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On The Comparison of Artificial Neural Network (ANN) and Multinomial Logistic Regression (MLR)

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Abstract

This work presented the results of an experimental comparison of two models: Multinomial Logistic Regression (MLR) and Artificial Neural Network (ANN) for classifying students based on their academic performance. The predictive accuracy for each model was measured by their average Classification Correct Rate (CCR). The Average Classification Correct Rate for the Artificial Neural Network was higher than Multinomial Logistic Regression.

Keywords: Multinomial Logistic Regression, Artificial Neural Network, Correct classification rate.

Introduction

Prediction of student academic performance is necessary in educational institutions, especially when admission officers are considering applications, accurate predictions help them to distinguish between suitable and unsuitable candidates for an academic program and identify candidates who would likely do well in the university. The failure to perform an accurate admission decision may result in an unsuitable student being admitted to the university. The quality of an educational institution is mainly reflected in its research and training. Hence, the quality of admitted candidates affects the quality level of institutions.

In addition, the results obtained from the prediction of academic performance may be also used for classifying students, which enables educational instructors to offer them additional support such as customized assistance and tutoring resources. The results of prediction can also be used by instructors to specify the most suitable teaching actions for each group of students and provide them with further assistance tailored to their needs. Accurate prediction of student achievement is one way to enhance the quality level and provide better educational services.

However, neural network model is originated from the mathematical neurobiology and the commonest practical models have been used in a wide variety of applications where statistical methods are traditionally used. Many literatures have pointed out the potentials of neural networks for prediction and classification problems. This can be due to the fact that these networks have attempts to model the capabilities of human brain. Neural network and traditional methods have been applied as a comparative model performance measure in solving different real life problems ranging from management sciences, business schools, and others [10], [12], [14], [17].

Moreover, this study aims at comparisons of the model performance of neural network and statistical technique (Multinomial Logistic Regression) in view of other objectives, using secondary data from the department of pharmaceutical science, University of Ibadan, to predict the academic performance of students at their penultimate year. Penultmate year is considered in this work because it acts as a key element in selecting the appropriate possible graduates. Over the past several years, there has been an increase in the number of students that either repeat class or be demoted at their

penultimate year and hence it is important to adequately and carefully study those possible factors that might likely contribute to the increased rate of the failure. These factors are enumerated in the methodology.

In view of this, many authors have worked on the academic performance prediction in educational institutions, especially that of the higher institutions of learning. [1] Used bivariate regression models to examine relationships between undergraduate GPA and a number of factors and found out that undergraduate GPA and PUTME were significant variables in predicting academic success. [2] showed that academic gain and learning performance in the University is affected by numerous factors: gender, age, etc. [16] compared the results of Artificial Neural Network model to that of a logistic regression analysis for modeling student enrollment decision making. It was shown that the improvement gained by using artificial neural network is significantly higher than that of the other model.

In this study, a student is classified in one category if he or she is promoted to final year and to the other groups if he or she is not promoted or demoted. The criterion for the promotion is the student's penultimate year GPA. Promoted category has GPA of 3.5 and above in 5-point scale while repeated class has penultimate year GPA between 2.5 to 3.4 and the demoted class have GPA below 2.5.

Artificial Neural Network (ANN):

Artificial neural network (ANN) commonly called neural network is a system composed of many single processing elements operating in parallel, whose function is determined by network structure, connection strength and the processing performed at computing elements or nodes [6]. Artificial Neural Network is considered nonlinear statistical data modeling tools where the complex relationships between inputs and outputs are modeled. It has three layers that are interconnected. The first layer which consist of the input layer. The intermediate layer called the hidden units (layer) or summing junction and the third layer which is the output layer. The hidden neuron receives data from the input neuron, works on it with the help of the transfer function and sends it to the output layer as the response.

The model proposed by [3] was used. The model is given as:

$$y = f(X, w) = \alpha X + \sum_{h=1}^{H} \beta_h \, g\left(\sum_{i=0}^{I} \gamma_{hi} x_i\right) \quad (1)$$

where the transfer function, $g = (1 + e^{-x})^{-1}$

$$X=(x_0 = 0,\ x_1, \ldots, x_I)\ ; \quad w = (\alpha, \beta, \gamma)$$

y = the output variable; x = the input variables;
α=the weight of the input unit(s); β= the weight of the hidden unit(s).
γ= the weight of the output unit(s)

Multinomial Logistic Regression:

Multinomial Logistic regression is a classification method that generalizes logistic regression to multi-class problems. (i.e with more than two possible discrete outcomes), [8]. Moreover, multinomial logistic regression is also a linear regression analysis to conduct when the dependent variables are categorical with more than two levels. Thus, it is an extension of logistic regression, which analyses dichotomous (binary) dependents. However, Multinomial Logistic Regression does not make any serious assumption about the distribution of the predictor variables. Considering a collection of k independent variables which will be denoted by a row vector $x = (x_1, x_2, \ldots, x_k)$. Then the log of the Multinomial Logistic Regression model is given in equation 1 below in form of linear function.

$$log(p_{ij} / p_{i1}) = \beta_{0j} + \beta_{1j} x_{i1} + \beta_{2j} x_{i2} + \cdots + \beta_{pj} x_{ip} \quad (2)$$

where i is the i^{th} individual and j is the j^{th} category of the dependent variables. It is necessary to make one of the categories the baseline category (i=1). From equation 1, β_{0j}= the intercept.

β_{ij}'s, are the coefficients associated with the explanatory variables $x_{i1}, x_{i2}, \ldots, x_{ip}$

Materials and Methods

Through extensive review of literatures, a number of pre-admission and socio-economic factors which influence student's academic

performance were identified. Some of these factors can be seen in [11], [7], [4] and others.

The data used in this work are secondary data and were collected from faculty of pharmaceutical Sciences, University of Ibadan, Oyo state. The data were the extraction of the student's pre-admission and some socio-economic factors contained in the student's file in their respective departments. Also, the student's penultimate year GPA was collected from the departmental examination officers. A total sample of 150 student's files were drawn using simple random sampling, after which 120 were considered in this study. Files with incomplete information were ignored. Those factors which were extracted from the student's file in the departments are shown in the appendix.

The output variable is the student's performances, while those considered pre-admission and socio-economic factors are considered the input variables. The output variable will be multi-categorized. Students with penultimate year GPA above 3.5 in 5-point scale were promoted to final year (possible graduants); those students with GPA below 2.5 were demoted to immediate lower class, while those students between 2.5 to 3.4 repeated a class. This restriction is to enable the students graduate well. The penultimate year is a year to the final year.

A multi-layer perception algorithm which was trained with back propagation with a logistic transfer function was programmed. This programmed model was compared with Multinomial Logistic Regression model based on some of the existing similarities between the models. A one unit neuron was used in the hidden layer in other to maintain the similarities. Mean Correct Classification Rate (CCR) was used as a measure of comparison.

Artificial Neural Network Model Architecture:

In this section the Neural Network technique is applied to the data. A three-layer feed forward network was considered in this analysis. The input layer contained eighteen (18) neurons. Based upon recommendations from [5] and [9] that one-hidden-layer network is sufficient to model any complex system, the designed network model will have only one hidden layer. As to the issue of determining the optimal number of hidden nodes it is a crucial yet complicated one [13]. The best way to determine the number of middle layers and their sizes is trial-and-error. This can also be helpful in revealing the underlining relationships between variables. The rule of thumb is to start with the smallest size possible for a given problem to allow for generalization, then to increase the size of the middle layer(s), until the optimal results are achieved [18]. In this work, one hidden neuron in the hidden layer was used, as the network performance was best at this number and the output layer contained three (3) neurons, namely the classes of student, the promoted students, the repeated students and the demoted students. The back-propagation learning algorithm was used for training the network. The logistic activation function was used at the hidden layer and the identity activation function was used at the output layer. 60% of the data were used for training, 30% for testing and 10% for validation in this research. This analysis resulted in a Mean Correct Classification Rate for the test data. Each network was run for 1000 epochs.

Statistical Approach:

MATLAB was used as a tool to assist in the analysis by importing a variety of factors specific to the independent variables. These factors were; Sex, PUTME score, Penultimate year GPA, etc as seen in the appendix. The analysis included all independent variables into the equation by using stepwise regression analysis. The conducted stepwise analysis is a way to know the order of contribution of those factors to the model.

Results

Result of Multinomial Logistic Regression (MLR)

Independent variables or predictors were introduced into the model by a stepwise regression approach to determine the significant ordering of the variables to the model fit. It was observed that the order of the contribution is as follow: GPA, father's education, mother's education, O' level English, type of secondary school attended, parental marital status, location of secondary school attended, etc. These arrangements of the variable order of

importance to the model were evaluated using variable's individual normalized important value. However, considering the significance of the variables to the model, it can be concluded that the Student's rate of Performance or promotion outcomes in the aforementioned faculty is mainly determined by Student's GPA and others as follow: Father's Education, Mother's Education, O' Level English, etc.

Table 1: Classification Table for Multinomial Logistic Regression

Performances	**Promoted**	**Repeated**	**Demoted**
Promoted	60 (82.19%)	11 (15.07%)	2 (2.74%)
Repeated	5(22.72%)	15(68.18%)	2(9.09%)
Demoted	3(12.00%)	0(0.00%)	22(88.00%)
Mean Correct Classification Rate (CCR) = 80.83%			

Table1 above shows the percentage of accuracy in prediction and classification. The twelve independent variables in the predicted equation predicted classification membership correctly with an average of (80.83%). It can equally be depicted from the above Table that the model was able to predict correctly 60 students out of 73 students who were promoted. 15 students out of 22 students who were repeated were correctly predicted and also predicted correctly 22 students out of 25 students who were demoted. The diagonal entries show the correctly classification and the Mean Correct Classification Rate was calculated by taking the ratio of percentage of the correctly classifies to the total entries. It was represented by CCR and was estimated at 80.83%.

Result of Artificial Neural Network (ANN)

The appropriate model was developed with a back propagation algorithm, having three layers with a feed forward structure. A logistic transfer function was used in the hidden layer while an identity function was used in the output layer. The input layer had eighteen (18) neurons. The hidden layer had only one (1) unit and ten (10) neurons while the output layer had three (3) neurons. The network was partitioned using 60% for training, 30% for testing and 10% for validation. One thousand (1000) epochs was equally used in the model.

Table2: Classification Table for Artificial Neural Network.

Performances	**Promoted**	**Repeated**	**Demoted**
Promoted	71 (97.26%)	1 (1.37%)	1 (1.37%)
Repeated	1 (4.55%)	21(95.45%)	0(0.00%)
Demoted	1 (4.00%)	1(4.00%)	23(92.00%)
Mean Correct Classification Rate (CCR) = 95.83%			

Table2 above shows the percentage of accuracy in prediction by Artificial Neural Network. The prediction Table above predicted Classification group membership correctly with an average of (95.83%). It can be vividly seen from the above Table 2 that the model was able to predict correctly 71 students out of 73 students who were promoted. Twemtu-pme (21) students were also predicted out of twenty-two (22) students who repeated class correctly and also predicted correctly twenty-three (23) students out of twenty-five (25) students who were demoted. The diagonal entries show the correct classification and the Mean Correct Classification Rate was calculated by taking the ratio of percentage of the correctly classified to the total entries. It was represented by CCR and was estimated at 95.83%.

Comparison of Multinomial Logistic Regression and Artificial Neural Network

To compare the performance of the models: Artificial Neural Network and Multinomial Logistic Regression, the Mean or Average Correct Classification Rate (CCR) was the criterion used. The predictive accuracies for Multinomial Logistic Regression and Artificial Neural Network were shown in Tables 1 and 2, respectively. Moreover, it can be clearly seen that Artificial Neural Network model predictive accuracy is higher than that of Multinomial Logistic Regression; hence Artificial Neural Network performed better than the other models in predicting students' academic performance classification, judging from their Mean Correct Classification Rate (%).

Table 3: Table of model comparison

Model Comparison	Mean Correct Classification Rate CCR (%)
Multinomial Logistic Regression (MLR)	CCR_{MLR} = **80.83%**
Artificial Neural Network (ANN)	CCR_{ANN} = **95.83%**

Table 3 above shows the classification results for the Multinomial Logistic Regression approach and the Artificial Neural Network model as used in this research work. The Mean Correct Classification Rate for the Artificial Neural Network was higher than that of the Multinomial Logistic Regression. The best efficiency was 95.83% and 80.83% respectively.

Conclusion

The purpose of this work was to compare the prediction classification efficiency of two models in predicting student's academic performance rates. The result of the two compared models showed that Artificial Neural Network outperformed Multinomial Logistic Regression in terms of the Mean Correct Classification Rate which was (95.83%) against (80.83%).

However, some of the variables which have the most significant impact or contribution to the model fit were equally identified in this study. The order of the significance of the variables to the model has been listed earlier and these ordering concur with the results of research by [11], [7] and [15].

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APPENDIX A

Those factors that were considered in this research work are listed in the table below;

Appendix: Table containing both response and predictor variables considered in this work and the appropriate code

No.	Variables descriptions	Data type	Location	Code
1	Gender	Categorical	Input	1=male, 0=female
2	Parents Marital Status	Categorical	Input	0= Married and living together 1= Father die 2= Mother die 3= Mother & father die 4= Married but living apart because of occupation 5= Married but living apart because other reasons 6 = Divorced
3	Father's Education	Categorical	Input	0 = Uneducated 1= Primary school 2 = Secondary school 3 = Degree 4 = Vocational 5 = Diploma 6 = Masters degree 7= Doctors degree
4	Mother's Education	Categorical	Input	0 = Uneducated 1 = Primary school 2 = Secondary school 3 = Degree 4 = Vocational 5 = Diploma 6 = Masters degree 7 = Doctors degree
5	Fathers Occupation	Categorical	Input	0 = Government service(govt. officer) 1 = Government service(temporary) 2 = State enterprise employee 3 = Company employee 4 = Ownership 5 = Farmer, fisher

				6 = Freelance 7 = Unemployed 8 = Others
6	Mother's Occupation	Categorical	Input	0 = Government service(govt. officer) 1 = Government service(temporary) 2 = State enterprise employee 3 = Company employee 4 = Ownership 5 = Farmer, fisher 6 = Freelance 7 = Unemployed 8 = Others
7	O' Level Results	Categorical	Input	English: 0 = A1-A2 1 = A3-C4 2 = C5-C6
				Mathematics: 0 = A1-A2 1 = A3-C4 2 = C5-C6
				Chemistry: 0 = A1-A2 1 = A3-C4 2 = C5-C6
				Physics: 0 = A1-A2 1 = A3-C4 2 = C5-C6
				Biology: 0 = A1-A2 1 = A3-C4 2 = C5-C6
8	Age at Entry	Categorical	Input	0 = Below 23 years 1 = 23 years and above
9	Time delay before admission	Categorical	Input	0=1year 1=2years 2=3years and above
10	Type Of Secondary School Attended	Categorical	Input	0= Private 1= State 2= Federal
11	Location of Secondary School attended	Categorical	Input	0=Urban 1= Rural
12	Post UTME	Numerical	Input	True value
13	Physically impaired	Categorical	Input	0 = Disable 2 = Not disable
14	Performance outcome	Categorical	output	1 = Promoted students 2 = Repeating students 3 = Demoted students

.

Prison Inmate Information System: The Case of Yola Central Pri[1]son, Nigeria

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Abstract

The development in technology has brought about using computer system to solve practical problems in various fields of work. This advancement leads to automation of system processes. This paper studied the manual processing of Prisoners Information in Yola Prison of Adamawa state, with a view to developing an "Automated Prison Information System". This system is expected tol provide an easier way of computing prisoner's information, reliable storage of data, easy access and retrieval of information to authorized users, and also to provide high security for prisoners' record. The software has features for adequate registration of prisoners both on the day of jail and discharge. In addition, there is provision to search and view reports of both current and discharged prisoners. In comparison to the current system, the prison inmate information system is more secure, flexible, provides more user feedback, reduces the workload, prevents erroneous data and provides more functionality.

Keywords: *Automation, Discharge, Inmate, Information, Prison, Systems,*

1.0 Introduction

Computer today is one of the most important tools people use. It has helped a lot in compiling data which used to be in hard records. One of the uses or benefit of computer is that it enables storage and retrieval of information so quickly that it has decreased information and work complexity. The increase in the speed of work has helped us to do many things with fewer resources. In the past lots of manpower was used in keeping the records safe. It also helps us to work with machines which have the ability to produce the best quality of products with maximum speed and efficiency. In today's world it is necessary to cater for such heavy permissions. Things are made at the higher pace with best quality.

A Prison, penitentiary, or correctional facility is a place in which individuals are physically confined or interned and usually deprived of a range of personal freedomctr. Prisons are conventionally institutions, which form part of the criminal justice system of a country, such that imprisonment or incarceration is a legal penalty that may be imposed by the state for the commission of a crime. In popular parlance of many countries, the term Jail (goal) is considered synonymous with Prison.

Prison tended to be a place where people were held before their trial or while sweating punishment. It was very rarely used as a punishment in its own right. Men and women, boys and girls, debtors and murderers were all held together in local level and convicted criminals serving a term of years or less. Evidence suggests that the Prisons of this period were badly maintained and often controlled by negligent Prison warders. Records of Prisoners in most Nigerian Prison are kept in manual files. This project targets the development ofu Prison information system which will handle processes involved in keeping records for Prisoners such as those under awaiting trials, warrant return date and transfer from other Prisons etc. Sanction for criminal behaviour tended to be

public event which were designed to correct the person and deteer others. These included the ducking stools, the pillory, whipping, branding and the stocks [15].

Background of the Study

The Nigerian Prison Service, Yola Provincial Prison was established in the year 1914 which derived its operational powers from CAP 366 laws of the Federal Republic of Nigeria 1990 to perform the following functions:

- Take into lawful custody all those certified to be so kept by courts of competent jurisdiction.
- Produce suspects in court as and when due.
- Identify the causes of their anti-social dispositions.
- Set in motion mechanisms for their treatment and training for eventual reintegration into society as normal law abiding citizens on discharge.
- Administer Prisons farms and industries for this purpose and in the process generate revenue for the Government.

The Prison service in Nigeria is a Federal phenomenon. That is to say, the Prison is exclusively a Federal Government concern, which means that no state for now has the power in law to operate or maintain Prisons. According to the official website of the Nigerian Prison Service, the following Prisons and Prison related Institutions are spread across the length of Nigeria

i) A total of one hundred and forty five (145) Convict Prisons.
ii) Eighty three (83) Satellite Prison Camps.
iii) Twelve (12) Major Farm Centers
iv) Nine (9) Subsidiary Farms
v) Nine (9) Cottage Industries
vi) One Hundred and Twenty-Four (124) Market Gardens
vii) Three (3) Borstal Institution
viii) One (1) Open Prison Camp
ix) One (1) Staff College, and
x) Four (4) Training School

The conventional Convict Prisons are for the remand of both the convicted and awaiting trial inmates. There are two major types of convict Prisons operational in Nigeria today. These are the maximum and the medium security Prisons. The maximum security Prisons take into custody all classes of Prisoners including condemned convicts; lifers, long term Prisoners etc. Even though, we have an unofficial classification of these maximum security Prisons in terms of heightened security. This explains why a high risk Prisoner could be sent to one maximum security Prison as against another. The medium security Prison on the other hand also takes into custody both remands inmates and convicts. However, short term convicts constitute the bulk of the inmates that should ordinarily be found in the medium Prison. The satellite Prisons can be described as intermediate Prisons camps setup mainly in areas with courts that are far from the main Prisons. They serve the purpose of providing Remand Centers especially for those whose cases are going on in courts within the areas. When convicted, long term Prisoners could be moved to appropriate convict Prisons to serve their terms.

The Farm Centers are Agricultural Prison camps setup to train inmates in Agro-based vocations so that when they are discharged they will have Agro-based skills to depend upon. The convicts are expected in addition to be taught to appreciate the dignity of labour. The farm centers are large mechanized farms that are located in the food-producing areas of the different geopolitical regions of the country. Subsidiary Farms and Market Gardens are Agricultural extension projects usually attached to some Prisons Headquarters for the same purpose as stated above. They are making up of vegetable – producing market gardens, poultry and piggery farms etc. apart from training inmates in all these agro-based vocations, these endeavors are expected to yield revenue to the state. From the discussion above, Yola Prison falls under the category of Convict Prisons.

Statement of The Problem

In Yola Prison, criminals' records are kept in manual files. The traditional manual way record keeping system of file jackets, file cabinets and shelves where searching, sorting and decision makes searching very tedious and time consuming with accompanying errors and data

loss. Besides this, most of the Prison warders in Yola Prison are not computer literate and do not appreciate the power of automation when it comes to information technology.

Large volume of data handles in the Prison constitute great problem to the present manual system. The storage file or books are subject to constant damages by termites and other destructive insects and rodents. Also natural hazard like weather (wet season), which causes damages on papers and books, even human being can ontribute to such storage hazard. There is lack of security also because Prisoners record kept manually on papers and books are not secured in terms of confidentiality.

Objectives of The Study

Record management is a crucial aspect of survival for any organization no matter the size. Not only is keeping track of information vital to the smooth operation of an organization, trying to track down and find documents (both paper and electronic) can be a very costly process. Having Management Information System in place to manage the admission of Prisoners, storage of data, discharging due Prisoners and applying reliable security measures to Yola Central Prison, this can help to avert costly and potentially damaging situation. The essence of Management Information System in Yola Central Prison is to assist management in making administrative decision. Therefore, this project aims at developing Prison inmate information system which will handle processes involved in keeping records for Prisoners such as those under awaiting trials, warrant return date and transfer from other Prisons.

i. To keep Prisoners personal and warrant details on admission, personal details include details like: name, address, date of admission etc. and warrant details include the court and the crime details, crime number, laws and sections, sentence for convicted Prisoners, etc. into databases..

ii. To handle disposal of Prisoners and their warrants. This includes type of disposals like bail, release on completion of sentence, transfer and other details like disposal date, warrant return date, generating comprehensive report of Prisoners by date of disposal or release, date jailed, etc. for easy sorting.

iii. To provide an effective and reliable method of data and file management which will reduce the movement of files and limit the problems.

Significance of the Study

The significance of the study is that through the use of this software, Yola Prison will be able to:

i. Efficiently manage the Prisoners records,
ii. Have better security for Prisoners record,
iii. Facilitate communication among the Prison officers,
iv. Have easy method of accessing and retrieval of records,
v. Have a comprehensive report of both current and discharged Prisoners.

Definition of terms

- **Convicts:** to declare somebody guilty of a crime in a court of law.
- **Awaiting trial**: is a period which accused person stay in a Prison waiting for court hearing.
- **Warrant:** written letter by the judge to jail an accused person.
- **Ex-convict:** person released after jailed.
- **Prison:** a source place where somebody is confined as punishment for a crime or while waiting to stand trial.
- **Penitentiary:** A prison for people convicted of serious crimes.
- **Inmate:** A person living in an institution such as a prison or hospital.
- **Remand:** Place on bail or in custody, especially when a trial is adjourned.

Literature Review

Prison is defined as a custom and tradition of society according to the law of the land to punish anyone or person who commits a crime. This is to prevent (a lawless society which invariably help secure) lives and properties of the people living in such a country or state. It is also a place in which individuals are physically confined or interned and usually deprived of personal freedom. This is usually a legal penalty that may be imposed by the state for committing a crime. It is also defined as the criminal law forbids the commission or omission of certain acts in order to preserve public order protect

person or property from what is offensive and injurious and provide sufficient safeguards against corruption of the state [13]. The prison, as an institution and an environment, is manipulated by both inmate and guard to help ease the passing of time and work and to sustain some individual identity within the institution, which can undermine the intended purpose of the prison. In short to understand the prison and its purpose, "we must see prison life as something more than a matter of walls and bars, of cells, and locks...we must see the prisons as a society within a society" Once an inmate is surrounded by the prison walls, he or she becomes subject to the operation and function of the institution [6].

