.3)	110(100.0)
<b>Service quality of laboratory personnel</b>						
Adequate laboratory personnel placed at each laboratory	9(8.2)	21(19.1)	35(31.8)	14(12.7)	31(28.2)	110(100.0)
Laboratory staff are accessible	6(5.5)	23(20.9)	39(35.5)	21(19.1)	21(19.1)	110(100.0)
Laboratory staff are knowledgeable to provide needed support	12(10.9)	17(15.5)	33(30.0)	32(29.1)	16(14.5)	110(100.0)
Laboratory staff are ready to help when needed	11(10.0)	14(12.7)	34(30.9)	30(27.3)	21(19.1)	110(100.0)
Laboratory staff provide assistance during practical	12(10.9)	14(12.7)	44(40.0)	13(11.8)	27(24.5)	110(100.0)
User safety while in the laboratory	11(10.0)	22(20.0)	38(34.5)	20(18.2)	19(17.3)	110(100.0)
Security of user personal belongings during practical	9(8.2)	15(13.6)	23(20.9)	32(29.1)	31(28.2)	110(100.0)
Emergency facilities re available (first aid box & fire extinguisher)	9(8.2)	12(10.9)	21(19.1)	20(18.2)	48(43.6)	110(100.0)
<b>Adequacy of practical time allocated</b>						
Power supply is available 24 hours	11(10.0)	21(19.1)	16(14.5)	25(22.7)	37(33.6)	110(100.0)
Computer lab operation hours in accordance with the needs of students	10(9.1)	10(9.1)	19(17.3)	22(20.0)	49(44.5)	110(100.0)
Lab is opened 24 hours daily	8(7.3)	9(8.2)	19(17.3)	25(22.7)	49(44.5)	100(100.0)
Computer is available for use at any time	8(7.3)	5(4.5)	18(16.4)	24(21.8)	55(50.0)	110(100.0)

#### 4. DISCUSSION

A large proportion of respondents from both institutions surveyed considered factors such as adequate software/compiler availability, hardware adequacy/availability, service quality of laboratory personnel and adequacy of practical time key to improved programming skills acquisition. Table 4 shows the factors considered extremely important that influence programming skills acquisition with 60% and above rating. These factors are key to improved programming skills acquisition.

**Table 4: Extremely important factors that influence programming skills acquisition**

S/N	Attributes	Extremely important	Total
		Factors: Num. of respondent (%)	Respondents Num (%)
1	Conducive temperature of lab during practicals	74(67.3)	110(100.0)
2	Availability of compilers to run program	72(65.5)	110(100.0)
3	Sufficient computers for students in a practical session	76(69.1)	110(100.0)
4	Internet access availability	71(64.5)	110(100.0)
5	Sufficient seats	73(66.4)	
6	Computer hardware in good working condition	75(68.2)	110(100.0)
7	Power supply is available 24 hours	72(65.5)	110(100.0)
8	Computer lab operation hours in accordance with the needs of students	69(62.7)	110(100.0)
9	Lab is opened 24 hours daily	69(62.7)	100(100.0)
10	Computer is available for use at any time	68(61.8)	110(100.0)

Table 5 shows the satisfaction rating of these factors identified as extremely by respondents. The table shows that for these factors perceived by respondents to be extremely important in influencing programming skill acquisition that will aid employability, the satisfaction of the respondents is generally low. reverse was the case as most of the respondents in both institutions were either very badly satisfied or poorly satisfied. This responses were recurrent for all attributes including, Environment, Software availability, Hardware adequacy. This responses were recurrent for all attributes including, Environment, Software availability, Hardware adequacy, Service quality of lab personnel and adequacy of practical time allocated.

**Table 5: Perception of the current situation of the attributes that influence programming skills acquisition**

S/N	Attributes	Satisfaction Rating		
		ES (%)	VS (%)	Total Respondents
1	Conducive temperature of lab for practicals	16(14.5)	14(12.7)	110(100.0)
2	Availability of compilers to run program	10 (9.1)	17(15.5)	110(100.0)
3	Sufficient computers for students in a practical session	8 (7.3)	14(12.7)	110(100.0)
4	Internet access availability	9(8.2)	18(16.4)	110(100.0)
5	Sufficient seats	10(9.1)	25(22.7)	110(100.0)
6	Computer hardware in good working condition	13(11.8)	17(15.5)	110(100.0)
7	Power supply is available 24 hours	11(10.0)	21(19.1)	110(100.0)
8	Computer lab operation hours in accordance with the needs of students	10(9.1)	10(9.1)	110(100.0)
9	Lab is opened 24 hours daily	8(7.3)	9(8.2)	100(100.0)
10	Computer is available for use at any time	8(7.3)	5(4.5)	110(100.0)

Key: ES - Extremely satisfied; VS - Very satisfied

The result of the analysis indicate that university students are generally not satisfied with the factor majority (60% and above) of the students consider as extremely important factors to enhancing their skill acquisition. Table 5 shows a very low satisfaction rating for all the factors. employability. They perceived that the computers in the lab are not enough for the number of students in the department. This discourage them from going to the lab as they may not find computers to use. A total of 75% are not satisfied with the available computers in the lab.

The interview held with the 15 employed graduates on where they were asked what extra effort on their part they perceived contributed to their being employed: all stated that they made extra effort to learn modern programming languages not taught in their institutions.

All mentioned PHP, JAVA and SQL. These languages are not taught in the institutions studied. C and C++ is among the modern languages and they are taught in the institutions but the students complain about not being able to program in these vvery important languages due to insufficient time to practice in the lab. The suggestion by majority (84%) of them is to have adequate practical time and power to light up the systems as there is no power supply even during the little time they are allocated practical time.

## **5. CONCLUSION**

Good grades are one of the prerequisites to get invited for job interviews, but not enough to get employed. The need for problem solving and scripting skill acquisition is very essential if graduated of computer science wish to find jobs in their field. The knowledge gained by computer science graduates in school seem not to be adequate enough to employed yet a number of them are first class graduates. This an indication that their high grade is based more on theoretical knowledge without much consideration by the institution to the practical skills acquired. The corporate world need graduates that put theory into practice, a skill that many graduates lack. Employment requirements for graduates in computer science is constantly changing, therefore higher institutions need to keep abreast of these changes and effect changes in the curriculum of their institutions to make it easy for the graduates to easily enter the job market. The academia need to collaborate with the computer industry so that the skills that the computer industry require of Nigerian computer science graduates can be incorporated into their curriculum make them ready for the job market upon graduation. To acquire more practice skill, universities need to overhaul the computer science curriculum and put more emphasis on acquiring practical skills than theory. More time should be created in the timetable for students to go to the lab for practicals. A whole semester could be dedicated to practical alone to enable them gain proficiency as lectures tend to interfere with their practical periods. To overcome the skill deficiency, young graduates can work in information technology units of their choice as volunteer . There is the need for increased funding to enable the institutions acquire the required hardware and software facilities for students to aquire the required skills. For a computer science graduate, the ability to solve problems and improve solutions by writing workable computer scripts or codes is a very critical skill they must acquire in order to be ready for the job market and be employable in their field of study.

## **6. SUGGESTIONS FOR FURTHER RESEARCH**

For more study in this area, study could be carried out in other factor that influence Nigerian graduate employability outside the provisions of higher institutions.

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