The prison environment contains a large number of stimuli (i.e. factors) that impacts both the behavior of inmates and their attitudes of the prison environment. This sectiona presents and reviews information about the following areas: prison environment; types of prison security (i.e. minimum, medium, close, and maximum); consequences of the prison environment incorporating personal inmate accounts; and methods of reducing inmate stressors of the environment [14].

Information System

Information system in a general sense, refers to a system of people, data records and activities that process the data and information in organization and it includes the organization's manual and automated processes. In a narrow sense, the term information system (or computer based information system) refers to the specific application software that is used to store data records in a computer system and automates some of the information processing activities of the organization. The disciplines of business process modeling describes the business processes supported by reformation system which is in the same way with the Prison Information System. Also Information System is a system that accepts data from its environment (input) and manipulates the data (processing) to produce information (output). Information System can be manual or automated [1].

Overview of Prison Information System Development

Based on the scope and objectives of this project work, new system is outgrowth of a process of "Yola Prison" problem solving. A new system will be built as a solution to the type of problems or set of problems that "Yola Prison" is currently facing.

Therefore, the activities that go into producing a new system solution to "Yola Prison" problems are called system development. These activities consist of system analysis, system design, program solution and distinct activities [7].

Database

According to Flavin, database is defined as "a systematic and logical organized collection of facts". Any organized system of information storage and retrieval is technically a database. Whether that data is on computer or file cabinet. But for this research work, the major concern is to develop a computerized database for "Yola Prison." The term database also implies to a series of related properties which include: data sharing, data integrity, data security, data abstraction and data independence [3]

- Data sharing: data stored in a database is not usually held solely for the use of one person. A database is normally expected to be accessible by more than one person, perhaps at the same time [1].
- Data Integrity: another responsibility arising as a consequence of shared data is that a database should display integrity. In other words, the database should accurately reflect the universe of discourse that it is attempting to model. This means that if relationship exists in the real world between objects represented by data in a database then changes made to other partners in that relationship [5].
- Data Security: one of the major ways of ensuring the integrity of a database is by restricting access. The main way of doing this in contemporary database system is by defining in some details a set of authorized users of the whole, or more usually parts of the database [4].
- Data Abstraction: a database can be viewed as a model of reality. The information stored in a database is usually an attempt to represent the properties of some

objects in the real world. Hence, we say relevant, because no database can store all the properties of real world objects. A database is therefore an abstraction of the real world [12].

- Data Independence: one immediate consequences of abstraction is the idea of buffering data from the processes that use such data. The idea is to achieve a situation where data organization is transparent to the users or application programs which feed off data. If for instance, a change is made to some part of the underlying database, no application programs using affected data should need to be changed. Also, if a change is made to some part of an application system then this should affect the structure of the underlying data used by the application.

Database Management System

Database Management System (DBMS) is an organized set of facilities for accessing and maintaining one or more database or series of database and through which all interactions take place with the database. The interactions catered for by most existing DBMS fall into four (4) main groups [13].

i. Data definition: defining new data structures for a database, removing data structures from the database, modifying the structure of existing data.

ii. Data maintenance: inserting new data into an existing database structures, updating data in existing data structures, deleting data from existing structure.

iii. Data retrieval: querying existing data by end users and extracting data for use by application programs.

iv. Data control: creating and monitoring users of the database, restricting access to data in the database and monitoring the performance of database.

Program Coding

Certainly, the graphical user interface control and menus would not work or function especially with the database without a series of codes working behind the scene, or at the background. Therefore, Visual Basic codes relevant to make each control and menu workable were written to activate their functionalities. Compilation is the final phase of system development of any newly built system, which is the same way with the Prison Inmate Information System, whereby all the final codes were compiled into an executable file and also deployed in a form that can have maximum security self-dependent. That is, the program can run as an application on its own [11].

Development Model

The primary objective of this research is to develop a workable computerized prison inmate information system for Yola Prison, Adamawa State. Thus, to achieve this objective, water fall model of software development process which is classical software model initiated by Winston Royce in 1970 was deployed to develop this system. This is because it is characterized with linear or sequential execution of the various phases of the software development life cycle as presented in figure 1.

It support proper documentation of each phase, discourages phase skipping and permits testing. Furthermore, it is iterative and permits systematic revisit of previous phases which is a good feature for system improvement. Thus, the system to be studied will take the following phases:

1. System analysis
  a) Functional requirement
  b) System requirement
2. System design
3. Implementation and integration
4. Testing and quality assurance
5. Maintenance

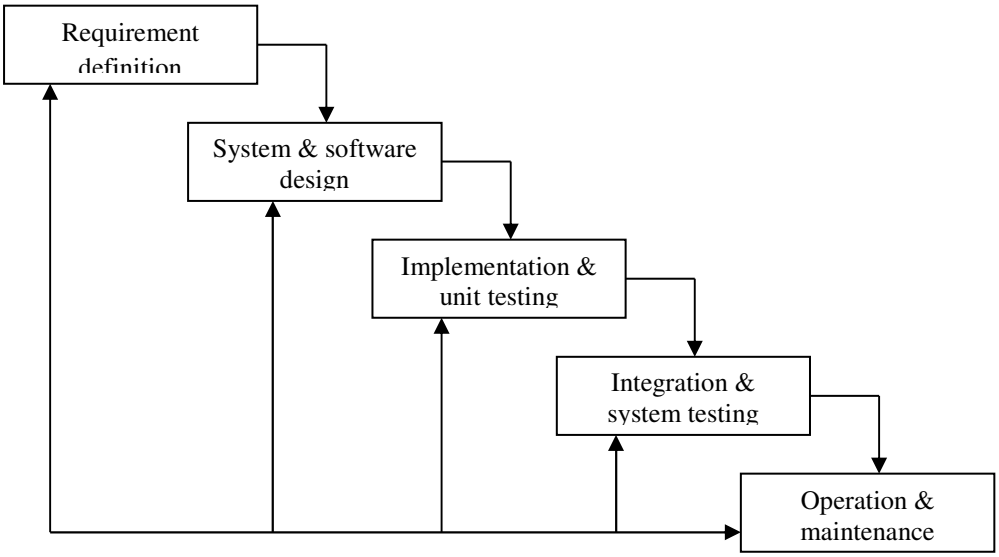

Figure 1: simplified water model for designing and implementation [16].

System Analysis

Jeffrey defines system analysis as a problem solving technique that decomposes a system into its component units for the purpose of studying how well those component parts work and interact to accomplish their purpose. The aim of system analysis is to review the existing system, problem imminent in the use of the existing system, ways in which the identified problems could be tackled or curbed and possibly the refinement of the system if necessary for better efficiency and productivity. Use-cases and other unified modeling language (UML) tools [8].

Method of Data Analysis

In other to have an easy understanding of the result in this work, the data collected from above will be examine and analyzed using data structure dictionary. This is to enable the researcher to determine the input, process and output that are need for the propose system. Thus, the needed component for the system will be best on the information gathered from data collected [10].

Description of the Existing System

The descriptions of the existing system are as follows:

i) The existing system is operated semi-manual in a way that inmates records are kept on shelves which is not secure but need to be secured.

ii) Delays encountered in the processing of inmates file; the rate of processing speed need to be increased.

iii) The method of record keeping in the existing system is manual, not efficient. Therefore, efficient method of record keeping need to be considered to enhance the speedy of the system.

An automated system performs the same function as a manual system, but by means of information technology. Thus, information system component includes; people, procedures, data, software and hardware.

Feasibility Analysis

Having made some observations from the finding in the system investigation, there is a need for propose system to be tested against several parameters. These include; financial feasibility analysis, technical and operation feasibility analysis.

Financial Feasibility

This report is required in order to determine whether the development of the new system is technically, operationally, socially, economically feasible and beneficial. The points below will be considered during feasibility report.

1) The speed and accuracy in processing data

2) The ability to handle large volume of data will be considered

Cost Benefit Analysis

The main ingredient of the feasibility study report is the cost/benefit analysis which must be accurate and understandable and should provide management with enough information to decide whether the development of the new system is cost effective. Because of its long lasting benefits of the new system it's cost effective.

Design and Technique

Tools that will be used to design and develop the software include Use-case diagram (UML), Waterfall model and Flowchart.

The flowchart shows the graphical representation of program execution.

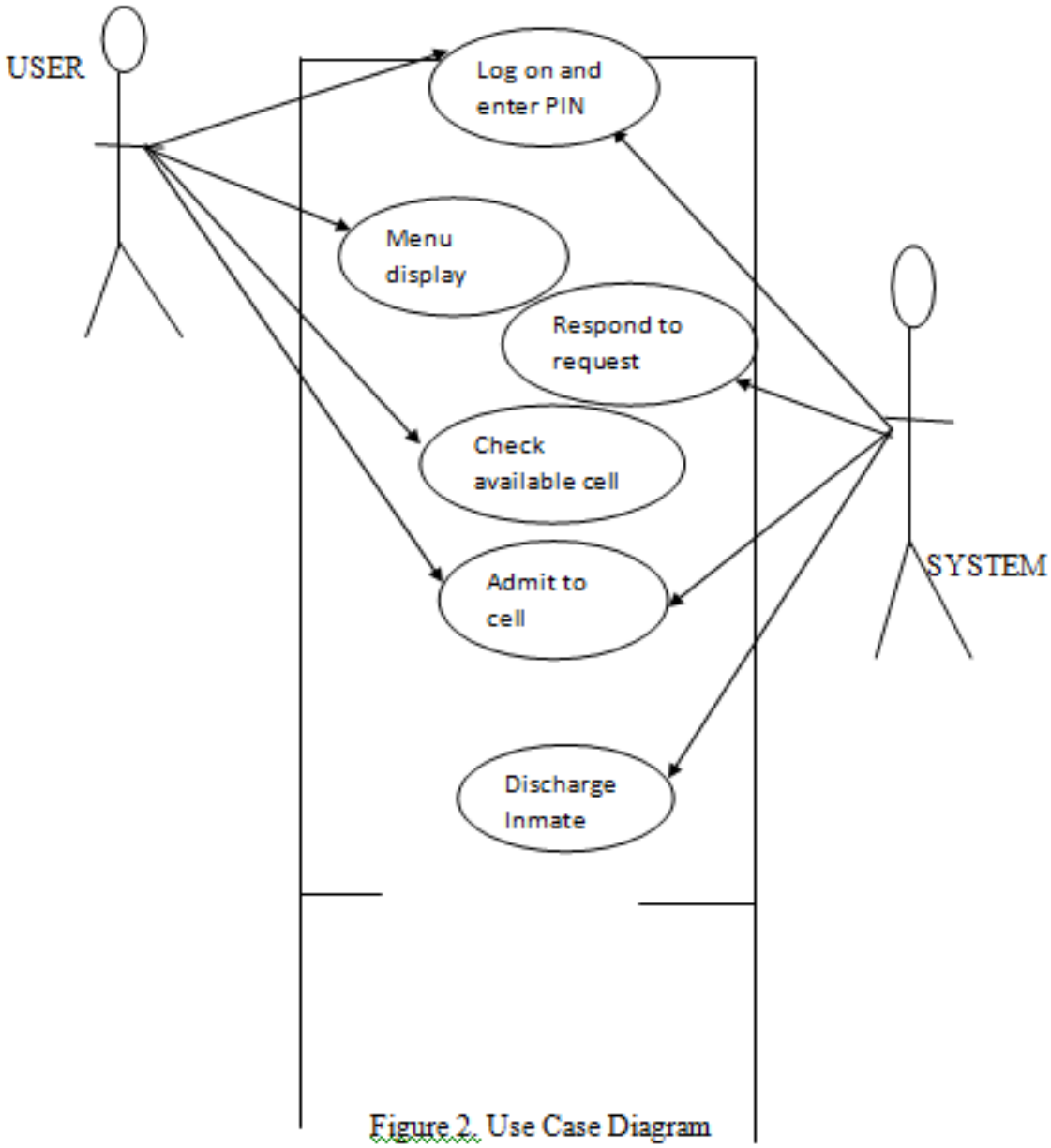

Figure 2. Use Case Diagram

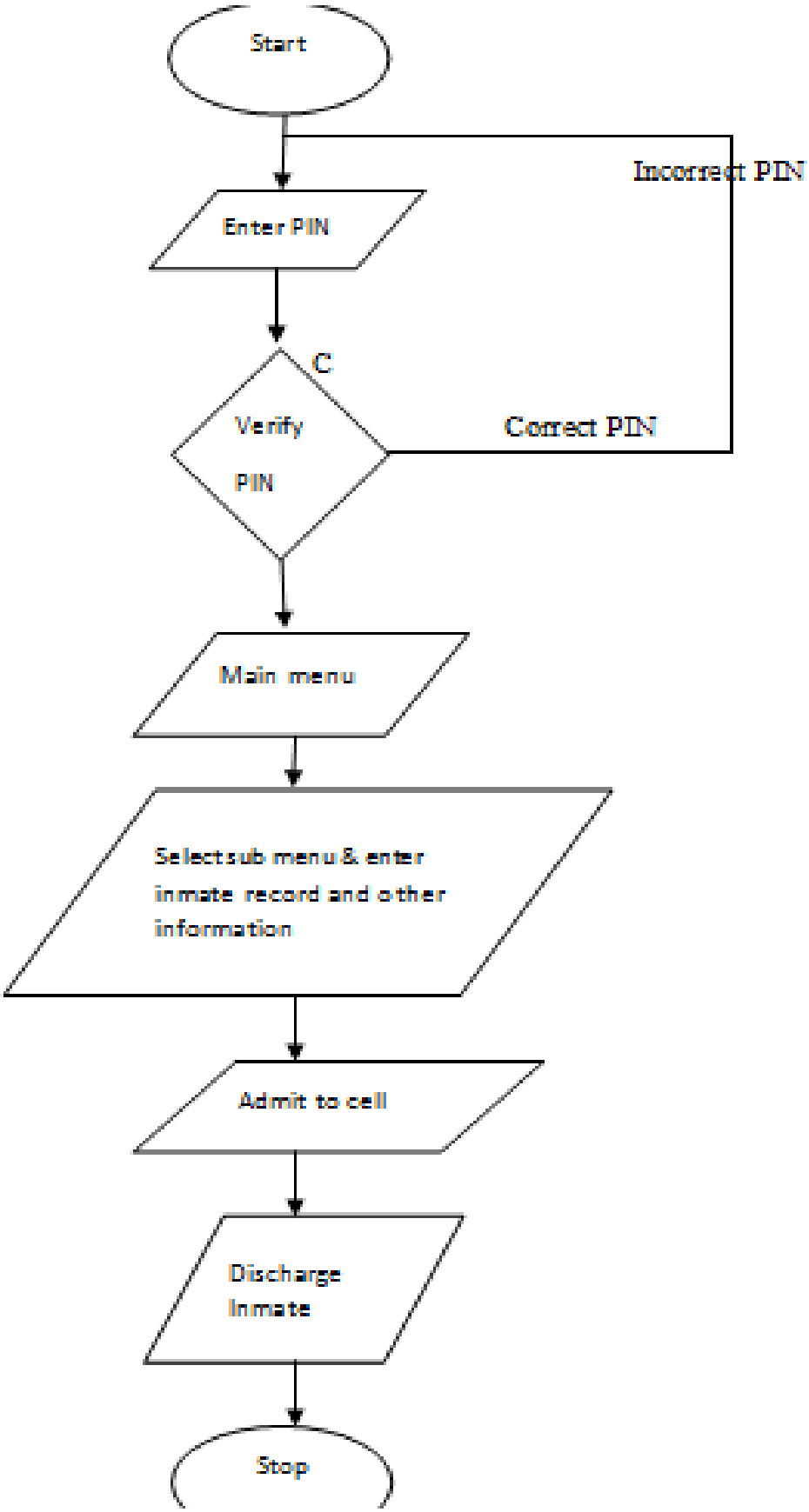

Figure 3. **The Program Flowchart**

Input Specification

The input starts when data are from the source. Input specifications strictly guide against the length and type of data items that are acceptable in particular file name. This input specification id is the designed input for the output to be generated. The specification is given in Table 1

.

S/No	Field Name	Data Type	Description
1	ID/No.	Text	IM 001
2	full name	Text	
3	Contact address	Memo	
4	Nationality	Text	
5	State	Text	
6	LGA	Text	
7	Marital status	Text	Married/single
8	Crime committed	Text	
9	Cell No.	Number	
10	Sex	Text	M/F
11	Age	Number	
12	Height	Text	
13	Date of sentence	Text	
14	Time duration	Text	
15	Discharge date	Text	

Table 1: Input Specification Guide.

Detail Design

The designed system consist of different modules, each of this modules can be selected from menu hence, followed by a processing actions. These various modules are described below:

- Create prisoner's record: This module deals with creation of creation of prisoner's record**.** Users are allowed to enter data that are peculiar to a prisoner. Previous record can also be reviewed in this process especially when prisoner's code already exists.
- Update record: hence user types the prisoner's code, which uses to search an update the database to select which record to be updated. If the code is found then necessary modification can be made to existing record .Process file: this module deals with all computational process of the system.
- Report: Report module is used to generate all sorts of reports include list of prisoners, list of discharged prisoners and report of monthly population analysis. Any of the report needed can be selected in the report menu.

Implementation

This is the process of proceeding from a given of a system to a working version of that system, or the specific way in which some parts of a system are made to fulfill their functions,

both individually and collectively. System implementation is the final phase in the development and operation of the new or revised system. Its goal lies in a system completely debugged, operational and is accepted by the end user. Most system designs, this one not being an exception, are based on the concept of modularity whereby the overall designed system is broken down into a series of sub-units (modules), each one being thoroughly tested before putting into use. As each module proves satisfactory, it will be integrated into the overall development system.

System Testing

This is a written report of the entire operations of the designed and implemented system. The lack of sufficient documentations at all levels plagues most computer installations where the average programmer spends most of his or her time working with programs which are written most likely by other programmers who may no longer be around to consult for the details of their code. Unless the programs are initially and adequately documented, maintenance is an extremely un-attractive past time. The production of the documentations must be seen as the written code itself. Provision for documentation is one of the greatest points of separation between amateurs and professional programmers.

Parallel Conversation

This method of system conversion allows implementation of new system whereby the new system and the old system are operated together for period of time. The old system is operated because if any fault may arise from the new system. The system of conversion determines the accuracy between the new system and old system because they are operated together, so as to find out if the new system meets the requirements that are needed to be achieved.

System Requirement

This refers to the facilities that are required for the new system to run smoothly, which involves the details of the hardware and software needed.

The Proposed system hardware will be developed on a system with the configuration of 160 GB of HDD, 2GB of RAM, Processor (Celeron) Dual –Core, 2.00GHz. The system software (that is, operating system such as windows 2000, windows XP, or windows Vista, windows 7), is an essential set of programs that manage hardware, data files and work with application programs. The operating system is a foundation on which the intended applications and work process are built [9].

Application software is a computer program designed to help operators produce documents and do some computations. Application software thus differs from an operating system (which runs a computer utility that performs maintenance and general purpose chores, and a language which computer programs are created), depending on the work with which it was designed for. An application program can be manipulated text, numbers, graphics or a combination of these elements. In general, application software is divided into: Application package: such as spread sheet, word processor and a database program.

i. Specialist application package: are programs designed specifically to help end users perform a task related to a particular field. A typical example of this is a package developed to handle the prisoner's record Processing system. However, for this project work, the programming language that is be used as the application development tool is Visual Basic Version 6.0 for application. Also to develop the required database, Microsoft Access Version 2010 is used as the development package.

Inmate is a suspect who has been charged with or is likely to be charged with a criminal offence may be held or remanded in Prison if he or she refuses or unable to meet conditions of bail, or is unable to post bail. This may also occur where the court determines that the suspect is at risk of absconding before the trial, or is otherwise a risk to society. An inmate defendant or trial verdict if found guilty, a defendant will be convicted and may receive a custodial sentence requiring imprisonment [15].

Graphics User Interface (Gui)

This is a menu driven windows environment through which the users interact with the system either by the use of mouse or hot keys. This is designed in Microsoft Visual Basic 6.0 in order to provide windows application that is friendly. A Multiple Document Interface (MDI form)

containing many child forms, which could be opened within that single MDI form. Also menu and submenu which users can select and click to access the functionalities, or by the use of key press event [11].

Operators Main Menu Form

The menu form is shown in figure 4. It contains all the operations in the program which are designed under each menu item. In addition figure 5, is the inmate registration form.

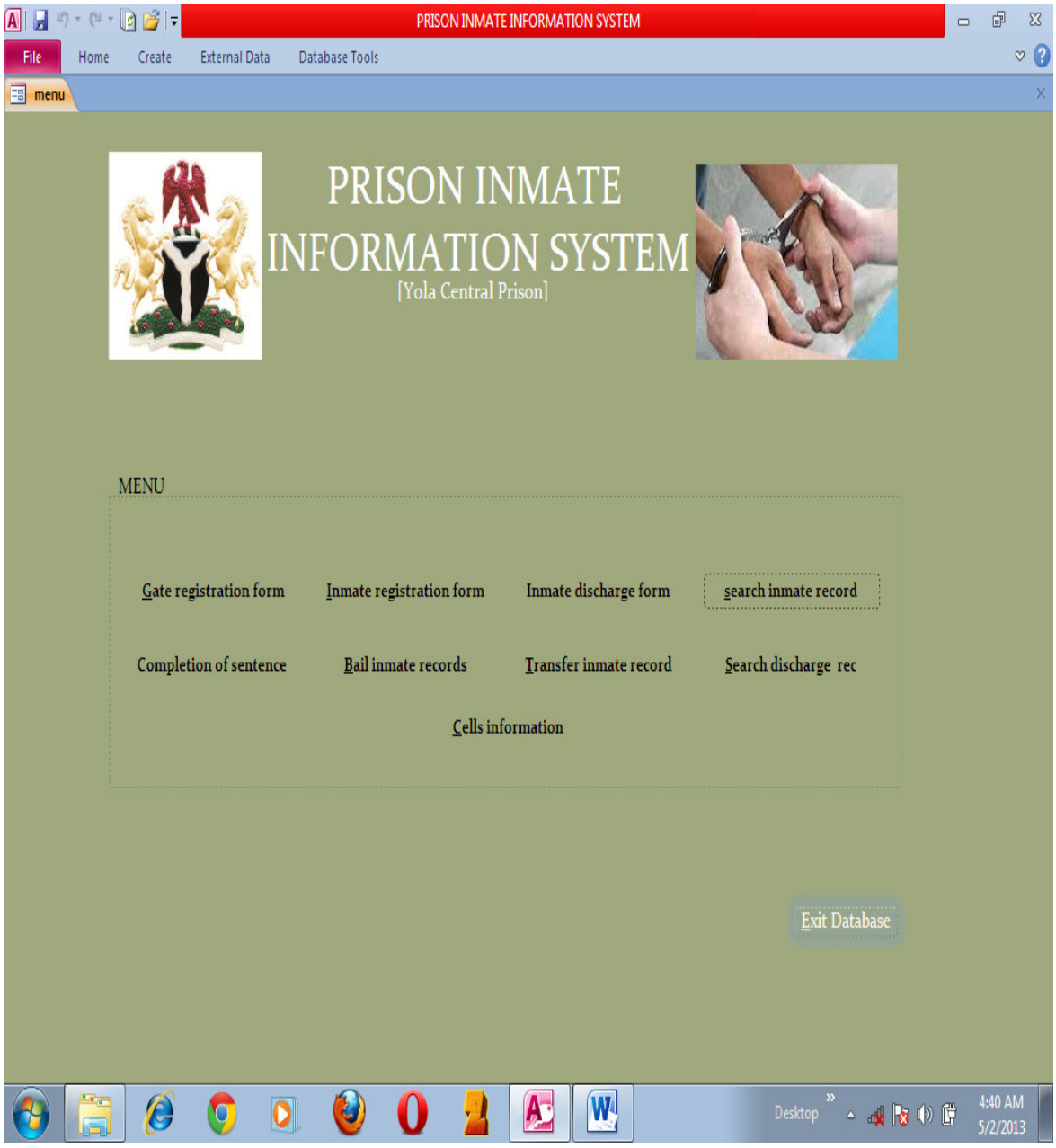

Figure 4: main menu form display

Inmate Registration

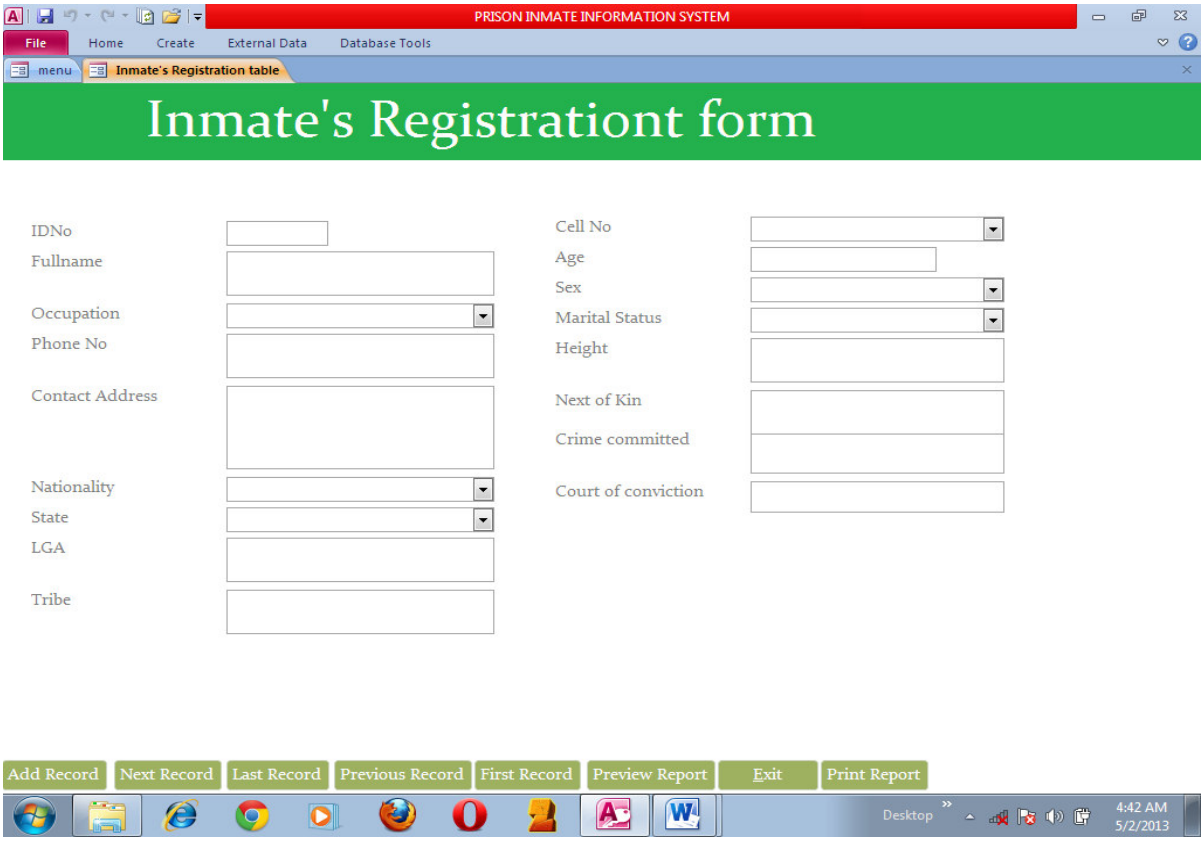

Figure 5: Inmate Registration Form

Conclusion and Recommendations

The new system has been successfully tested, implemented and meets all the specified requirements. In comparison to the current system (manual system), the system is more secure, flexible, provides more user feedback, reduces the workload, prevent erroneous data entry and provides more functionality. This program should be implemented not only to ease the work load of Prison Inmate Information System, but to encourage continuity and improvement in record keeping. We also recommended the following.

i) This system should not be used for any criminal or un-authorized purpose as it is still a prototype and subject to error if not used by a professional.

ii) The prison should be networked so that when a prisoner is registered at gate his or her record can be accessed at record office and other offices.

iii) Lastly, all operators that may likely group to use this system must be computer literate whoh have undergone a short training on how to use the system to avoid errors.

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ICT-Based Framework for Improved Food Security in Nigeria

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Abstract

Hunger has plagued mankind throughout history and still remains a critical problem especially in Nigeria. This paper has analyzed the government and individual farmer's effort to improve the lot of agriculture in Nigeria and discovered that enough has not been done on the issue of embracing ICT tools as a needed foundation for improved agricultural productivity. This paper has modeled an ICT based platform that if adopted by stakeholders, shall greatly pull Nigeria out of the mess of food insecurity. This framework incorporated a national internet host that will drive the information flow amongst the various stakeholders in agriculture. The six regional decision support systems in this model is a comprehensive database of agricultural information generated from research findings and innovations, inputs from agricultural extension officers, farmers, consumers, marketers, agricultural agencies via the interactive websites, radio, television, computers, personal digital assistants etc. The result of this research is a holistic ICT platform that if adopted, will ensure precision farming which shall improve food security in Nigeria.

Keywords: Food Security, Interactive websites, National Internet host, Precision farming, Regional decision support systems.

1.0 Introduction

Nigeria spends 60% of her total earnings from crude oil revenue on food importation [1]. aThis is a disturbing trend in a largely mono economy such as Nigeria. The implication here is that if the crude oil stops flowing for one year Nigeria will plunge itself into more severe food crisis and its attendant consequences. The above scenario indicates clearly that Nigeria does not have food security for its citizens.

The United Nations Food and Agriculture Organization (FAO) defines food security as "a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life."[2]

Famine and hunger have plagued mankind throughout history and still remain a critical problem especially in the developing world. Most recently, attention has been focused on the problem of food security, which has become one of the main issues on the global agenda. Concerns over food security have been prompted by the impact of climate change, sharp rises in food prices in many countries, and energy policies, in particular the issue of biofuels. The magnitude of the problem of hunger and food security is alarming. Every six seconds, a child dies from hunger and related diseases. The Food and Agriculture Organization (FAO), a specialized agency of the United Nations, estimates that more than 860 million people in the world today suffer from hunger. Of these, about 830 million live in developing countries, the very countries expected to be most affected by climate change. As the lead UN agency for ICTs, the International Telecommunication Union (ITU) is playing a key role in promoting the use of ICTs to address emergency situations and food security. Increased access to and use of ICTs can be beneficial to farmers and the agricultural

industry. Nonetheless, efforts to date to employ these tools have not been uniform or sufficiently widespread. There are many factors (policy, legal framework, technology, knowledge, markets, research, etc.) to be considered when addressing food security, but in all of them information and communication technologies (ICTs) can act as catalysts [3].

Information and communications technology (ICT) is an umbrella term that includes any communication device or application, encompassing: radio, television, mobile phones, computers and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as video-conferencing and distance learning. [4]. ICT is attractive as a means of achieving the goal of food security because it creates room for market transparency, mobility, E-collaboration, interactiveness and distance neutrality.

The greatest tool that a farmer should have is access to adequate information that will help him improve farm yield, crop storage and access to the right market for his farm products, this needed information can be accessed through various ICT platforms.

Governments in Nigeria have made several efforts to improve the fortunes of agriculture. These efforts include; the 1962-1968 development plan which laid emphasis on farm settlements, cooperative plantations, supply of improved farm implements, the National Accelerated Food Production Program NAFPP of 1972, establishment of River Basin Authorities in 1976, Operation feed the Nation (OFN), Green Revolution Program of the 1980's, the Agricultural Development Program (ADP) , the establishment of agricultural research institutes, and . Nigeria's National Fadama Development Project (NFDP), the national space research and development agency (NASRDA) uses Global positioning system (GPS) that will help farmers in decision making for precision farming. The national information management system for agriculture in Nigeria initiative is aimed at disseminating price information on agricultural products to all stakeholders in agriculture. The e-wallet initiative in Nigeria is also aimed at sending information directly to the farmers via the mobile phone.

The trend to improve agriculture in Nigeria is centered around training of farmers on farming techniques and giving them access to loans to embark on farming. However, these trainings are not ICT driven, and where a modicum of ICT is involved there is no sustainable platform to ensure its coordinated success. There is no radio station in Nigeria that has up to four hours daily program dedicated for agricultural activities. There is also no mobile telephone network that offer adequate subscribed information relating to agriculture. This is very worrisome in a country such as Nigeria that is already facing food crisis

Meanwhile, it is generally accepted that ICT will drive the transformation of Africa, with Nigeria in the forefront, from an agricultural to knowledge society. Rather than wait for 2030, we can invest in ICT, not as a panic measure as we did in 2006 and 2011 salvaging the voters' registration exercise by importing, assembling, and deploying over 120,000 laptops and data capture machines in a few weeks. In the process we overwhelmed the volunteer workforce that INEC had engaged for the exercise. Come to think of it, we tend to have a special liking for panic measures as was recently played out in the now controversial attempt to buy 10 million GSM phones valued at N60b for rural farmers in Nigeria. Whether our development as a nation is pegged to any timeline or not, the sober thing for us to do today would be to adopt a long-term ICT strategy to ensure that we are ready to leap when opportunity calls. There are key objectives that ICT professionals must pursue in 2013 as our contribution towards creating a character for the ICT industry while refocusing this nation [5]. This research is an effort to create an appropriate ICT model that when adopted shall greatly improve the present food crisis in Nigeria.

2.0 ICT Trends in Agriculture

The application of ICT in agriculture is an evolving phenomenon. During the 1990-2000, agriculture enjoyed the platform of electronic business. However farmers could only visit agriculture websites to extract or read information which they apply to improve their fortunes. The websites were static and so, farmers could not give feedback information neither were they able to transact business

through these websites. Things improved in the 2000-2005 with the introduction of electronic agriculture (e-agriculture). This gave the farmers opportunity to enjoy interactive websites through which they are able to transact agricultural business such as payments, ordering of farm inputs and sale of farm produce using the interactive websites and electronic payment options. The year 2005 till date has witnessed a revolution in mobile agriculture characterized by its portability and ubiquity. Farmers connected to the internet can get information via the mobile phones, laptops, personal digital assistants (PDAs) anywhere and every time.

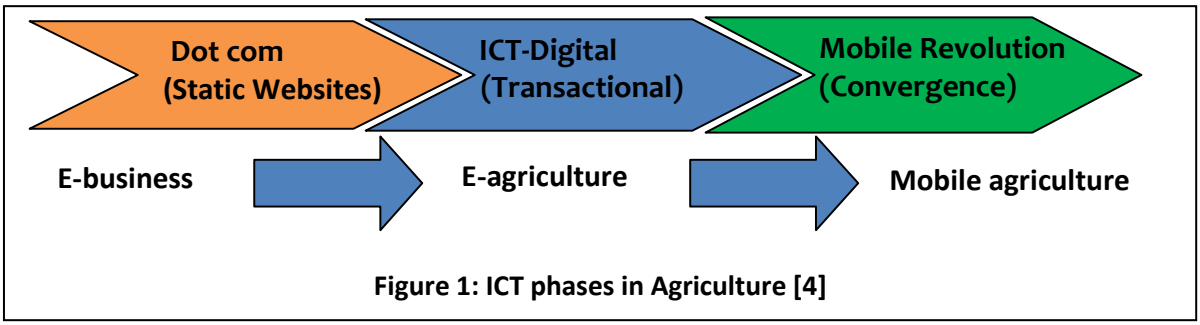

Figure 1: ICT phases in Agriculture [4]

3.0 Importance/Impact of ICT on Food Security

The use of ICT in agricultural practices is inevitable. This is because it provides very important tools and platforms for improving the fortunes of farmers. ICT provides information to the farmers which help them in decision making and also improve on their farming techniques. A well informed farmer has a great potential to becoming a successful farmer because he knows when and how best to farm, where and when to sell his products, where and when to obtain loan or grants for his farm. The following are some of the importance of ICT in food security.

a. Radio/Television

Farmers can connect to radio stations to get information that will help them improve their farming methods and productivity. The radio can also give a guide on current seed and farm product prices. Radio receivers are very cheap to afford and maintain and so majority of our rural farmers can afford it. An average world receiver radio costs N700.00 in Nigeria markets. Television can also be used because it affords the farmers opportunity to visualize the demonstration of experts in the field of agriculture; by so doing the farmer better understands and also becomes better equipped.

b. Mobile Phones

Because of the rapidly increasing use of mobile phones in developing countries, they have become another major means of disseminating information. With the short message service (SMS), farmers and fishers can receive information directly on their phones, and in their local language For example, e-Choupal in India offers services that help farmers achieve better yields and secure better prices. TradeNet, based in Accra, Ghana, has created a platform where farmers and traders across the world can share market information via mobile networks and the Internet. Such services help to avoid food being wasted, too. A study in Kerala, India, showed that by using mobile phones while at sea, fishermen are able to respond quickly to market demand and prevent wastage caused by over-fishing. [2]. Other examples are DrumNet in Kenya which increases the bargaining powers of farmers on market prices, MarketMaker in the USA which enhances access to market information and the e-wallet initiative in Nigeria aimed at sending information to farmers through the mobile phones. About 80% of Nigeria population is made up of youth, majority of them clad mobile phones. So reaching out to them through the mobile phones will create awareness to the youths about the profitability in farming, this will greatly encourage them to take farming as occupation.

c. Improvement in food supply chain

Wastage of food can be minimized if there is a good communication amongst the farmers, marketers and consumers. Radio frequency identification (RFID) tags can be attached to farm produce to ensure that they are kept in good condition and also to track inventories to ensure optimal supply of farm produce. Geographic positioning systems (GPS) can be used for fleet management for agricultural product distribution

d. Monitoring and Early Warning

A systematic monitoring and creation of database of farm outputs and its consumption rate will go a long way to enhance food security. Computer networks and databases can be used to collect and analyze information. Use of mobile phones and the internet can go a long way to ensure that information reaches to the farmers about impending disasters. High resolution radiometers and satellites can be deployed for remote sensing of agricultural resources.

The deployment of ICTs in the field can help to improve food yields and enable farmers to better forecast crop yields and production. The use of ICTs to share data increases the number of farmers profiting from the information.

One example is provided by the COMMON Sense Net project (Community-Oriented Management and Monitoring of Natural Resources through sensor network). COMMON Sense Net is used for agricultural management in the rural semi-arid areas in Karnataka, Southern India (See Figure 2). The project consists of a wireless network of ground-sensors that periodically record the state of the soil (measuring salinity and humidity), the air temperature, the volume of precipitation and other parameters. A second network of subterranean sensors is used to monitor the level and quality of ground-water. A different example of soil mapping is provided by a new project of the African Soil Information Service. This project combines remote satellite imagery and soil science to produce the first detailed digital soil map of sub-Saharan Africa. [3]

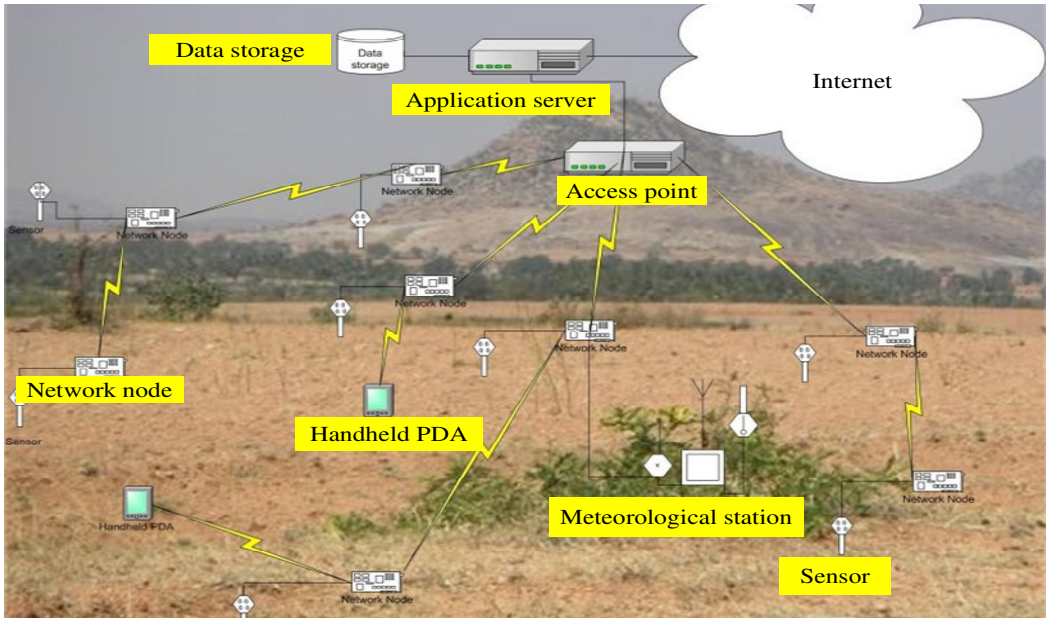

Figure 2: Example of a wireless network scheme to monitor agriculture parameters
Source: COMMON Sense net, http://commonsense.epfl.ch/

e. Automation of Farm Production

Farming methods can be automated for improved efficiency. E-record keeping through appropriate software is deployed for proper inventory. Statistical tools and computer applications can be used for proper budgeting (e-budgeting). Automation apart from ensuring that wastage is reduced also ensures that farmers are adequately informed about the prospects and pitfalls ahead.

For example, the following ICT for development (ICT4D) innovation have been

found in Taiwan; a rice germination electronic cooker, a robotic tubing-grafting system for fruit-bearing vegetable seedlings, and an air bubble machine and multi-functional, ultrasonic machine for fruit cleaning [6]

Other examples of importance of ICT in food security includes; e- banking, use of internet social media for promotion and marketing, online farmers market for e-ordering and delivery and e-learning / training for farmers through the internet

4.0 ICT Model for Improved Food Security

This conceptual framework is based on establishment of a national ICT/Internet Host that will house the comprehensive information database of agricultural research findings, the best farming practices, technology and farming opportunities which shall be easily accessible by all stakeholders in an interactive and ubiquitous manner

a. Regional Decision Support Systems

Linked to the national host is the regional decision support system (RDSS). The decision support system is a unique database system that receives input from various universities, research institutions, federal, states and local government agencies and NGOs. This information shall be transmitted electronically through a network infrastructure to the RDSS. The content of the RDSS shall form the primary source of information for agricultural experts, legislators and government agencies that are directly involved in agricultural policy formulation and decision makings spread across the region. It should be noted that each of the six RDSS shall be accessible to each other for information sharing purposes. The farmers who gets information from the various state agencies, LGAs, farmers cooperative societies, agric extension officers also gives feedback to the research institutes, and the states and LGAs about their performances and challenges via the ICT tools (radio, websites, telephones, computers, PDAs.(see fig 3) RDSS is also linked directly to the national host. Both the national host and the

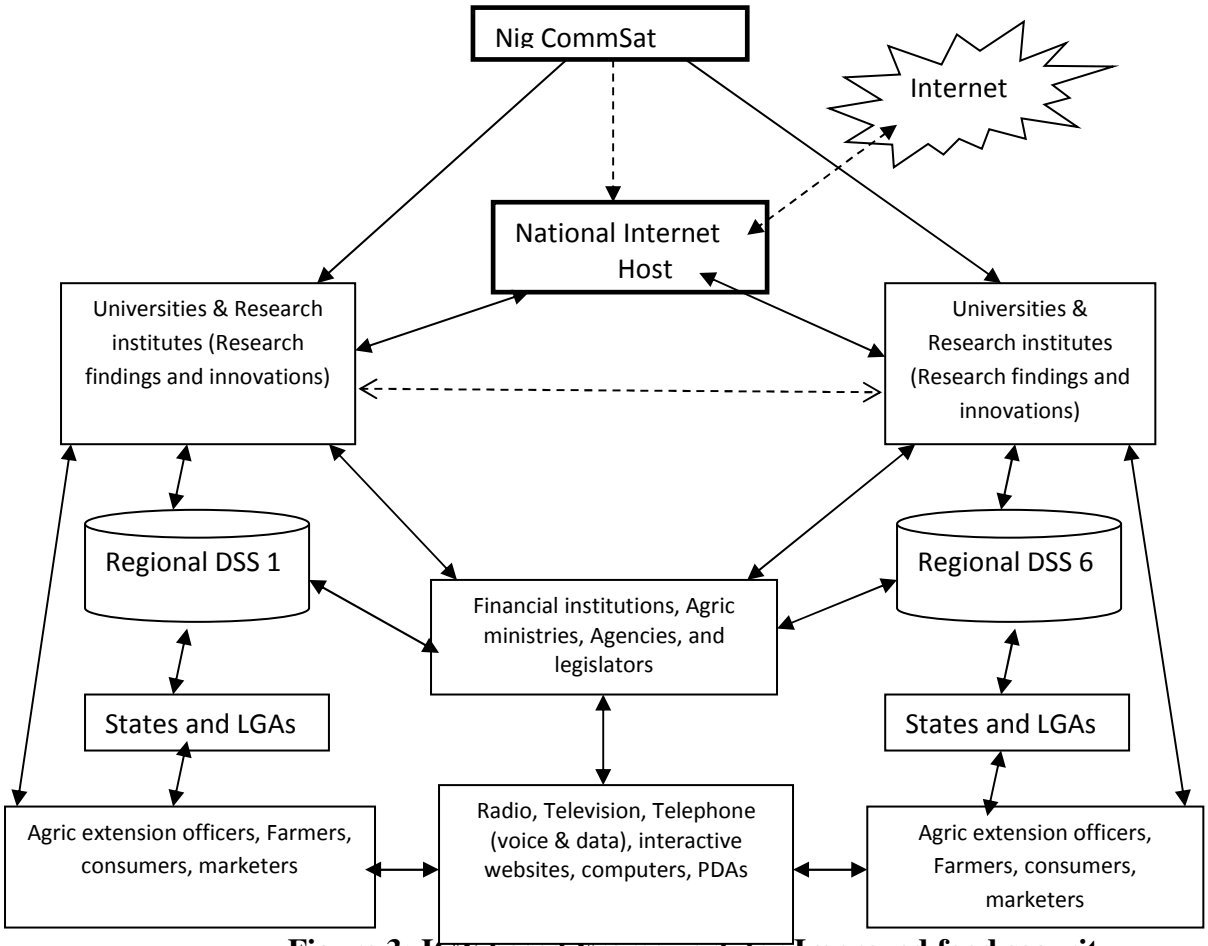

Figure 3: ICT-based Framework for Improved food security

5.0 Why a National Host is Required

The Internet is a network of networks. Each of the interconnected networks has one or more HOST computers which coordinate information flow among the network subscribers. Any level of protection can be given in terms of supply or retrieval of information, to or from a HOST. If data security is required at a national level, then reliance on foreign based hosts may not be acceptable. A National HOST and a National Intranet (ie within the nation network, also connected to the Internet) are required in order to control effectively, access to classified data of national interest, and at the same time provide access to Internet for all other purposes [7]

6.0 Conclusions

This paper has analyzed the government and individual farmer's efforts to improve the lot of agriculture in Nigeria and discovered that enough has not been done on the issue of embracing ICT tools as a needed foundation for improved agriculture. The result of this has led Nigeria to over dependence on food importations.

This paper then presented an ICT based model, which if adopted by all stakeholders in agriculture shall be a good platform for addressing the problem of food security in Nigeria.

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Automatic Attendance and Mobile Learning System in Sensor-Enabled Heterogeneous and Dynamic University Environment.

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2Abstract.

Many questions come up when we think about the academic performance of students and the ways and means to ameliorate that. In today's digital era we can use latest technologies to improve student performance and attendance. Class attendance, quizzes and assignments play a key role in academics. In this paper, we have defined a framework for improving class attendance based on GPS and face detection, and new learning environment where students can use devices like enabled devices, iPad, Tab, iPhone, blackberry, laptop etc. for class quizzes and assignments. We proposed an online as well off-line model for quizzes that will run on platform independent applications.

Keywords: *Heterogeneous, face recognition, GPS, Platform Independent application, mobile learning*

1.0 Introduction

The adoption of information and communication technologies in education has exponentially increased the use of mobile technologies in learning[1]. During the last decade, reference to the propagation of several types of electronic devices and their steadily decreasing prices, many learners are now equipped with powerful mobile devices, ranging from common laptops to tablet PCs [2]. Mobile devices have become integral part of the society. Everyone is familiar with the use of it. It does not require any preparation to practice. It is very common for students to bring personal mobile devices to universities which are their first choice for using internet and for communication purpose. Higher quality cameras, their positioning technologies and other sensors as well as internet access have become standard characteristics of modern mobile devices[5]. Although there are many benefits of mobile devices, but a major challenge in developing an application for such devices is heterogeneity in these devices in terms of their screen size, operating system, input methods, communication capabilities. The rapid and constant evolution of web and mobile technologies brings new opportunities for developers and researches in the process of creating new mobile application[14]

Given the wide variety of mobile devices available, the challenges developing innovative mobile learning solutions for class quizzes and assignments arose.

Projects like [16] and [12] presents the use of mobile devices, cameras and other sensor devices like RFID for attendance, quizzes, assignments and feedback. The most widely used location technologies are GPS, WI-FI, Cellular, Bluetooth, Infrared, and Radio Frequency Identification (RFID) [3]. Student attendance is one of the cumbersome task lecturer's face when as the numerical strength of students increases. To check student location in a university premises, coordinates of university and student can be squared up by the help of GPS. But an important challenge here is to confirm time, place and person for presence of students in class. A manual attendance, taking fingerprints or capturing students' photos by student standing in front of camera confirms the presence of the student. But during the lectures, teachers give a short break so keeping an attendance record after the break is another tedious task for teachers as well for students. A classroom equipped with sensing

cameras that automatically capture students' photos without student involvement with continuous observation can effectively solve attendance related problems. In attendance we are also concerned with the techniques of face detection and recognition to detect faces from an image captured by camera.

There are a few philosophies of not using mobile phones for education purpose, but nevertheless there are several reasons that encourage the integration of the mobile learning into the formal education. This paper presents a proposal on use of mobile phones in universities.

2.0 Literature Review

Since the focus of this research is on class attendance, quizzes and assignments, a brief overview of previous work done in the areas is mentioned in subsequent paragraphs.

a. Electronic Attendance System

Attendance is a very basic task. When the numerical strength of the students is more, it is very cumbersome and time consuming. But with the advent of the electronic attendance system, it has become easy and fast. Still researches are going on to make it more efficient. Here we will discuss and compare some of the techniques being used for electronic attendance.

For marking attendance[6], student during class using mobile send teacher's photo through email and teacher check email and mark attendance of the student. The picture of teacher and time for email ensures the presence of students in the class. An authentication algorithm[7] that scans the surrounding Smart phone through Wi-Fi allow student to confirm attendance within active attendance time by sending scanned area of Wi-Fi Ap's MAC address list and phone number to server. Thus, checking attendance at any time in the class of vicarious attendance. RFID tag, RFID reader and PDA are proposed collectively for portable examination attendance system [8] and an interface with GSM network system and mobile phone for the RFID based attendance through SMS[15]. A sending camera and capturing camera with face detection technique can effectively work for student attendance if no two students sit on the same chair and student not frequently move to different seats [9]. A web camera takes pictures, detect faces and compare with reference image for attendance[10]. For detection it uses all the results of continuous observations and has the same conditions as mentioned before. A roll call system with web can uses 10 training and 10 test samples of each student for face detection based on chin information [5].

b. Mobile learning System

Many web based application have been introduced for quizzes and assignments on mobile to get student response and instant feedback. Some of them are mentioned in this paragraph. Votapedia[11] a Wikipedia like web based interface is used in audience response system where respondents vote by cost free dialing. It is accessible to users on PDA and smartphones. Wikimedia and Mediwiki are used for quiz and survey creation. An academic kit[16] includes teaching materials for Java ME and Blackberry applications and uses blackberry API's for creating multiple choice based assignments and games in Blackberry.

A smart response website with a smart response quiz[12], students can access on their personal mobile or any devices with internet connectivity. In indoor quizzes result appears on smart board after the quiz and in the outdoors after the quiz students get results in their system. Quiz comprises of multiple choice questions, multiple answers and true false. Acme[1] a platform independent mobile learning system is a web based application and it provides a test quiz tool which is a mobile implementation of student response system provide a quick feedback to teachers about students' performance.

Teachers use Hot Potatoes for creating of the quiz which comprised of multiple choice questions and questions that require numerical answers.

From the literature review usage of electronic devices and latest software practice in teaching and learning is quite obvious. But all of them pose to certain imitations like in the electronic attendance system in case of RFID its major limitations are mentioned in [7]. Similarly, if mobiles are used for attendance they do not support the presence of student as someone else can bring mobile to class or can

apply the other student ID hence provide then an attendance problem can happen. If sensing and web cam are use, fake attendance problem is solved, but if two students sit on the same seat as on a bench or student frequently changes seat than accuracy of face detection and identification are affected moreover a large number of training samples of each student highlight a major problem of memory requirement. In case of mobile learning systems that are implemented as web based application even for a class quiz internet is required for teachers as well as for students and[16] is just defined for blackberry therefore if a student has not this device he or she cannot participate in course activities

Motivation and Research Questions

Computerized record of attendance, quizzes and assignments not only help teachers and students, but also higher management to check progress of student in different courses. The use of mobiles devices and all other latest technologies of the current digital era for teaching, learning and attendance can improve student participation and cut down chances of mistakes in records. One of the major objectives of this research is to implement the system with the minimum possible cost and use tools and techniques that are effortlessly available. But to achieve our targets we mention here some research questions.

- How many training images, samples and input images per person will be enough for effective face detection and face recognition?
- Which face recognition technique will be suitable under constant changing status of a single person like hair styles, with or without glasses, covered or uncovered head and changes in seating position?
- Which methods or protocols are required for communication between server / database, build-in GPS receiver or Wi Fi capabilities of end use devices (Smartphone, tabs, and laptop?
- Do different types of database and query Language required to store and process heterogeneous real time dynamic data and retrieve information.
- Which software architecture technique and programming language are required for development of platform independent applicant and effective visualization of information to different users of the system on their respective devices?

Framework Of Academic Management System

We define here a framework of our proposed system that we will follow during implementation of the system. We have considered two modules and our research questions are based on these two modules. Here we discuss them briefly with their flow charts that are subject to modification for implementation.

a. **Attendance module**

- Stopping vicarious attendance
- Preventing attendee's departure at intervals
- Locating student in the university premises at any time

In order to achieve our target we will focus on two techniques GPS and face detection. We will use GPS for locating student position as usually student give excuses of being late through his/her personal smart phone and information will be updated in database as shown in Figure 1. By locating the student position we can validate excuse reason.

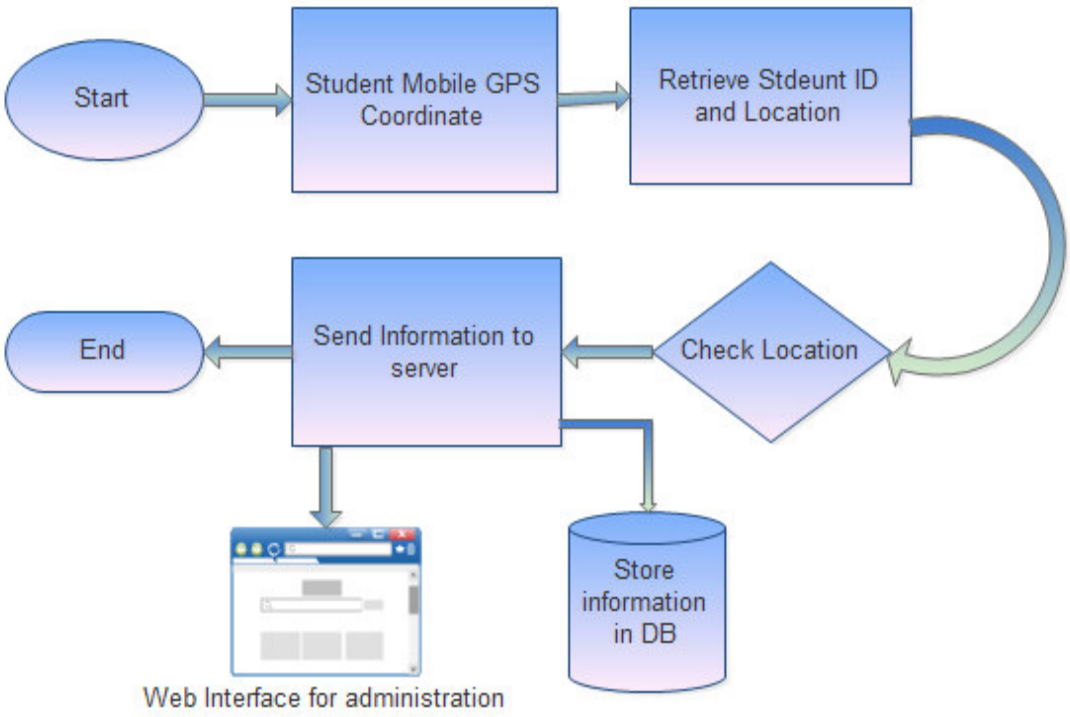

Figure 1: Students location tracking using GPS

For class attendance, it is important to confirm the student presence in class so will focus on face detection techniques. Therefore cameras will be used for automatically capturing images in class at any time without student involvement. Input images when compared with training sample will provide face recognition and mark attendance. Attendance can be viewed by student and teacher on the web based system as show in **figure 2**

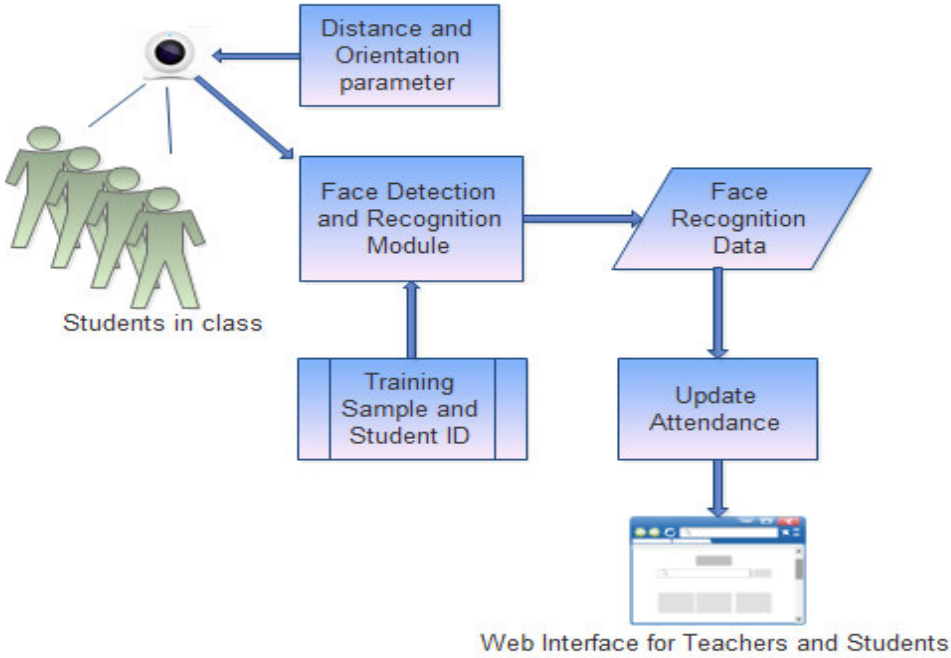

Figure 2: Flow of data for class attendance

3.0 Mobile Learning Module

The mobile learning module is proposed for conducting class quizzes and assignment submission. Both quizzes and assignment will work under time constraint. Quizzes can be conducted even if internet is not available, but for assignments, internet is required. For quizzes or assignments generation instructors will create content, set time(s) and create answer key (see figure 3)and that content is generated for various target devices with a click of a button. The system will be able to track learners and evaluate their progress. It will be done by analyzing and grading their course work, and sending the results to the instructor and by providing answer key to students.

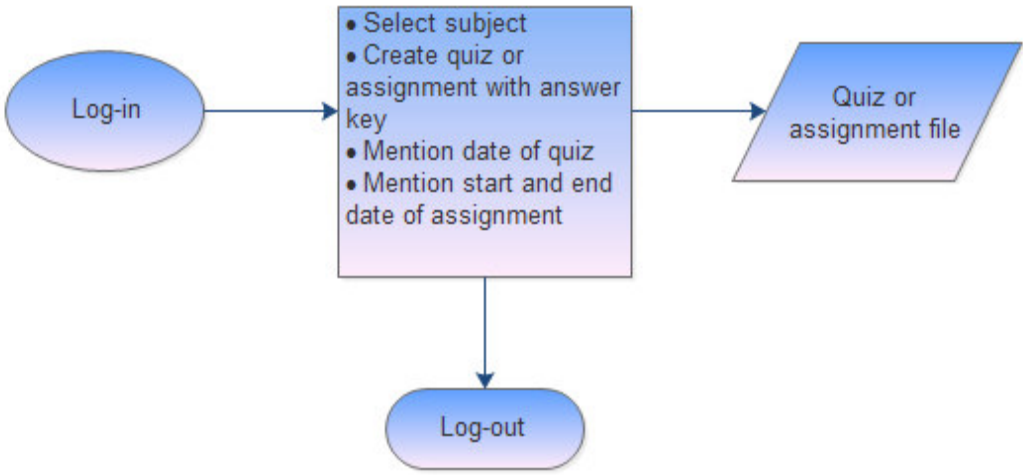

Figure 3: Quiz and assignment generator

If internet is available during the quiz, server will be used for quiz retrieval, time check, and display of answer key and calculation of results. The flow of information in online approach for quizzes is given in **Figure 4.**

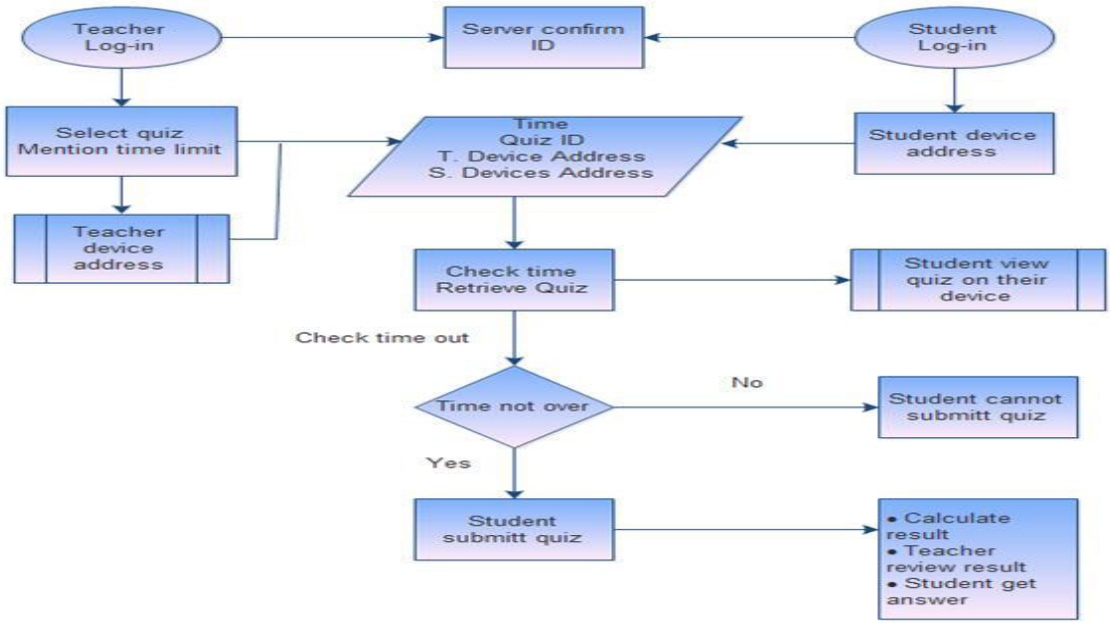

Figure 4: Class quiz using on-line approach

For off-line approach of quizzes it is assumed that quiz and answer key will be there on teacher's devices, hence no need for sever connectivity. When instructors will declare start of quiz his device will scan student devices and send quiz to all student devices. Student log in through their ID's can access the quiz and should complete the quiz in the time limit. The quiz will be submitted back to the instructor's device and after valid time will not be accepted.

Assignments will be web based which student can access on their device and should submit within due date. The server will automatically send assignment to students on start date.

For implementation of framework, different tools and techniques would be considered according to the research question. For information retrieval of GPS based attendance and routing of location information we will explore further [17]and[18]. Face recognition based attendance pose to certain research question, in order to get their solution we will investigate [19 – 23], that will help us in making a decision for camera and face detection technique. Different devices have different operating system, screen size, input method, communication capabilities etc. Design and capabilities of mobile operating system is very much different than general purpose operating system running on desktop computers.

In order to provide an application the work in heterogeneous devices environment and applicable for heterogeneous and dynamic data, we will consider the XML. File format and Java (APIs) modules, components add-ons) . K., .

"Research on an Authentication Algorithm for an Electronic Attendance S. K., " "Research on an Authentication Algorithm for an Electronic Attendance Sfor server /client applications and database access. Particular focus we will be on[1],[14] and[24]. For off-line quizzes we will use Bluetooth technique for scanning student devices. Oracle database and MySOL will be considered to store data and query processing as they both support different operating system and data types. In implementation our focus will be on user interface also but its tools techniques and guidelines are not mentioned in this paper.

4.0 Conclusion

The high propagation of Smart phone and handheld devices leads to the new research ground in the acceptance of such technologies in learning processes. The integration of mobile learning activities in a real context by converting variety of academic activities is not so simple. In this paper, we have proposed a framework of an academic system to help universities worldwide in integrading mobile devices in their academic activities. The framework features student attendance and students assessment through quizzes and assignments with face recognition and mobile learning techniques respectively.

Our future work includes implementation of our platform independent framework. If possible, we like getting more academic activities in application like getting student feedback for course evaluation and university services

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Biometric Enhancement of Home and Office Security to Reduce Assassinations In Nigeria

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Abstract

Insecurity is posing national threat in Nigeria today. You do not know who your next door neighbor is, because of security challenges in the country. Indiscriminate killing of innocent people, kidnapping, fraud by unknown person is becoming a worrisome national problem. The question is how do we minimize this menace? Biometrics security technology uses the physiological and behavourial characteristics of a person to properly identify him and helps to tell the class of person he belongs based on the available data. Your fingerprint, face and iris can grant or deny you access if they are tampered with. Since nobody can be trusted, our motivation is to find a way to minimize killer syndrome, impersonation, terrorism attack and fraud by unknown persons. We used verification and authentication methodology to verify how facial screening explores the different aspects of the face structure and pattern of arrangement to implement a unique personal identification system. It measures the different components of the face structure, such as the nose position, the mouth, the distance of the left eye to right eye and the actual location of the eyes to the mouth, nose etc and stores the bio-information extracted from the face of every person that enrolls in a database. These form the basic identification data. Reduction of financial fraud, assassination and kidnapping is the outcome of the work system. It has minimized unauthorized access to confidential documents and impersonation.

Keywords: Security, Authentication, Physiological, Facial, Enrollment,

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1.0 Introduction

Security is of primary concern to the nation. In international setup, the issue of security cannot be swept aside. Government in one way or the other creates a measure to safeguard life and property against bandits, terrorist and men of the underworld. Most of these measures centre on identification of these individuals, and disclosure of vital information concerning them, and subsequently, bringing any culprit to book. A person can be recognized by his various characteristics. You recognize others by their faces when you meet with them. One can also be identified by his voice.Identity verification has originally been by keys, pins, passwords etc. These help to realize the proper person, who owns and or is a member, as the case may be. But these are not absolute ways of identification because, keys sometimes are stolen or lost and passwords are often forgotten or disclosed.

However, to achieve a more reliable identification, we should use something that gives us real points of measurement. The biometrics of a person actually provides vital points that can be used to properly identify him. This method of identification is based on the principles of measurable physiological or behavioural characteristics of the person. Such characteristics as fingerprint, voice sample, pattern of the face, DNA etc, are peculiar to an

individual. These characteristics are measurable and are readily available for any given person. Biometrics technology is considered by its usefulness, ease to use, and its security ability. This can be viewed in two modes, the authentication and verification modes.

2.0 Literature Review

2.1 Biometrics Security

Biometrics security application is best implemented in environments with critical physical security requirements or prone to identity theft, Cory Janssen [8]. The issue of security of life and property cannot be over-emphasized. In the world today, the rates of terrorist attack, kidnapping, hijacking, fraudster activities, murdering, stealing and arm rubbery are growing rapidly. The time these activities are carried out is uncertain, and it becomes difficult to predict their mode of operation. Against this backdrop, there is need for a security mechanism to be put in place, to counter the activities of these undesirable elements in our society. Biometric security system pre-stored individual body characteristics. Stanley et al [15] described biometrics as the most secured and convenient authentication tool that cannot be stolen, forgotten, borrowed or forged. If biometric authentication is used in government offices and individual homes for access, it will reduces kidnapping, fraud, assassination, etc: Thamer Alhussain and Steve Drew [13] in their titled Developing a Theoretical Framework for the Adoption of Biometrics in M-Government Applications Using Grounded Theory described biometrics technology as a tools that can ensure that correct working times are recorded and that only authorized personnel have access to government property and resources. Selina Oko and Jane Oruh [14] described biometrics technology application to ATM security as a means to reduce fraud in ATM industry.

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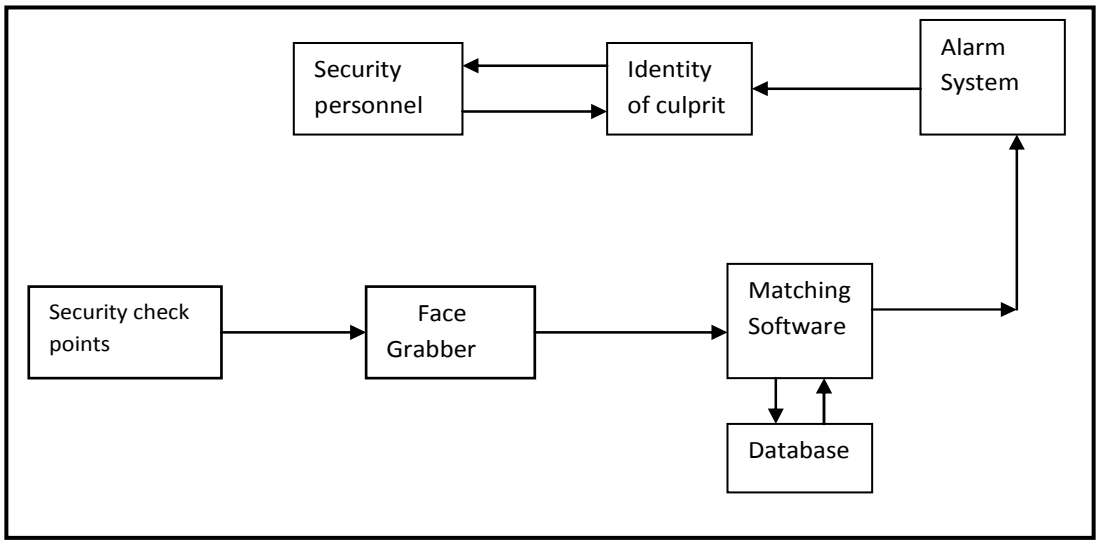

Figure 2.1 Block diagram of biometric enrollment platform

2.2 Biometric Authentication Technology

F.O. Aranuwaand and G. B Ogunniye [1] identified biometric technology as a foundation of an extensive array of highly secure identification and verification solutions, in communication and in our environments. Biometrics is one of the most reliable and secure means of authentication because it uses human distinctive physiological properties like face, eye (retina, iris), fingerprint, etc and behavioural like voice, signature dynamics etc characteristics for authentication Stanley et al (2009) described biometrics as the most secured and convenient authentication tool that cannot be stolen, forgotten, borrowed or forged. Their study identified a number of features that make

biometrics a reliable authentication tools. These include: universality, uniqueness, permanence, collectability, performance, acceptability, and circumvention Authentication involves the ability of the system in verifying the identity of a user to indicate that he/she is whom he/she claims to be. Authentication could be carried out in the following three ways: i) password and pin, ii) token and smart card . Ratha et al, had pointed out that passwords, cards and pins are no more enough to authenticate holders' identity.

2.3 Types of Biometrics Measurement

Biometrics measurement can be classified into two major types Physiological and Behavioral biometric. According to Julia Zangl Colby and Bernadette Koczwara 2004), Physiological biometrics measures the distinct traits that people have, usually (but not always or entirely) dictated by their genetics. They are based on measurements and data derived from direct measurement of a part of the human body. The face is an important part of the human body. It is this part that can tell who you are, and how people can identify you. Imagine how difficult it would have been to recognize even your own brother if all human faces were to look the same. Facial recognition is a natural way of identifying people. This part of the body helps us to distinguish one person from another.

Therefore, facial recognition is a natural means of biometric identification. Originally facial recognition was not regarded as a science because any good camera can be used to get the image of the face. This biometric measurement is collectable and does not have invasive and intrusive effect. According to Kevin Bonsor (2006), human face when observed critically, has some distinguishing landmarks. These he called valleys and peaks, they make up the different features of the human face. These landmarks are called node. The human face contains about 80 nodal points, which include the following and more:

- Depth of the eye socket
- Cheekbones
- Distance between eyes
- Jaw line
- Width of the nose
- Chin, etc

Computer reads in these measurable points, and covert them into numerical codes, (that is numbers that represents the face), and stores it in the database. These codes are known as faceprint. Facial recognition is primarily used by the Law Enforcement Agencies. They use this technology to capture people faces in the crowd. The faces are compared to a database of criminal mug shots to ascertain the presence of any unknown criminal. This system is also used for security surveillance. Facial recognition is also very useful in the following areas:

- Elimination of Voting Fraud
- Computer Security
- Checking-cashing identity Verification
- Home and office security.

3.0 Methodology

In the cause of this research a lot of people were interviewed including my supervisor and other professionals in the field of security and. Educational publication by eminent personalities on biometric and security systems also formed source of our information gathering. Analysis of the old manual methods of security check points was very vital to this work. development of a platform for the biometric traits feature extraction (see figure 3.1). The warehouse of information, the Internet was a backbone of our research, a lot of data were gathered from it.

4.0 Discussion

The server and client components of the proposed biometric application can be installed in our office and home entrances or in confidential areas that requires authentication. It is design secured for this purpose, bearing in mind user convenience and security. In view of this, the requirements of the system are defined as follows: (i) prospective users (office members or customers) for face enrollment which includes user's bio-data or photograph captured by the system after registration (ii) verification and authentication on access which involves physical presentation of the face or passport. Biometrics application in security system remains one of the most effective means in

checking financial fraud, unauthorized access to confidential documents, impersonation, murder, kidnapping etc. The system authenticates a user properly since it is difficult for two persons to have the same biometric traits. It uses Physiological properties like depth of the eye socket, Cheekbones, Distance between eyes, Jaw lines, Width of the nose and Chin in facial biometrics for identification and verification and this gives it an age over other security measures because these traits cannot be cloned. As a good biometrics security system it was able to spot out key areas of the image input, and extracted it from the whole lot of the image and stores this extracted Bio-Capsule in the database. It also matches this Bio-Capsule in the database against a current input presented across for verification and present a result of the match in a yes/no format. (See figure 4.1and figure 4.2) The system is designed to use the web or digital camera to capture the face of people on enrolment and the bio capsules are stored in the database for future matching. A web or digital camera installed on the entrance (Office or Home) captures the face of the user on access, matches it with the one stored in the database. If it matches access is granted other wise denied. A secured communication channel is suggested to be able handle the possible threats of hacking and tampering with biometric feature in the database. More over, the biometric database should be stored in a reliable environment so as to prevent any attacks that may arise from an intruder.

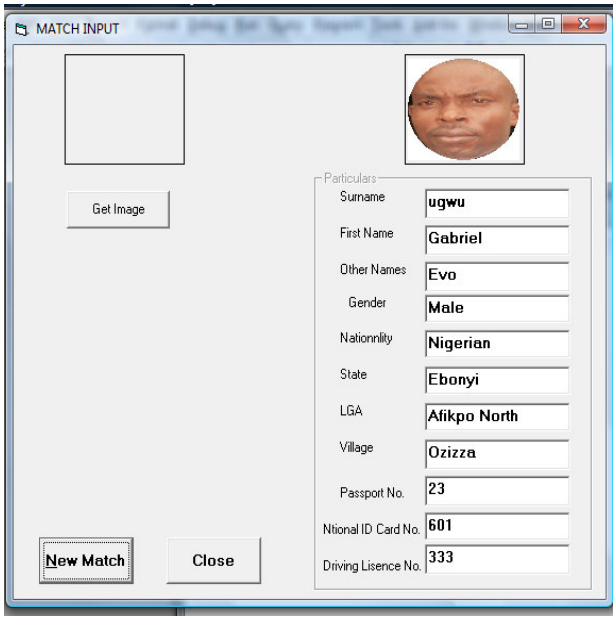

Fig 3.1: samples of pre face extraction mode

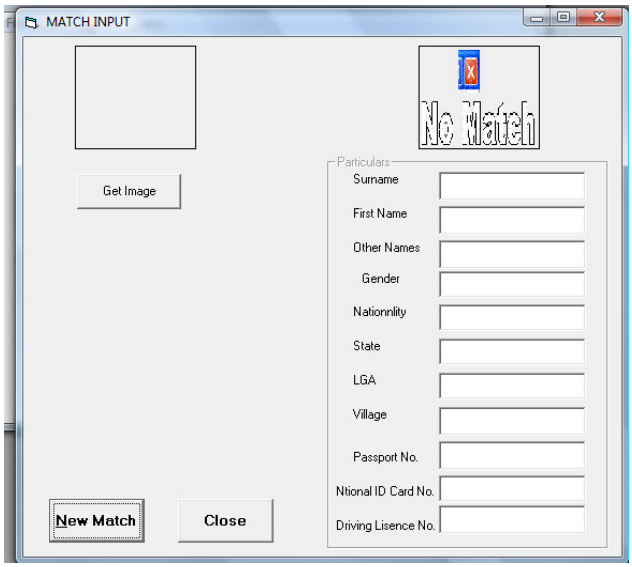

Figure 4.1: output sample for a non match access denied.

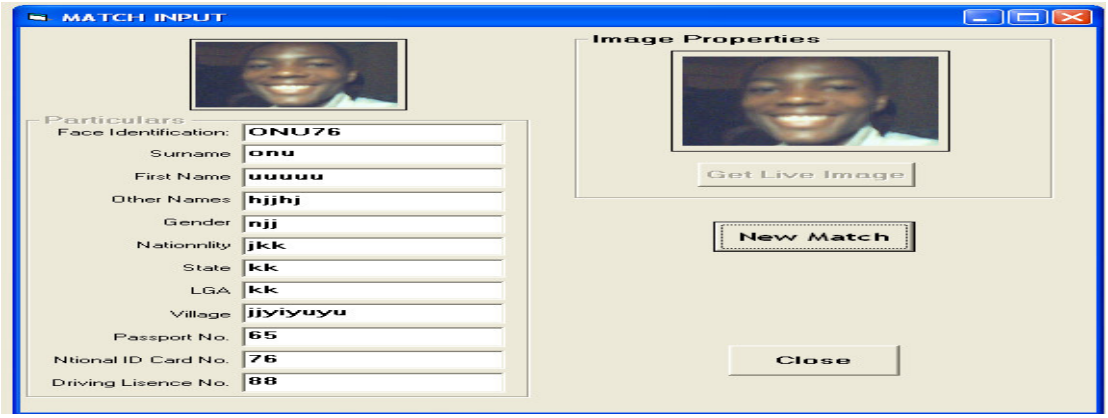

Figure 4.2 out sample of a match, access granted

5.0 Conclusion

An enhancing home and office security to reduce the rate of assassination in Nigeria using biometrics has been developed and implemented for use in our environment. The work embraces facial screening that measure the face pattern to extract the features. The stored bio-information of users is used for authentication. it is targeted for offices and home use to reduces kidnapping, assassination and fraud in our society to the barest minimum . We can store images of the customers, office staff and friends, also families and relations to be granted access depending on the intention of the user. We encourage the Government at both federal and state, level and even individuals, to employ the use of this security system as may be applicable.

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ICT and Pragmatism: Creating sustainable Employment for Graduates in Nigeria.

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Abstract

This article is saying, in a nutshell. that a competently trained computer scientist and IT graduate has no business with unemployment because the Internet is a wealth creator and the engine house that makes this happen is the IT expert. The Internet is the biggest market place in the world. Online transactions in 2008 amounted to over USD $180 Billion and is estimated to grow to USD $263 billion in year 2012 (Credit Suisse). This paper will bring home pragmatism on how IT and Computer Science graduates can create jobs; employ others instead of waiting to be employed. The paper has lined up 23 revenue spinners, for the IT graduate. The actualization of job creation via the internet will depend to a large extent on the provision of the required ICT infrastructure and the promotion of broadband stimulus by government for extending internet access to the remote communities of Nigeria. This paper is significant because over 140,000,000 graduates of Nigeria's tertiary institutions are jobless. This is further buttressed by information from the National Population and Federal Bureau of Statistics: ***The National Population Commission has said that the rate of unemployment in Nigeria rose from 21.1 per cent in 2010 to 23.9 per cent in 2011. The NPC, in the latest report on its website, said the nation's economic growth had not translated into job creation. It said, "Figures from the National Bureau of Statistics clearly illustrated the deep challenges in Nigeria's labour market, where the nation's rapid economic growth has not translated into effective job creation [6]. Thus, unless*** *there is effort to create self employment, this can galvanize unexpected revolution whose consequences will be very grave. The reading public will have to apply the advice provided in this article to create self employment.*

Key Words: e-commerce, online transaction, broadband stimulus, unemployment.

1.0 Introduction

2014 World Bank statistics put the number of Nigerians living in destitution at 100 million, while its latest report released in May 2015 put Nigeria among the five poorest countries in the world! The high rate of unemployment and low per capita income in the country are just two of the indices used by the World Bank in arriving at this assessment The gravity of the nation's unemployment rate, especially graduate unemployment, the trampling of graduate job seekers to death during stampedes at the recent Nigeria Immigration Service (NIS) recruitment drive across the country, presents a graphic picture of the problem [7]. Table 1 presents and forecast unemployment rate in 2015 [8]

Table 1: Actual and Predicted Unemployment Rate (2015)

Nigeria	Actual	Units	Jun 2015	Sep 2015	2020	2050
Unemployment Rate	23.9	percent	28.4	28.6	10.6	7.7

Source: http://ieconomics.com/nigeria-unemployment-rate-forecast [8]

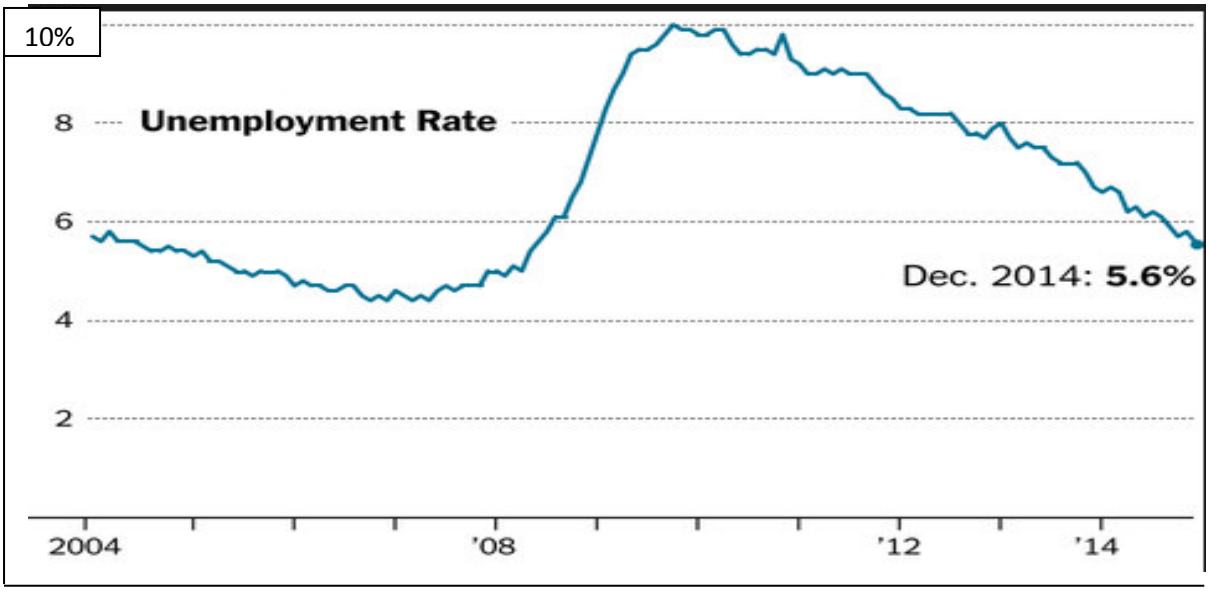

Figure 2: Unemployment rate extrapolation up to 2014

Table 2: Female Unemployment

Year	Percentage of Unemployed Youth that are Female	Percentage of Unemployed Youth that are in Rural Areas
2008	58.50	54.68
2009	57.82	50.77
2010	54.52	47.59
2011	50.85	59.95
2012	55.42	53.25

Source: NISER, 2013

The figures and tables above suggest that all is not well with youth employment.

A recent study by Hamilton Consultants [http://wwv.theinquirer.net][1] has shown that Internet commerce makes up 2.1 per cent or $300 billion of US GDP. More than 10 percent of retail purchases are now made online and Internet-based advertising revenues have increased to more than $20 billion. The employment figures are based on people who

work directly in building or maintaining the Internet's infrastructure, or have something to do with advertising or e-commerce and other direct uses.

In the few short years of existence, the Internet has shown that despite security concerns and slow access, it can deliver on the long sought after goal of electronic commerce and global integration. The main reasons for its stunning and rapid success are its ease of use, low cost and extensive world wide coverage [2] . No other system has ever come close to delivering on these fundamentals in our time. The world is now convinced that Internet works. **Forester Research** estimates that Internet commerce is in a period of hyper growth and will likely reach US $328 billion by the year 2010, a geometric increase over the current level of $8 billion. Another IT research company, IDC, estimates that Internet assisted sales could account for two percent of total world GDP by 2010 and as much as five percent for developed countries. While these percentages are impressive in themselves, it is the rapid rate of growth that is attracting most attention to this new business tool. 'The main products currently selling on the Internet are computer software and hard, office supplies, consulting and research services.

Companies world-wide have recognized the business potential of the internet and are getting connected to this network of Networks by the millions. It is estimated that more than 90% percent of banks plan to use the Internet, for information dissemination and 87 percent will have Internet based transaction by 2015. Approximately 50 percent United States Businesses provide promotional and other information about their companies on an internet website and 75 percent of UK business have an Internet connection.

From an international trade perspective, the Internet is the window to the global village. The potential for companies to reach clients world wide is enormous and the cost for this access offer huge potential benefits to companies in regions distant from the major world markets. Some of the new businesses spawned by the internet are making impressive strides. Amaon.com, one of the first virtual bookstores on the internet, now has annual sales of approximately US $100 million, serves over 600,000 customers world-wide and holds 1.5 million titles. Fashion is another example of a virtual business. Home to I8 apparel manufactures, six fashion magazines and I4 designers, this virtual clothing company is visited 3.5 million times per day by Internet users. Cisco, a leading network router company, currently sells $1 Billion per year on the Internet. And you do no need to be a large organization to benefit - the international Centre (ICT) in Geneva offers free hosting for handcraft products on its virtual trade Mart

Using the Internet, it is now possible to order your custom built Dell Computer, select suppliers from around the world by product or service, review detailed international trade statistics, view the current stock of houses for sale in a particular city, calculate your down payment and mortgage payments instantly on-line, or set up a virtual bank. The Internet is also having a significant impact on the service industries. Research had earlier estimated that on-line airline ticket would reach US $8 billion in 2001. Other services industries directly affected are real estate, insurance and entertainment booking. What is happening here is a process of dis-intermediation where clients can now go directly to the seller (as airline bookings) and perhaps receive more in formation on special promotions, discount, and group or volume purchase plans. This is not to say that the middle man is obsolete. However, in some industries, service agencies will have to look at creative ways of utilizing the new technology and adding value to the new range of information available direct to customer [3]

Service industries that do not recognize this fundamental change in business practice are likely to be in difficulty soon. Companies are also using Internet to provide better service to the client and, thus, millions of' Naira enhanced efficiency, whereby clients can place and track orders, make inquires, and give feedback, 24 hours a day, seven days a week. Interactive sites effectively allow the user to query the company information available, leave messages, request further information or place an order. Not only is this much more convenient from a client perspective, companies estimate savings in the religion of 70 percent over traditional method like phone and fax.

Electronic mail or e-mail, one of' the most popular internet related business tools, is rapidly replacing phone and fax for basic business communications at a fraction of the cost. For example, the cost savings on e-mailing a 10 page report from Lagos to New York would be enough to cover the full internet charges (US $50) for one month. Security is still a significant issue for Internet commerce [4]. Given the value of businesses currently being transacted over the Internet, it is likely that the security risk will be reduced to an acceptable level by the year 2013 AD. Security is in fact being addressed by some of the biggest players in the industry. Visa and Master Card are currently on Secure Electronic Transnational Standard (SET) technology to make credit and transaction safe and this is likely to become the international standard for online commerce. IBM has joined with 16 major banks in USA and Canada to develop the Gold Standard for interactive banking and bill payment. Microsoft is also spending millions on this issue. Security issues are here and companies must face them head on. However, the business potential of the internet is too strong and too pervasive to hold companies back at this stage. Indeed, it is reasonable to speculate that when security on the internet is at an acceptable level, business and public utilization will increase even more dramatically than the current trend and the internet will become the de-facto standard for business transaction and a vehicle for global2. integration.

It has become inevitable that for Nigeria to become relevant in the 21st century, there is urgent need for huge investment in information3. technology infrastructure to ensure benefits from IT products are harnessed for the development of Nigeria and Sub-Sahara Africa. Of particular interest is internet commerce and the need to develop effective web strategy for e-commerce infrastructure in Nigeria.

1.1 Problem statement:

To what extent can computer technology and access to the internet engender a new generation of Nigerians capable of creating self-employment?

2.0 Pragmatic Solutions to IT Graduate Unemployment Via The Internet

1. **Virtual Answer Banks:** Organize a group of' M.Sc/MBA/Ph.D in Accounting with ACCA, ACA and ANAN, CPA, AC1S, MCIA, ACIB, MCPN, MBCS etc. Take up ten years Question papers and give it to various experts to answer. Develop a website and call it Virtual Answer Bank. Advertise and let prospective professional Students register in form of' reading clubs. The registration cost will be a one time payment. This site will be visited by all professional students studying Accounting, finance, banking, Information Technology and Data Processing around the world. If registration is say N2000 and your site is visited by 200,000 members, that will amount to N400,000.000 per annum. In addition you will be collecting advert fee for the site and so many other benefits. This revenue will be enough for the professionals employed and the growth rate will be well over 200% per annum. When I was a student of ICSA/IDPM/BCS in London, I used Answer Bank services and it helped me to pass the ACIS/AIDPM/BCS examinations. At that time, the era of the web had not arrived. It was answers to previous questions of ICSA, ACMA, ACCA, IDPM, BCS etc. printed and posted to professional students on payment of a certain fee in pounds sterling around the world. In this era of the www, the job is made easier via hosting websites with strong database back-ends with adequate storage space.

The same idea can be replicated for Marketing, Insurance. NSL, CPN and other established professional examinations with large body of student population.

Tertiary Virtual Knowledge-based Banks:

Professors can collaborate and open Tertiary Virtual Knowledge-based Bank websites where difficult fields in science, engineering and technology are handled. Questions for five to ten years can be collected from various universities and other tertiary institutions on topics and solved and posted in a secured website. This will include all science subjects at bachelors, masters and Ph.D. This will be so classified. A collaboration arrangement can be concluded with each countries National Universities Commission or equivalent bodies in other countries of the world such that questions

posed by each level in different subject areas are answered by seasoned professionals with PhD and professional qualifications in the field. Different sites can be organized for each specialization but linked with a Metadata. It will be advisable that the key lecturer that teaches such courses is the same person appointed to handle the subject. Such a site will yield millions of US Dollars annually as every undergraduate and graduate student around the world will likely become a member of the club. Two types of membership are proposed - monthly subscription in form of magazine subscription or life membership. Life membership attract membership fee of say N 15,000 while monthly subscription can be as little as N500 so that undergraduates can afford to pay and visit the site. Lecturers too will need the site to prepare students and to set examinations in their respect field of knowledge. Although this is a very difficult task, it will be a money spinner. You do not need to be professor or hold PhD to do this; you need only be an organizer, computer scientist, IT professional or Website Designer and Administrator. Initial capital outlay may not be tremendous as the cost of designing and hosting a website can be less than N200,000, Web Server will be less than N200,000. You will need a one-room office space or a flat. You may employ a Web Designer and Administrator; formalize a business name registration with **Corporate Affairs Commission.** You will need to comb for senior academics and professionals willing to participate in this task and I believe many of them will avail themselves of such opportunities for increased income. You will need a data base of academics in each tertiary institution in each country and the subjects they teach including their contact and email addresses and you will need to sign a memorandum of understanding on collaboration and copyright protection. A good Attorney will advise you. You may need a two or multiple factor authentication for the type of security required to secure this valuable site. A monthly journal or volumes of answers for each of the subjects can be printed for those living where there will be no access to the internet due to infrastructural hiccups which will be discussed under "problems and prospects".

4. **Same vacancy exists for WAEC**, JAMB and University Post UME examinations.

5. **Doctors** can do same for Nursing/Midwifery Examination Boards, Examinations of the West African College of Surgeons/Medical Examinations Board, Medical Examination Council etc.

6. **Virtual Institutions:**

Rapid Results College, Exam Success and Wolsey Hall made some of us forty years ago. Then the Internet was not known as a veritable tool for educational diffusion. You can run your own Rapid Result by organizing e-learning institutions. The Federal government is yet to finalize policy on how to verify knowledge acquired by e-learning and how such knowledge could be accredited and credited. However e-learning is supplementing brick and wall traditional institutions around the world. In most good institutions around the world, assignments and course delivery is based on this method and many good universities have established degree programs up to doctorate via e-learning methods. We were told while on business trip to the US last year that something was being done to encourage education diffusion via c-learning. Late 2009 the National Universities Commission (NUC) published conditions for the establishment of cross-border institutions. It was this objective that informed the reinforcement of the National Open University. NOUN is yet to be fully driven by IT though. The study modules are printed and handed over to the students in the same style as Rapid Results some 40 years ago! However, qualifications obtained through their present method are recognized by government. Government also recognizes qualifications obtained from foreign institutions established in Nigeria with NUC permission. A virtual institution, well organized can be linked to institutions like NOUN, British Open University, US Open University for acceptance of credits for the award of their own degrees. These institutions may need to accredit your virtual institution via rigorous assessment and some level of control over examinations.

Almost every course no matter how technical, including aerospace engineering can be taught in the web. Virtual Realty model and Video conferencing technologies can be deployed. This will however depend on your financial strength for initial capital outlay. You may need to register the institution with Corporate Affairs as a Trustee and may need approval from the Federal Ministry of Education.

7. **E-publishing:**

Taking scholarly articles, books for e-publishing in the web. Prospective customers who try to download them are asked to pay special sum of money. This is another money spinner. There are so many e-journals now in the Internet. These e-journals can also be printed on paper and mailed to subscribers. Some universities do not accept e-journals for promotion to senior academic positions. For this reason you may need to print the hard copy of the e-version.

8. **Small Scale Internet Café:**

Although Internet Café's are not very viable these days because of the cost of maintenance, bandwidth cost, cost of supporting generating sets due to absence of power from the national grid, and cheating by call staff and the ascendance of broadband internet connectivity which makes it possible for individuals to link to the internet with their laptops and modems. However a café can still succeed where there is a good patronage, say in a university campus or densely populated areas without internet service. You may create membership club which pays you one down payment on monthly bases at a fixed cost. This may help you to stabilize your income forecast every month. For patronage to be sustained you need adequate bandwidth with good processors with speeds of not less than 2GHz clock speed and RAM of at least 1G. You may need to register with NCC.

9. **Learn Computer Maintenance:**

After graduating HND, B.Sc, B.Tech, B.Ed in Computer Science/Computer Engineering/IT, arrange to spend six months learning computer maintenance and get experience from those who know how to do it well. This hands-on training is advisable because the university provides you with only basic training. To develop professional ability in computer maintenance, you need this type of training. Repairing laptops is now lucractive though highly technical. If you confident, you will be able to do it, establish your Computer Maintenance Company. You will succeed. Try to see if you can hook up to big companies to maintain their systems on contract. That may do the miracle you have been expecting!

Networking/wireless networking And internetworking:

The networking courses you learnt in the university is intended to lay basic understanding of the technology. You need to do some apprenticeship in strong networking firms to get experience on wired or wireless LAN, MAN, WAN. INTRANET, EXTRANETS and inter-networking technologies. Try Cisco certification for wired and wireless technology when you have acquired the training and experience. Confident? Go ahead and establish an IT firm anchored on Network line of business. In addition learn about structured cabling and fiber optics cabling technology. All these training must be industry-based. Do not expect this level of training in your degree programs, even if your degree curriculum contains outlines of these programs. Every organization in the world is desirous of networking their systems for seamless communication. Wireless networking is becoming popular for interoperability, quick deployment and enterprise integration. So there will always be jobs for you. What is most important is that you must be able to deliver!

Fibre optics cabling:

The preponderance of wireless/satellite technology for internet diffusion in Nigeria notwithstanding, the future holds plenty of hope for professionals who know how to deploy fibre optics cabling. As soon as 1CT infrastructure is in place in Nigeria, the next line of expectation is that most organizations will link to a fibre optics ring. This means there will be need to migrate from the present twisted pair LANs to fibre optics cabled networks.

Do practical software engineering and development:

Learn how to develop software architecture. This will enable you to design any software no matter how sophisticated. However. you need skills in writing programs in C, C++, Java, Cold fusion, VB.Net, PHP etc. It takes time and sacrifice to really know how to program. Knowing how to program is a different bail game from designing a software archetype. You need both skills and you will be on your way to becoming Nigeria's Bill Gates. For a successful software company, you will need skills in Reverse Engineering, Component-based software Engineering, computer securities, information assurance and computer forensics to secure your investment. Additional skills in Firmware programming and burning including embedded systems will be an advantage. Take IEEE and CPN Software Engineering Certification, SUN JAVA certification or Microsoft Certified Software Engineer Certification if you are strong enough to prove your mettle. This will give your prospective clients confidence that you can deliver.

10. **Become a Specialist in Web Engineering, Hosting and Administration**:

A collection of the independent websites makes the World Wide Web. Every organization that intends to show internet presence must have a website including individuals. So you can see how big the market is. Website continues to undergo refinement and re-engineering due to new trends and competitions. A firm can gain a niche in Website Engineering and administration. You need skills in HTML, DHTML, Dream Weaver, Flash, ColdFusion, PhP for rapid web development and deployment. You can learn and gain experience from individuals who do it or from specialized institutions that possess tremendous experience in Web Engineering. Once a niche is created and there are proofs that you can deliver, your miracle may well be on the way. One thing peculiar to IT training is that you must not be clever by half. You must know what you are doing and must deliver as expected and on schedule. Half baked training is not acceptable!

3.0 Job Opportunities In The Web

1. Affiliate Marketing/Google Adwords

Affiliate marketing is unarguably the world's easiest, cheapest and fastest business to start. It is so cheap that you can start it with less than $25. You can earn more than $1 million dollars from it annually, and so fast that you can begin earning money from it in less than an hour! And the earning potential keeps increasing daily. You do not need to own a product, service or website of your own and about two hours of browsing a week would he enough for you if you are ready. Affiliate Programs: More than 350 million times daily, people from all over the world use Google.com to search for products and services they want to purchase online. More than 90% of these people have credit cards or other means for online payment (e.g. PayPal). At 350 million searches daily, you will agree with me that Google.com gets lots of visitors.

Affiliate programs involve your partnering with different websites on the Internet which have items for sale. These items could be phones, books, furniture, electronics, cars, jewelries, web hosting, bags, boats or virtual goods like software, ebooks etc. Forming such partnerships is very simple - just fill out a form. Now, since lots of people are already searching for lots of different products and services to purchase, you simply partner with any website/company whose products are on demand and **then place adverts on Google.com for them**. For each sale you help any website/company you partner with, they pay you a commission (a percentage). These adverts you place on Google are called Google AdWords. They appear on the right of your search results.

The commissions you receive per sale may range from $25, $40, $50, $75, $100, even $150 depending on the product. For instance if you are generating only 1 sale a day at a mere $50 commission payout, you will be making $50 per day. This will yield approximately $1500 a month! This is equivalent to $1500 x N150 = N225,000. No fresh graduate earns this much in the Civil service in a month in Nigeria!

Google AdWords:

It is a very efficient advertising system developed by Google. It costs you only $5 dollars to register and you are charged only when someone clicks on your advert. The minimum cost per click is about $0.05 (5 cents),

yet you gain a commission of $50.-$0.05 = $49.05 per click.

How does Google know the sale was made through your advert? Whenever you choose an affiliate product to promote from an Affiliate Website such as ClickBank.com, Clck2sell and CJ.com, you are given a special unique tracking code (Link) which is used to know whenever someone buys through your advert. And whenever someone does, the sale is unfailingly credited to you. In most cases a "cookie' (small computer program) is placed on the persons computer so that you are still credited with the sale if the person comes back to buy, say within the next 6 months! For inexplicable reasons C/ickBank.com no longer accepts registrations from Nigeria. However, a US address can be used to collect your cheques if you operate from Nigeria. Digital downloadable products such as ebooks, software etc are preferred in place of tangibles like Cell Phones, Plasma TVs, Toys, Cars etc because digital products sell like hot cakes! Their prices are mostly not expensive and people are mostly on the Internet for information, hence they buy them more. Furthermore, you could earn as much as 75% commissions on each sale from your adverts which is not possible with physical goods like cars and TVs. Clickbank.com sends out commission cheques on the 15th of every month. To sign up for Google Ad Words costs only $5 and ClickBank.com is free to join. 4.

2. **Google Adsense:**

If you have your own page on the Internet or a free blog, you can get paid every time a person visits it and clicks on a link. All you do is submit your application to sign up to Google's Free Adsense, take the simple code they give you, "copy and paste" it onto your page or free blog, and money will start flowing in. No matter what your topic is, google will automatically place little advertisements related to the exact topic of your Page, so people will not be seeing random ads but ads of things they are probably interested in learning more about! Each time someone clicks on one of these little "adverts",5. you get paid as much as $0.50, $2.00, $5.00,6. even as much as $10.00 per click. Thus, if you get say 100 clicks in one at $0/50 a click you will earn $50 per day. You will be sent a cheque once your earnings is up to $100. Adsense is the revenue source behind most blogs, websites and forums on the internet.

1. **Paid Online Surveys**.

Just give your opinion and get paid for it.! By participating in a survey you are giving companies your opinion on different products and services, it is much more cost effective for the company than doing it through the mail or on the telephone. By filling out an online survey you help the companies to serve the needs of the consumer better. Doing surveys for pay requires nothing more than an internet connection and your opinion. If you can sign your name and click a mouse, you can make extra cash right away. All you have to do is to register your name and password with a website that offers this kind of job, they will immediately send them to your email just open your inbox and click on a survey link. It takes just a few minutes to answer basic questions about your shopping preferences, and then, with a click of the mouse, there's money in your account. Anywhere from £1- £100 for just 15-20 minutes of your time, while you lounge in your comfortable clothes and listen to music, or even watch TV. For instance, if you do only four (4) surveys a day, at $20 per survey, you can make $480 per week, $2120 a month, or $23,440 a year!

4, **Email Marketing and Newsletter Publishing:**

Learn how you can start an online publication plus how to build a HUGE database of people who you can regularly sell your products and services to. You can set up all the content you want to send to your readers for full year in a single day - and then forget about it! Whenever the dates you have chosen arrive, your newsletter or c-zinc auto-responder will automatically send your publication to all your subscribers. Publishing a newsletter costs you almost nothing because you only pay for the auto-responder service.

5. Online shop/Store:

Open a small shop/store and put it on the web. By putting it on the web you are keeping your doors open for 24/7 and make sales round

the clock. The shop will experience a quantum growth in a short time.

6. **Invest Online:**

One of them is euro wide, a great H.Y.1.P company. They used to pay 27% for every investment you make for four days but recently they reduced it to 10% because everyday more and more people are discovering them. For every investment that you make you will get 10% returns in four days time. This means if you put in $50 in four days time your money will be $55. That is a $5 added. The minimum amount you can invest is $5. If you put in $500, in 4 days time, you will get $50 profit. Invest the whole money back and in a month's time you will get more than $350 as profit. It is better to have N1i million where it will be multiplied than just putting it in a hank with little returns.

7. **Online Currency Trading/ePayments and Account Funding**.

This has to do with making money online buying and selling money. You can earn good income by funding c-gold, Credit Cards and PayPal accounts for people.

8. **Take Your Present Offline Business Online And Make It 100 Times More Profitable.**

You can dramatically increase the pro1tability of your present business by taking your transactions online. Begin selling your products and services online, increase your customer base and boost your profits. The following list of items can be sold via the net:

- Used mobile phones - working condition.
- Used mobile phone — not in working condition (will require good marketing)
- Used iPhone - working condition.
- iPhone not in working condition (selling skills needed)
- Used MP3 player
- Unused MP3 player
- College Textbooks
- College lecture notes
- High schools assignments
- College assignments
- Sun-glasses
- Swim suits
- Used pair of jeans
- Vintage Shoes
- Trophies and tiaras
- Used tuxedos
- Unused tuxedos (bought, but not the right size)
- Promo dresses
- Wedding dresses (time of need can make a woman sell anything)
- Chess boards (I don't know why, but people do)
- Used Digital cameras - working condition
- Used Digital cameras - not in working condition
- Novels (because the local library won't give a good price Ir it)
- Autographed memorabilia (again, time of need can make a man sell anything)
- Vehicles (cars, bikes, skateboards etc)
- Girl friends (yes, this is the silliest that 1 have come across, but one website has a girlfriend for sale)
- Husbands (looks like the wives are now taking control, and selling their husbands online?)
- Pet supplies (unused)
- Gift Certificates (unused)
- Letterman jackets
- Real Estate
- Guitars
- Pianos
- Violins
- Microphones
- Antique furniture
- Antique jewelry
- Accessories
- Laptops and computers (used and unused)
- Paintings
- Artifacts
- Movie DVDs
- Music
- Old coins and other collectors items
- Software
- ebooks

9. **Quick Website Design:**

Web designing is absolutely ten times easier than you think and besides you do not even need to know how to write HTML, CSS or JavaScript codes to be able to design a website. You can easily use website templates or What You See IS What You Get (WYS1WYG) editors like Microsoft FrontPage or Macromedia Dream weaver to easily design websites. Using

templates or WYSIWYG editors makes the design as simple as typing up a document in Microsoft Word!

10. P**ay Per Lead Programs:**

These pay per lead programs are easy to join and start making money in less than 30 minutes because all what you are required to do is to refer (lead/derive/direct) others to sign up or download a free software through your special link that will be given to you, they do not even need to buy any thing and you will get paid for directing them, this is because the website needs you to introduce it to more people. This will translate to their success.

3.0 Government Stimulus For Broadbani) Diffusion As Solution For Web Job Creation

To eliminate the current gap chasm emanating from the absence of' a cheap ICT infrastructure to drive Internet diffusion in Nigeria, the Dr. Goodluck Jonathan led administration should borrow a leaf from the current US President who plans to invest $7.2 billion to Fund grants aimed at improving access to broadband in the US, especially in areas that have little access to fast Web connections [http://www.businessweek.com] Last year, as part of the $787 billion budgeted for the project. For the American Recovery & Reinvestment Act, Congress approved $4.7 billion in funding through the National Telecommunications & Information Administration (NTIA), with the remaining $2.5 billion going to the Agriculture Department of Rural Utilities Service (RUS). The first batch of funding, about $183 million, was awarded to 18 different organizations in December, and another $7.5 billion was awarded in a grant to the city of Los Angeles on January 13, 2010.

William Lehr [5] a research scientist and economist at the Massachusetts Institute of Technology (MIT) who has researched the economics of broadband access has confirmed accelerated growth in employment due to expansion of broadband access to the Internet. Broadband would enable us to move to the places we really wanted to live, as opposed to the cities that we live in. However, people who live in areas where high-speed internet access is not available or too expensive are left at a social any economic disadvantage. He posited that in an era when employers typically demand a familiarity with the Internet for even entry-level jobs, and when elected officials communicate with the public via e-mail and twitter, there is a case to be made that people without access to affordable broadband miss out on significant aspects of modern life. Thus, the research further confirmed that increased availability of broadband tends to result in more jobs for companies with high concentrations of professional, administrative, and scientific needs, and fewer for manufacturing firms. The effect is also stronger in places with lower populations as local businesses find ways to reach new markets farther a field. Increased availability of broadband also results in higher tax returns for municipal and county governments as property values increase and the number of people paying taxes rises The research has concluded therefore that there is a strong correlation between economic growth and broadband internet access.

Broadband is anchored on the new 4G wireless technology called Worldwide interoperability for Microwave Access (WiMax).

Wimax is a cutting edge technology geared towards providing wireless data over long distances in variety of ways ranging from point to point links to a full cellular type. It is the next generation of wireless technology designed to enable pervasive, high-speed mobile internet access to the widest array of devices including notebook PCs, handsets, smart-phones and consumer electronics such as gaming devices, cameras, camcorders and music players. In Nigeria Mobile! WiMax 4-G network will offer broadband services at access speeds ranging from one to 10Mbps per subscriber giving the user uninterrupted internet access irrespective of location. Also Galaxy Wireless Communications Ltd has launched Nigeria's first portable plug-and-play broadband wireless service, G-MAXTM based on the emerging mobile WiMax 802.16e standard in Abuja and Port-Harcourt. The G-MAXTM brand provides fixed and mobile wireless broadband Internet and data services at highly affordable costs designed to massively increase Internet penetration in Nigeria. It is the first plug-and-play nomadic broadband solution in Nigeria

based on a hybrid of the Smart AntennaTM, Multi- Carrier Wireless Information Local LoopTM and emerging Wh\IAX technologies.

3.1 Government has to urgently address the power sector problem.

3.2 Government needs to sustain PPP to create a national fibre optics backbone to reduce the preponderance of satellite as the key tool for internet diffusion in Nigeria.

3.3 Broadband technology however remains the most practical approach to make Nigeria to join the rest of the world in the new global information society.

3.4 EFCC should fortify her personnel with computer forensics tools to arrest and successfully prosecute internet fraudsters. This will act as a deterrent and reduce the incidence of internet criminality.

3.5 Most payments in the internet are via VISA and Master Cards. Authentic and reliable electronic payment platform need be established and all banks, not just few, should join the race.

3.6 Government must re-launch a new communications satellite to bring down the cost of monthly bandwidth paid by ISPs in Nigeria which is transferred to consumers.

4.0 Bottlenecks

Although the Internet and c-commerce have created several avenues for self-employment, there are many problems on the way to realizing this goal in Nigeria:

a) Lack of functional curriculum to help produce functionally educated graduates with applicable, adaptive skills in the IT industry. Tertiary institutions curriculum may need retooling. It may involve refocusing technical programs to achieve best fit between educational institutions and the industry. The new Federal Government's National Innovation Institutions may well be the answer!

(b) The near absence of electricity is a major bottleneck towards the realization of economic impact of IT and c-commerce. Without power, only limited achievements can be made in this direction. The cost of powering generators can discourage prospective investors. Nigeria is yet to explore alternative energy to power computers and the internet. Most times there is no power to run the computers!

(c) Internet scam & Security bottleneck: A large percentage of job advertisements in the net are fraud. There is however techniques to identify fraudulent sites:

Dodgy websites come in many shapes and sizes, including:

• Phishing sites that try to steal your identity.
• Fraudulent online shops.
• Bogus charity websites
• Tempting sites that contain viruses or spy ware.
• Sites that (unexpectedly) contain illegal or pirated content,
• Sites that promote worthless investments or get-rich-quick schemes.

It is very easy to clone a real website and criminals can use virus-infected computers to host a dodgy website so it costs them nothing to put it up. It does not take a skilled developer long to produce a very professional-looking site.

Phishing:

Phishing is a scam where criminals send emails to thousands of people. These emails pretend to come from banks, credit card companies, online shops and auction sites as well as other trusted organizations. They usiicil1' contain a compelling bait bogus reason to go to the site, far example to update your password before your account is suspended. Victims click on an embedded link in the email itself which takes them to a website that looks exactly like the real thing but is, in fact, a fake designed to trick victims into entering personal information such as a password or credit card number.

Risks

• Identity theft.
• Fraud.
• Theft from your bank account or credit card.
• Virus infections

How to spot a 'phishing' email

Criminals can make an email look as if it comes from someone else.

Fake emails often (but not always) display some of the following

characteristics:

- The sender's email address does not tally with the trusted organization's website address.
- The email is sent from a completely different address or a free web mail address.
- The email does not use your proper name, but uses a non-specific greeting like "dear customer."
- A sense of urgency; for example the threat that unless you act immediately your account may be closed.
- A prominent website link. These can be forged or seem very similar to the proper address, but even a single character's difference means a different website.
- A request for personal information such as user name, password or bank details.
- You weren't expecting to get an email from the company that appears to have sent it.
- The entire text of the email is contained within an image rather than the usual text format. The image contains an embedded hyperlink to a bogus site.

How to spot a fake website

We recommend that you install the latest version of your web browser. Internet Explorer 7 and Firefox 2 both have sophisticated fillers that can detect most fake websites.

Below are some other clues that might give away a fake site:

- Use your instincts and commonsense. If it smells bad, it is probably rotten.
- Look for evidence of a real-world presence: an address, a phone number, an email contact. If in doubt, send an email, make a phone call or write a letter to establish whether they really exist.
- Consider using a spam email filler that will detect and block many fraudulent emails. Be wary of **hoax emails and advance fee fraud emails.**
- This kind of fraud also takes place over the telephone and in person. Be wary of **social engineering** in any form.
- Do not give out personal information unless you initiated the contact and you al-c sure you know who you are dealing with.
- If in doubt contact the bank or website owner direct by telephone or email before proceeding.

1.0 Summary, Conclusions and Recommendation

Internet technology today is a pre-requisite for national economic growth. Nigeria may fail to fully utilize the benefits of this technology however if the attendant bottlenecks such as pool- electricity supply, lack of effective e-payment system, restructuring/retooling of IT curriculum in our tertiary institutions towards the direction of the new National Innovation Institutions formula, reinforcement of EFCC capacity to fight internet criminality and acquisition of extended capacity in Computer Forensics. Government would need to do more investment in Information Technology infrastructure and promote Stimulus For Broadband Diffusion As Solution For Web Job Creation as is currently being c/one by the US President, Barrack Obama. It is. only through it4G communications technology which the remote communities of Nigeria can access the Internet because there is total absence of IT infrastructure in these re/note villages and it is unlikely such infrastructure would be made available in the next 10-20 years. The only way to leapfrog this gap chasm is the 4G broadband revolution!

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Hybrid Bee Ant Colony Algorithm for Effective Load Balancing And Job Scheduling In Cloud Computing

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Abstract

Cloud Computing is new paradigm in computing that promises a delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility (like the electricity grid) over a network (typically the Internet). Cloud Computing is a new style of computing on the internet. It has many merits along with some crucial issues that need to be resolved in order to improve reliability of cloud environment. These issues are related with the load balancing, fault tolerance and different security issues in cloud environment. In this paper the main concern is to develop an effective load balancing algorithm that gives satisfactory performance to both, cloud users and providers. This proposed algorithm (hybrid Bee Ant Colony algorithm) is a combination of two dynamic algorithms: Ant Colony Optimization and Bees Life algorithm. Ant Colony algorithm is used in this hybrid Bee Ant Colony algorithm to solve load balancing issues whiles the Bees Life algorithm is used for optimization of job scheduling in cloud environment. The results of the proposed algorithm shows that the hybrid Bee Ant Colony algorithm outperforms the performances of both Ant Colony algorithm and Bees Life algorithm when evaluating the proposed algorithm performances

Keywords — Ant Colony Optimization algorithm, Bees Life algorithm, Scheduling Algorithm, **Performance, cloud computing, load balancing, Waiting time, Response time**

1.0 Introduction

Cloud computing is a general term for anything that involves delivering hosted services over the Internet. Basically, two kinds of cloud are identified in cloud environment. The first type is public cloud. This type service may be sold to anyone on the Internet. Here, Amazon Elastic Compute Cloud (EC2) [1], Google App Engine [2] are large public cloud providers. The second type of the cloud is the private cloud. It is a proprietary network that supplies hosted services to a limited number of clients (end-users). Cloud computing enables users to remotely run services such as Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS) [3].

In cloud computing Load balancing is the process of distributing the load among various virtual machines of a cloud computing system to improve both resource utilization and job response time while also avoiding a situation where some of the virtual machines are heavily loaded while other virtual machines are idle or doing very little work. Load balancing ensures that all the virtual machines in the cloud system or every node in the network does approximately equal amount of work at any instant of time. In cloud, there are existing of many dynamic algorithms such as Ant Colony Optimization, Bees Life algorithm, Particle Swarm Optimization and Bee Colony Algorithm. This research paper combines Ant Colony Optimization algorithm and Bees Life algorithm to establish an effective load balancing and efficient scheduling algorithm than can be implemented in cloud environment to ensure that all Virtual Machines are busy in their assigned jobs and none of the Virtual Machines gets Idle.

In view of this the main objective of this research is to develop an effective load balancing and scheduling algorithm by combining Ant Colony Optimization and Bees Life algorithms in order to improve the different performances for both cloud users and providers.

2.0 Related Works

2.1 Job Scheduling in Cloud Environment

Job Scheduling aims at assigning jobs to datacenters in the cloud so that the execution time (makespan) of the overall tasks of jobs is minimized.

Jing Liu et al [3] proposed Multi Objective Genetic Algorithm (MO-GA) for dynamic job scheduling that combines both random and greedy initialization methods. In their research the fitness is calculated by energy consumption and profits of the service providers. Here, the two parameters used to calculate the fitness can be a dependant of the economic situations of user(s) and therefore not much appropriate to be used as a good parameter for the calculation of the fitness.

Another algorithm was introduced in [9] that are based on the reproduction principle of bees which is referred to as marriage in honey bees optimization algorithm. In the marriage in honey bees optimization algorithm it starts with randomly initializing the queen's genotype and then a heuristic is applied to improve the queen's genotype with that therefore preserving the assumption that a queen is usually a good bee. Next, a set of mating–flights is undertaken relatively to the queen's energy and speed. The queen then moves between different states (solutions) in the space and mates with the encountered drones according to probability criterion.

In [8] Tasquia M. et al. proposed modified task scheduling algorithm that combines bees life algorithm and greedy algorithm to obtain job scheduling optimization in cloud environment. With their algorithm the Bee life algorithm was used for the job scheduling and the greedy algorithm was used for randomly selection of a data centre.

2.2 Load Balancing in Cloud Environment

Linan Z. et al. [5] proposed Ant Colony Optimization algorithm to solve travelling sales man problem. Ant colony algorithm chooses the target path through the pheromone strength. This ant colony algorithm achieves QOS requirement and shortest path. Thus ant colony algorithm gives more efficient result for calculating node distribution and load balancing.

Zehua Zhang and Xuejie Zhang [11] described about Load balancing mechanism based on Ant Colony. They described about the function of Load balancing and how to distribute the workload in a cloud and to realize a high ratio of user satisfaction. They described the two

characteristic of Complex Network and these two characteristics are considered for the move of the ants in the work, since the ants move more quickly towards that region where more resources found.

In [7] Marco Dorigo and Luca Maria Gambardella introduced real and artificial ant. An artificial ant colony, that was capable of solving Travelling Salesman Problem. Real ants are capable of finding the shortest path from food source to the nest without using visual cues. Also, they are capable of adapting to changes in the environment, for example finding a new shortest path once the old one is no longer feasible due to a new obstacle.

3.0 Proposed Algorithm - (Hybrid Bee Ant Colony Algorithm)

3.1 Conceptualized Framework

The proposed algorithm combines both ant colony optimization algorithm and bee life algorithm to improve the effectiveness of load balancing and cloud scheduling. In this proposed algorithm Ant colony optimization algorithm is used to determine the load balancing problem in cloud and Bees life algorithm is an optimization algorithm used for job scheduling. The bees' life algorithm is used to search the information such as bandwidth and execution time of neighboring, and maintains as a table. If user gives any job as an input to cloud, the BLA first gets the job details and calculates the fitness for each job.

After the calculation of the fitness for each job the Ant Colony Optimization algorithm is therefore used to determine the best path for resource allocation and shares the workload for all the virtual machines.

3.2 Pseudo code for Proposed algorithm.

a. Initialize population (*N* bees).
b. Evaluate fitness of population.
c. ***While*** stopping criteria are not satisfied (Forming new population)
/* **reproduction behavior** */
d. Generate ***N*** broods by **crossover** and mutation
e. Evaluate fitness of broods
f. If the fittest brood is fitter than the queen then replace the queen for the next generation
g. Choose *D* best bees among *D* fittest following broods and drones of current population (Forming next generation
h. drones)
i. Choose *W* best bees among *W* fittest remaining broods and
j. workers of current population (to ensure food foraging)

/* **food foraging behavior** */
k. Search of food source in *W* regions by *W* workers
l. Recruit bees for each region for **neighborhood search**
m. Select the fittest bee from each region.
n. Assign remaining bees to search randomly and evaluate their fitness's.
o. **End While**
p. Initialize parameters and pheromone trails.
q. ***While*** stopping criteria are not satisfied.
Do
Make all Ants Construct their Solutions.
Update pheromone trails
End Do

3.3 Flowchart for proposed algorithm

Figure 1.1 shows the flowchart of the proposed algorithm

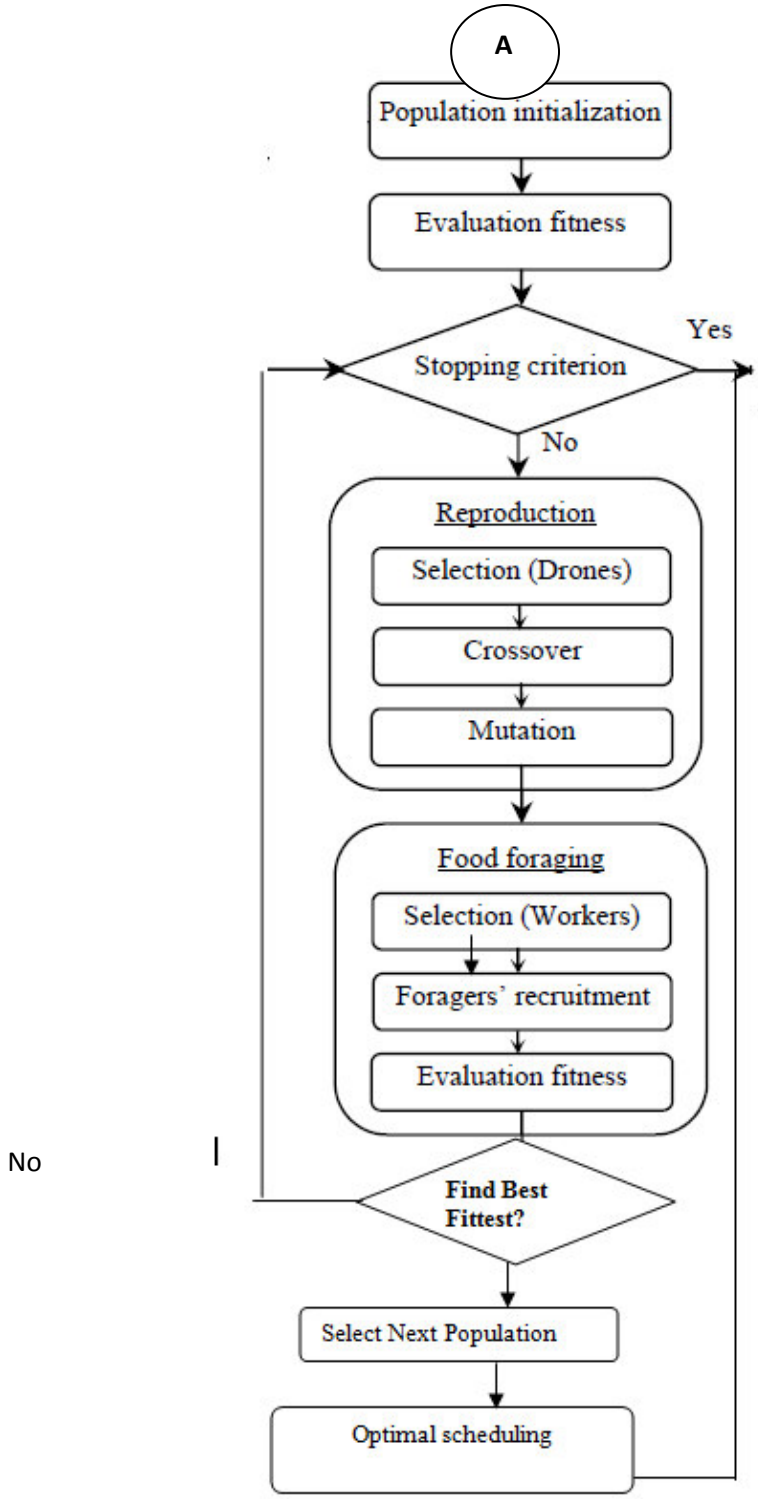

Figure 1.1: Proposed Hybrid algorithm for job optimization.

4.0 Results

For better performance comparison the researcher formulated several test cases for bee's algorithm, ant colony's algorithm and proposed hybrid Ant Bee life algorithm. Table 1-1, Table 1-2 and Table 1-3 give the results of the response time and Data Centre processing time for Ant Colony, Bee Life and the proposed algorithm respectively.

Table 1.1: ***Ant Colony Algorithm Results***

Overall Response Time Summary			
Time	Avg(ms)	Min(ms)	Max(ms)
Overall Response Time	566.02	45.29	22207.9
Data Center Processing Time	207.30	2.36	31698.4

Table 1.2: Bee Life Algorithm Results

Overall Response Time Summary			
Time	Avg(ms)	Min(ms)	Max(ms)
Overall ResponseTime	542.51	40.10	10306.31
Data Center Processing Time	189.02	2.76	16920.16

Table 1.3: Hybrid Ant Bee Algorithm Results (Proposed Algorithm)

Overall Response Time Summary			
Time	Avg(ms)	Min(ms)	Max(ms)
Overall ResponseTime	462.02	26.10	10306.3
Data Center Processing Time	126.18	1.02	30078.2

Comparison of overall response time and Data Centre processing time are shown in Figure 1.2.

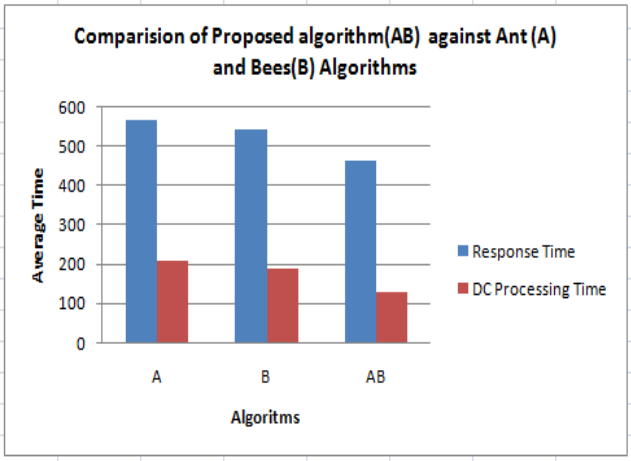

Fig 1-2: Results of Algorithms Compared

5.0 Conclusion.

In this paper, a new algorithm for both job scheduling and load balancing in cloud computing has been proposed. In this algorithm there is emphasis on deposition of pheromone. Here it is observed that when a node with minimum load is attracted by most of the ants gives result to the maximum deposition of pheromone resulted in decrease in waiting time and response time of the data center.

Again, this hybrid algorithm achieves overload avoidance while the number of resources are increased, thus the resources utilization are balanced for systems with multi resource constraints when the proposed algorithm was investigated

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Development and Evaluation of a Computer-Aided Learning (CAL) Package on C++ Programming Language

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Abstract

The increasing rate at which access is being provided to education worldwide is due to the growth in computer technology and its application in education. Technology has created a great potential for borderless education. The potential for growth is tremendous particularly in higher education even in developing countries like Nigeria. This trend has caused educators to have a re-think of the very nature of teaching, learning and quality of education. Against this background, this paper was aimed at teaching students the fundamentals of C++ programming language in higher institutions in Nigeria using Computer Aided Learning software system (CAL) developed for C++, which is a course being taught at the 2nd year, 3rd year and 4th year to students of Engineering and Computer Science in the universities and HND 1 in the polytechnics. Quantitative feedback was collected from students and teaching staff using paper-based questionnaires. Student examination marks were compared for 2007/2008 and 2008/2009 sessions, allowing a comparison of student performance before and after the replacement of the traditional lecture with the CAL package. Ethical approval for the study was granted by the institution's ethics committee. The CAL package on C++ programming was well received by teaching staff and students. Students' performance in examination improved after the introduction of CAL program, suggesting that it provides a suitable alternative to didactic teaching. The creation and distribution of the CAL package on CDROM and its availability via the Internet are intended to contribute to the general learning of programming languages. The package sets a precedent for the development of more Internet-based, student-authored CAL packages in the future, thus roviding additional resources for independent learning.

Keywords: Computer Aided Learning (CAL), C++, programming, learning, teaching, education

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Introduction

The programming knowledge requirements for engineering, science and technology students have been debated for many years, and concerns have been expressed about this, especially in the higher education sector. This paper considers a programming course, C++, specifically designed to address some of these issues of the introduction of CAL packages. Traditionally, at the Federal University of Technology Owerri (FUTO), the 3rd year Computer Science students attended a single 1-hour didactic lecture on C++ programming language within the programming courses. The lecture covered the fundamentals of programming, basic declarations, expressions in C++ and control structures. The main learning objectives were for students to have a full understanding of the basics of programming and how to relate these to understanding C++ programming language which is a scientific programming language that must be taught and passed by all Computer Science students and some other engineering-based students during the same course. Computer Aided Learning (CAL) represents an alternative, independent method of instruction. CAL has been available to students in different fields of endeavour [1]. A previous evaluation study at Glasgow demonstrated that CAL is a suitable replacement for didactic lectures on the subject of diagnostic imaging [2]. To create an alternative to the traditional didactic lecture described above, an interactive CAL package on C++ programming language was created during the 1st semester of 2007/2008 and refined throughout the session, with evaluation extending into the following academic session.

Computer Aided Learning (CAL) can be defined as a way of individualizing instructions by making use of the computer as assistance for teaching, reading and learning. Computer Aided Learning (CAI), is a diverse and rapidly expanding spectrum of computer technologies that aide the teaching and learning process. Examples of CAL applications include guided drill and practice exercises, computer visualization of complex objects, and computer-facilitated communication between students and teachers. The number of computers in American schools has risen from one for every 125 students in 1981 to one for every nine students in 1996. While the United States leads the world in the number of computers per school student, Western European and Japanese schools are also highly computerized [3]. In CAL lesson, the user and the computer are usually involved in a dialogue process. The dialogue can be via the screen and keyboard (which is mostly common) or by using speech input etc. the major advantages they have are that the pupils are captivated by the terminals, they learn at a fast rate with a high level of retention and finish each session of the subject with a sense of accomplishment.

In the CAL package, a form of interaction between the user and the computer is made possible in such a way that necessary action can be carried out to a response made by a user. CAL packages are designed with an anticipation of making the learning process less tedious and much more interesting to the user. Figure 1 depicts integrated components which make up CAL. The developed software package - Computer Aided Learning of C PLUS PLUS (CALCPPLUS) - is classed under the CAL (Computer Aided learning) packages. The package has the facility which allows the teacher to store questions on his own, using a database which is part of this software. It also has the facility which allows the students retrieve the question which appears in graphics mode to make the student more interested in it. Many educators agree that the most pressing problem affecting the use of computer aided learning or computer aided instruction as a classroom tool today is the need for high quality software [4, 5]. There are varieties of software tools that are used in the design and development of CAL packages. Some of these are: Visual Basic programming, ASP.Net, C++, etc. Besides, some web-designing programming software such as Hypertext Mark-up Language (HTML), Microsoft PowerPoint, Microsoft FrontPage, Macromedia Dreamweaver, etc. could also be utilized to some degree. Each of them has a distinct advantages and disadvantages of one form or the other.

Impact of Technological Education

The advancement in technological education has left a distinct gap between developed and the developing world. One of the several reasons why the United States became a technological leader in the 20th century was its development of an advanced system of technical education. Mechanical arts schools began in Philadelphia in the 18th century, and by the end of the 19th century they had spread to every major American city. In the 20th century, a state-based system of vocational education provided training in basic technical skills. Between 1862 and 1890, engineering and agricultural colleges in every state were funded by a federal programme known as the Morrill Land Grant [6]. Many technological innovations of the 20th century promised breakthrough in the methods and effectiveness of teaching for the 21st century. Some of the most promising innovations included access to Internet and programmed instruction (instruction delivered in a graded sequence of steps, usually by means of a computer or other device). The revolution in computer and communications technology holds out hope that all students will connect with more information and more people than ever before, and that learning might become more individualized [7].

Universities and Colleges are institutions of higher education that offer programmes beyond the high school level. Universities and Colleges provide necessary training for individuals wishing to enter professional careers. They also strive to develop students' creativity, insight, and analytical skills. By acquainting students with complex ideas in an intellectually stimulating environment, colleges and universities can provide unique opportunities for personal enrichment while also preparing students for future careers [6]. Such diverse

professions as engineering, teaching, medicine, and information science all require a higher education. These citadels of learning strive to inform students of established principles of knowledge as well as of the most recent developments in academic research. Instruction takes place in classrooms, lecture halls, laboratories, and other settings. When students enrol in a course, professors provide them with a syllabus, or outline, of the course. The syllabus describes how the course will be taught. It includes a list of the required books and articles students are to read; the schedules and descriptions of course examinations, papers, and other assignments; and an explanation of methods used to evaluate or grade student performance. Methods of instruction may be a lecture, lecture-discussion, discussion, laboratory, seminar, internship, clinical experience, community service, distance education, or a combination of these and other formats [8].

The development of new technologies and the globalization of the world economy have created high demand for workers with computer, communications, and other occupational skills that can be acquired at colleges or universities. For example, computers and other new technologies have eliminated many low-skilled jobs in a variety of fields, but these same technologies have created widespread job opportunities for those who have the proper training. In addition, employers increasingly seek out college graduates who have gained the critical thinking and problem-solving skills necessary to adapt to changing economic conditions [9].

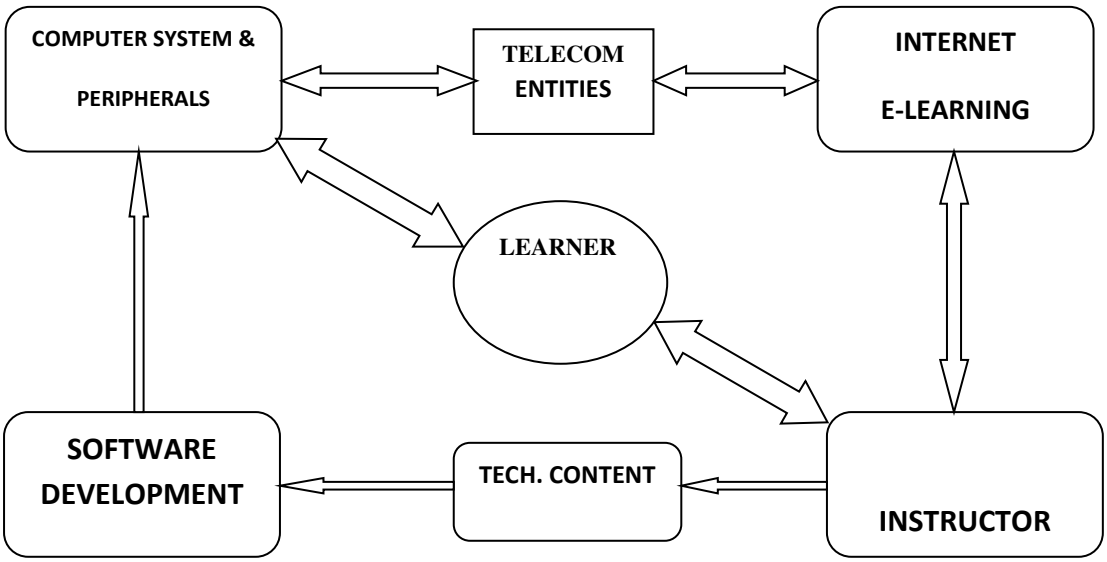

Figure 1: A **Block Representation of CAL for Science and Engineering Education**

Problems Facing Deployment of E-Learning

The journey to the information superhighway through e-learning is real but it is unfortunate that this important issue is not being given the much needed attention it deserves by the academic communities in Nigeria. Some of the problems facing the deployment of e-learning systems in Nigerian tertiary institutions include:

a) **Student Attrition**: This is caused by lack of face-to-face contact with the lecturer, which makes the model impersonal. This constraint can now be virtually eliminated through videoconferencing technology, which is a telecommunications technology that makes it possible for teacher-student interaction. This technology allows groups to have conferences in one connection combining video and audio transmission. If this is employed in our academic communities, then student attrition would be eliminated.

b) **State of Information Technology (IT) in Academic Communities in Nigeria**: Since the industrial revolution is quite a distant ahead of us in this part of the globe, the academic communities in Nigeria are far away from e-learning age. These academic communities form a block of technological desert. IT development in Nigerian tertiary institutions is at lower ebb and as such, they are cut off from their counterparts and researchers at the global terrain. This has made the journey of the nation's academic communities into the e-educational superhighway to be somehow retarded.

c) **Management Attitudes**: Funding is one of the areas where the support of the management is highly needed. Provision of adequate facilities and other equipment are supposed to be done by the management. However, this is not so in our tertiary institutions. Various management's assistance towards the development of the e-learning is rather slow in some institutions and in some others, no aid or assistance are given by the management.

d) **Lack of Personnel**: Knowing full well that the world has gone computer and educational development depends on computer, it is important to improve the level and acceptance of computer literacy and usage in the society. But the main problem is either that the people are resisting change or too lazy to learn. Most institutions even lack enough experts to support computer usage while some have none.

e) Economic Constraint: Capital is the backbone of any good educational resource but the fact is that the educational sector is poorly funded, little or no facilities/infrastructure to aid teaching-learning are available and the little available funds are being mismanaged. The cost of installing good and up-to-date computer equipment in a country like Nigeria with battered economy is enormous. This factor seriously militates against the noble adoption of e-learning in Nigerian institutions of higher learning.

f) Technological Constraints: A major setback towards the pragmatic adoption of e-learning in Nigerian institutions is the near-absence of the required information technology infrastructure necessary for its deployment. Less than 20% of Nigerian teachers own computers or have access to them. The energy authority, Power Holding Company of Nigeria (PHCN), is not living up to expectation as power is supplied for less than an average of 4 hours a day in most towns. Electricity is totally absent in most remote communities in Nigeria and other sources of generating power are more expensive options and are not affordable by an average income earner in Nigeria. This particular factor is seriously hindering the growth of information technology and as such, causing serious setback to adoption of e-learning in Nigeria.

As a matter of fact, individuals in their house or in their academic communities that want to achieve their objectives can use the e-learning developed in this study. It may not be necessary to be in an academic community before it is used. Hence, the problems listed above may not adversely affect the individual who opt for this system as a means of learning the C++ programming language so far as the individual can afford to overcome the inhibiting factors discussed above.

Aims And Objectives

The project required the students to:

- Visit the computer laboratory and see how the CAL package is installed and how it can be loaded.
- Create an alternative resource to teaching the 300/400 level students about the basics of computer programming, and to present the subject matter in a more interactive and engaging way than the traditional didactic lecture
- Provide flexible access to current information for technologists and the laboratory assistants
- Educate staff, tutorial staff and the computer laboratory staff at the laboratories about the functionality of the software by providing them with a copy of the finished resource on CDROM
- Make the resource freely available on the campus intranet to wider community to promote education on the learning of C++ programming

- Carry out a summative evaluation of the resource as a lecture replacement tool for Computer Science and Engineering students.

Time Line

The CAL package was planned, developed and evaluated over a 3-month period, through the following stages:

- ***Preliminary needs analysis***: questionnaire to on-site undergraduates asking them about their experiences of the didactic lecture on C++ programming and the attitudes to support lecture with CAL
- ***Early formative assessment***: questionnaire to recent graduates, technologists, laboratory assistants, computer analysts, software developers and computer science students to gather feedback on the "look and feel" of the CAL interface at an early stage of development.
- ***Formative evaluation***: questionnaire on the complete first module to all 300 level computer science students
- ***Summative evaluation***: questionnaire on all the four modules to Computer Science teaching staff with expert knowledge on computer programming and software development.

Discussion of Results

Preliminary needs analysis

Prior to the development of the CAL package, a questionnaire was circulated by e-mail to students of Computer Science and Electrical Engineering in years 4 and 5 to gauge their opinions on the lecture they had attended in year 3 on the subject of scientific programming using C++; to gather suggestions on how the CAL package should be designed; and to assess students' views on CAL as a lecture replacement in general. It has been argued that questionnaire can be used to gather large amounts of information, at a relatively low cost, in a short time [10]. In this case, only 24 of the 400 4th and 5th year of Computer Science and Electrical Engineering students responded (6%), because the survey was conducted during the ASUU (Academic Staff Union of Universities) strike, and via e-mail. It must also be acknowledged that students' feedback was retrospective. In terms of preliminary needs analysis, however, the resulting data provided a useful starting point for the system design and development. Results are shown in Table 1

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Table 1: Results of the preliminary needs evaluation (N=24, 6%)*

Question	Quartile 1	Median	Quartile 3
How helpful were the lectures on C++ programming language? (1 = Not at all helpful, 5 = Very helpful)	2	2	2
How interesting did you find the lectures? (1 = Not at all interesting, 5 = Very interesting)	2	2	3
How useful do you find CAL packages generally? (1 = Not at all useful, 5 = Very useful)	2	3	3
How useful do you think a CAL package on C++ would be? (1 = Not at all helpful, 5 = Very helpful)	2	3	4
How happy would you be for the C++ lectures to be replaced with a CAL package? (1 = Not at all happy, 5 = Very happy)	3	4	5
How important do you think it is for the C++ CAL package to be available online? (1 = Not at all important, 5 = Very important)	3	4	5

* The first and third quartiles are included to show the inter-quartile range of responses

The qualitative responses to this preliminary needs analysis suggested that the package should be:

- Well illustrated with numerous and colourful pictures to maintain user interest and aid memory retention
- Highly interactive
- Kept concise, excluding unnecessary detail

In addition, the following features were requested:

- Optional links to more detailed information
- Navigable contents index
- Printable version of the contents
- Optional quiz

A CAL package was subsequently developed that included the following modules:

1. Topics in C++
2. Students Activity
3. Teacher Activity
4. Report Generation

Early Formative Assessment

At an early stage of development, a formative questionnaire was circulated by hand to teaching staff and students on campus (selected using convenience sampling), asking to review the "look and feel" of the prototype CAL. This took place during the ASUU strike hence, the number of participants was small: two computer science scholars (recently graduated), two computer technologists, two computer laboratory assistants, five computer science students and three electrical engineering students. Participants were also asked to comment on features they liked, disliked or would like added.

As Table 2 shows, responses to all questions were favourable. Several suggestions were made for refinement of the package, such as including more references to detailed information, slightly more difficult quiz questions, and rollover explanations of images. The first module was modified to include respondents' feedback.

Table 2: Results of early formative evaluation of Module 1 (N=14)

Question	Quartile 1	Median	Quartile 3
How easy to use was the package? (1 = Very difficult, 5 = Very easy)	5	5	5
How well was the information presented? (1 = Very badly, 5 = Very well)	4	5	5
How interesting was the package? (1 = Very dull, 5 = Very interesting)	4		4
How useful was the information in the package? (1 = Useless, 5 = Very useful)	4	4	4
How much information was in the package? (1 = Not enough, 5 = Too much)*	3	3	3
What did you think of the integrated quiz? (1 = Very bad idea, 5 = Very good idea)	4	4	5

* A response of 3 was considered the ideal response to this question, whereas for other questions a rating of 5 was considered optimal

Evaluation Methodology

Formative Evaluation Questionnaire

*A*fter the development of the first module, student opinion was sought via a questionnaire containing seven lickert-scale items and a number of open-ended questions. The questions asked are shown in Table 3. All the 3rd year students were asked to work through the first module of the package in a mandatory laboratory practical class. The CAL package was considered sufficiently detailed and self-explanatory that the staff supervision was not required, although staff operated on open-door policy to support individual students seeking assistance.

Summative Evaluation Questionnaire

Once the four modules were complete, the subsequent cohort of three-year students was asked to use the cal package, again in a time-tabled, unsupervised class. students were assigned to one of the two computer centres, where they were expected to work at their own pace.

The questionnaire, like the CAL package, has been refined – in particular, related items were grouped under appropriate themes to facilitate participant engagement with the questionnaire, a policy advocated by [11].

Table 3: Results of formative evaluation questionnaire completed by Computer Science students (N=55)

Question	Quartile 1	Median	Quartile 3
How easy to use was the package? (1 = Very difficult, 5 = Very easy)	5	5	5
How well was the information presented? (1 = Very badly, 5 = Very well)	4	5	5
How interesting was the package? (1 = Very dull, 5 = Very interesting)	3	4	4
How useful was the information in the package? (1 = Useless, 5 = Very useful)	4	4	4
How much information was in the package? (1 = Not enough, 5 = Too much)*	3	3	3
What did you think of the integrated quiz? (1 = Very bad idea, 5 = Very good idea)	4	4	4
How happy would you be for the C++ lecture to be replaced by CAL? (1 = Not all happy, 5 = Very happy)	4	4	5

* A response of 3 was considered the ideal response to this question, whereas for the other questions a rating of 5 was considered optimal

The questionnaire included nine statements associated with a five-point Likert scale ranging from “strongly disagree” to “strongly agree”, a higher rating representing a more positive response. The statements are listed in Table 4. Students were also encouraged to rate each module on a scale ranging from “very poor” to “very good”. For each item, a value of 3 represented a neutral response. A space for qualitative comments about each questionnaire item was also available, and students were invited to provide additional comments about the resource in general.

The questionnaire was distributed to a purposive sample of teaching staff knowledgeable about the subject of C++ programming. These included eight graduate assistants with some teaching responsibility, three programming lecturers, and one technologist involved in teaching the course.

Focus Groups

Discussion with several students about the CAL package was facilitated through broader discussions, within two of five focus groups, on the application of educational methods and technologies in the science and engineering curriculum as part of the researcher’s contiguous research studies.

Analysis of Examination Results

The third-year class examinations held in March 2008 and March 2009 included questions on the topic of C++ programming, allowing for

a comparison of student performance before and after the introduction of CAL as a lecture support tool. Individual student marks were obtained for these examination questions, and an independent samples t-test was carried out to compare performance between the two separate student cohorts (student sitting in the March 2008 examination had been lectured to, while students sitting in March 2009 examination had received the CAL package). The 2009 examination question was based on the content of CALCPPLUS Module 1. The results from the 2009 examination were not included in the analysis, as the examination format has changed from essay questions to multiple-choice questions.

RESULTS

Formative Evaluation Questionnaire

Fifty-five forms were returned from the class of 113 students in 2007/2008 session (48.7%). The results, shown in Table 3 indicate that the first module was well received by students.

Table 4: Results of summative evaluation questionnaire completed by Computer Science students (n=51, 43.6%) and by teaching staff (N=12)

Questionnaire Item*	Role	Quartile 1	Median	Quartile 3
Layout and design				
The CAL program is easy to use.	Students	4	4	5
	Staff	4	4.5	5
The information is well presented.	Students	4	4	4
	Staff	4	4	5
The CAL program is interesting and fun to use.	Students	3.5	4	4
	Staff	3	4	4
Content				
The CAL program included just the right amount of information	Students	3	4	4
	Staff	3	4	4
The integrated quiz is useful in allowing users to review their understanding	Students	4	4	5
	Staff	4	4	5
The information in the program is useful to students' learning	Students	4	4	5
	Staff	4	4	4
CAL as an alternative to lectures				
The CAL program adequately replaces lectures on this topic	Students	2	3	4
	Staff	2	3	4
There is scope for more didactic lectures to be replaced with CAL programs	Students	3	3	4
	Staff	2.75	3	4
Rating of Individual modules				
Fundamental concepts of C++	Students	4	4	4
	Staff	4	4	4
Basic Declarations & Expressions	Students	4	4	4
	Staff	3.75	4	4
Control Structures in C++	Students	4	4	4
	Staff	3.75	4	4

* For each item, a rating of 5 was considered the optimal response

Summative Evaluation Questionnaire

Fifty-one forms were returned from the class of 117 third-year students in 2007/2008 session (43.6%), and 12 forms were collected from members of the teaching staff with expert knowledge on programming.

Summative results are reported in Table 4. They indicate that all four modules were well received by staff and students and that staff responses were closely aligned with those of the students.

Focus Groups

Third-year students cited CAL as an appropriate medium through which to teach the principles of C++ programming:

- *It was targeting a subject-area that does not need to be taught in lectures*
- *Yes, the subject lends itself better than say, programming. (dialogue among third-year students about CAL).*

This sentiment was also expressed by third-year students in a separate focus-group discussion:

- *I don't think it's a topic that really needs a lecture or there's anything that needs explaining … Knowing how big C++ programming has to be, there's no need for a lecture on that.*
- *I don't think lectures should be eliminated from Scientific programming*
- *I wouldn't say that either, but the little quizzes in CAL are really useful. (dialogue among third-year students about CAL)*

These statements also served to highlight the importance of self-assessment of students, as well as their reluctance to see lectures replaced by CAL in general.

Analysis of Examination Results

The mean value of the 2008 examination scores was 19.4 of a possible 33, while that for 2009 was 21.4/33. At $p = 0.0005$, this difference is statistically significant, suggesting that the students who learned from CAL package performed better than the previous cohort, who had been lectured via traditional teachning method.

Summary Of Findings

The preliminary needs analysis indicate that students did not consider the traditional lecture on the topic on C++ programming to have been particularly helpful or interesting, although it did fulfil the learning objectives described in the introductory part of this paper. The respondents were supportive of the idea of replacing the lecture with CAL, particularly if the learning package were made available on the campus intranet.

The subsequent formative evaluations indicated that the CAL package:

- Was very easy to use
- Contained an appropriate amount of well-presented information
- Was interesting and fun to use
- The integrated quiz was thought to promote the student learning, and
- The majority of students were satisfied with the package as a lecture replacement

The findings from the summative evaluation reiterate previous positive findings on the layout and design of the package and its content. The overall consensus on the ability of CAL to replace lectures was neutral, however, with some respondents for and others against lecture replacement, as indicated by the inter-quartile range in ratings. This range of opinion is further demonstrated by responses to open-ended questionnaire items:

- Would be a good support rather than replacement (Student)
- Certain more difficult classes may not be well suited as CAL programs in place of lectures, but may be to augment lectures (Student)
- Doing CAL package with lecturer in room to explain/amplify would work. (Lecturer)

Students and staff also felt that replacing lectures with CAL was appropriate only for certain subjects:

- Depends on the content of the lecture (Student)

CAL has been shown to be effective alternative to lectures in human physiology [12] and orthodontics [13], although its use does not need to be fully integrated into the curriculum to ensure uptake by students [14]. Reluctance on

the part of students to part with the traditional lecture has been cited in relation to veterinary pathology and clinical sonography [15]; it has been suggested that students are caught between different learning and teaching paradigms [16].

In terms of finding evidence that students' learning is supported equally well by CAL and by lectures, the significant increase in students' examination scores in this study is encouraging. However, the problem with comparing two educational methods using examination marks is that the comparison does not take into account either the revision or further study carried out by the students between the teaching treatment and the examination [17] or any inequity in the level of difficulty of question between the periods.

One of the benefits of face-to-face teaching is the ability to ask questions to check understanding. Active participation in large-group teaching activities can be promoted through the use of questions with feedback [18]. The focus-group comment made by the third-year student would suggest that CAL quizzes serve the same function in CAL as a lecture replacement.

The triangulated evidence from the questionnaires, focus groups and examination results suggest that CAL is an acceptable replacement for a lecture on this particular topic.

Recommendations

The most important challenge of the arrival of CALCPPLUS and other modes of dispensing e-learning is now at the door steps of our various educational researchers, management, planning and training institutions. Therefore, the following recommendations are made:

1. That, our present and future educators are not only made to be IT literate, but put through the requisites for their ultimate admission into modern day classroom via the e-learning.
2. That, there is a dire need to restructure the training curricula of our future educators in the light of the present and future envisaged IT.
3. That, both educators and learners should be aided and properly oriented, not only to be informed, but effective and efficient users and producers of the IT tools so as to utilize the CALCPPLUS system effectively.

Conclusion

Information technology will continue to play a vital role in all aspects of human endeavour especially in educational sector since the world is going through information revolution that will drastically change the way we think, the way we live, and the environment in which we live. It is appalling that Nigeria Universities have not been able to benefit much from the said information revolution. The technology and funds are not necessarily the inhibiting factors, but the will and awareness does not seem to be present nor penetrating the psyche in our academic communities.

The researchers strongly believe that the deployment of CALCPPLUS will definitely leapfrog the educational chasm in Nigeria and provide the desired impetus for technological and socioeconomic emancipation of Nigeria. An important warning, however is that the federal and state governments, rich multinational firms and individuals need to show adequate commitment and political will necessary to remove the IT infrastructural constraints that inhibit the attainability of the positive benefits of e-learning.

The brief conclusion is to appeal to all IT learned personalities and others looking forward to a progressive future life in our society to see and accept the e-learning as an evolving need of the modern civilization, and the automate solution to some of the current prevailing social embarrassment (particularly in our educational sectors) militating against our collective drive to chart a new conducive social order.

Finally, the researchers strongly believe that we all own the present and future generations of our society the important duty of bringing e-learning within the reach of eligible Nigerian students, especially the undergraduates.

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Modeling Determinants of Discriminatory Attitude towards HIV/AIDS Patients in Zambia: A Generalized Additive Mixed Model

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Abstract

The 2007 Zambia Demographic Health Survey (ZDHS) HIV/AIDS data was used to investigate the attitude of people to HIV/AIDS patients in Zambia using the generalized additive mixed model. The model was used to simultaneously measure the fixed, nonlinear and random effects. The fixed effects of categorical covariates were modelled using the diffuse prior, P-spline with second-order random walk for the nonlinear effect of continuous variable while the exchangeable normal priors were used for the random effects of the district. The Binomial distribution was used to handle the dichotomous nature of the three dependent variables considered. The dependent variables are stigmatization towards relative sick with HIV/AIDS, teacher who has HIV/AIDS but is not sick and a food vendor who has HIV/AIDS. We found that the people who seem to be responsible for discriminatory attitude towards PLWHA in Zambia are predominantly those who stay in the Southern and Lusaka provinces, the urban areas, who are from at least the middle class wealth index, elite, age 20$^+$ and who either are married/living together with partner.

Keywords: Bayesian inference, binomial, generalized additive mixed model, HIV/AIDS, Zambia.

1. Introduction

Zambia is an entirely land-locked sub-Saharan country sharing boundaries with the Democratic Republic of Congo and Tanzania in the North, Malawi and Mozambique in the East and Zimbabwe and Botswana in the South. Zambia is divided into nine provinces. The first Acquired Immunodeficiency Syndrome (AIDS) case in Zambia was diagnosed in 1984 which within the space of six years had increased to 20% among adults [1]. HIV prevalence in Zambia is 14.3% among the general population and 4.7% among those aged 15 – 19 [1]. By 2009, [2] estimated that 800,000 adolescents were living with HIV in Zambia.

The Antiretroviral (ARV) therapy has effectively changed AIDS from a terminal to manageable chronic illness [3]. However, PLWHA have an important factor to contend with, which is stigmatization [4]. Several studies conducted in sub-Saharan Africa have shown how fear, ignorance and lack of knowledge contributed to the negative attitudes and behaviours towards PLWHA [4, 5, 6]. Stigmatization[§] is a complex social phenomenon whose persistent occurrence has been described as "black box" and life-altering condition by so many researchers [7, 8, 9]. In Zambia, PLWHA still battle with stigmatization and discrimination in their interaction with people on daily basis, especially the sex workers, poor and single women [10]. Stigmatization, hostility and gossip take their toll on the health and psychological wellbeing of PLWHA [11]. [12] found that HIV/AIDS related stigma and its associated discrimination, is known to negatively affect HIV diagnosis, treatment and care. In order to offer palliative care to PLWHA in Zambia there is a need to identify

the factors responsible for stigmatization and discriminatory attitude towards them. It cannot be overemphasized that model-based analyses offer an objective outlook to empirical problems in sub-Saharan Africa especially in the absence of reliable national data. Many researchers have worked on stigmatization of PLWHA in different context, however, little is known about the set of factors which are responsible for discrimination against PLWHA in Zambia. This is the major gap intended to be filled in this study.

2. Data

The data used for this study were drawn from 2007 ZDHS HIV/AIDS data. The 2007 ZDHS is the second DHS that includes the collection of information on violence against women, syphilis and HIV testing. The two-stage stratified probability sample design was used for selection of the ZDHS sample. In the first stage, a representative of 8000 households was drawn consisting of 320 standard enumeration areas selected with probability proportional to size. In the second-stage selection, an average number of 25 households were selected in every cluster, by equal probability systematic sampling. A total of 7969 households were selected for the sample of which 7326 were occupied. Of the 7326 existing households, 7164 were interviewed which gave a 98% response rate. This study is based on the survey data with all participant identifiers removed. There was no ethical consent other than the permission granted by ZDHS to use the data. Although, different covariates were presented in ZDHS 2007, we focused on attitude of people to relative of a family who is sick with HIV/AIDS, teacher infected with HIV/AIDS and food vendor who is living with HIV/AIDS. The covariates considered are: place of residence, province, wealth index, educational attainment, marital status, age and district. The three dependent variables considered in this study are: Dependent 1: If a relative became sick with HIV/AIDS, would you be willing to care for him or her?

Dependent 2: If a teacher has HIV/AIDS, should s/he be allowed to continue teaching in school?

Dependent 3: If you knew a vendor has HIV/AIDS, would you buy vegetables from him?

We explore the Generalized Additive Mixed Model to simultaneously handle the categorical, continuous and random variables of the explanatory variables as well as the dichotomous nature of the dependent variables in turn.

3. Generalized Additive Mixed Model

Consider the generalized additive mixed model given as

$$\eta_r = f_1(x_{r1}) + \ldots + f_k(x_{rk}) + u_r'\gamma + b_g \quad (1)$$

Where

η_r is the generalized additive mixed model predictor

$f_{i,i=1,\ldots,k}$ is the nonlinear effect of metrical or continuous covariates x

u is the fixed effect of categorical variables γ

$b_g g \in \{1,\ldots,G\}$ are uncorrelated (unstructured) random effects to model unobserved heterogeneity

For the continuous/metrical covariates, we assume Penalized Splines (P-spline) prior with second order random walk [13, 14].

$$f(x) = \sum_{t=1}^{k} \alpha_t B_t(x) \quad (2)$$

where

$B_t(x)$ are B-splines, α_t are defined to follow a first order or second order random walk prior. The second order random walk is given as

$$\alpha_t = 2\alpha_{t-1} - \alpha_{t-2} + \varepsilon_t \quad (3)$$

with Gaussian errors $\varepsilon_t \sim N(0, \tau_\varepsilon^2)$ where τ_ε^2 controls the smoothness of f. This variance is estimated jointly with the coefficients of the basis function by assigning a weakly informative inverse Gamma prior with $\tau_\varepsilon^2 \sim IG(\varepsilon, \varepsilon)$. A suitable choice of diffuse prior is assumed for the fixed effect of categorical covariates given as

$$p(\gamma) \propto const \quad (4)$$

The random effects b_g were modelled from exchangeable normal priors,

where τ_b^2 is the variance that accounts for overdispersion and heterogeneity. We assigned highly dispersed but proper prior for all variance components. An inverse Gamma distribution with hyperparameters *a* and *b* is chosen, such that $\tau^2 \sim IG(a,b)$. Standard choices of hyperparameters are $a = 1$ and $b = 0.005$ or $a = b = 0.001$(which is close to Jeffrey's non-informative prior) [14, 15]. These values can be varied to know the sensitivity of the choices of hyperparameters to the inverse Gamma distribution.

Letting α represent the nonlinear effect of *f*, τ to represent the vector of all variance components, and β the vector of fixed effects parameters, then the posterior probability distribution is

$$p(\alpha, \tau, \beta \mid y) \propto p(y \mid \alpha, \beta, \tau) p(\alpha) p(\beta) p(\tau) \quad (5)$$

where

$p(y|\alpha, \tau, \beta)$ is the likelihood function of the data given the parameters of the model (based on the dependent variable)

$p(\alpha)p(\beta)p(\tau)$ are the prior densities of all the parameters

The Bayesian framework based on Markov Chain Monte Carlo (MCMC) simulation techniques from full conditionals for nonlinear, spatial, fixed effects and smoothing parameters will be used for the posterior analysis.The

$$b_{ij} \sim N(0, \tau_b^2)$$

Deviance Information Criterion (DIC) is employed for comparison of the models [16]. The DIC is defined as

$$DIC = \bar{D}(\theta) + pD \quad (6)$$

where

$\bar{D}$ is the posterior mean of the deviance

pD is the effective number of parameters (not equal to degrees of freedom)

Small values of $\bar{D}$ and pD indicate a better and parsimonious model respectively. The model with the lowest DIC is the best.

4. Data Analysis and Presentation of Results

4.1 Data Analysis

We used the dichotomous dependent variables as defined in section 2. Each dependent variable follows a binomial distribution whose dependence is modelled through logit link model given as:

$$y_{ij} \mid \gamma, b_i \sim Bin(n_i, \pi_i) \quad (7)$$

$$\pi_i = \Pr(Y_i = 1 / \eta_i) = \frac{e^{\eta_i}}{1 + e^{\eta_i}}$$

$$\log it(\pi_i) = \log\left(\frac{\pi_i}{1 - \pi_i}\right) = \eta_i$$

$$\eta_i = w^{'}\gamma + f^{'}x + b_i \quad (8)$$

Where

η_i is the mean number of people according to dependent 1, dependent 2 and dependent 3

$w^{'}\gamma$ is the vector of fixed effect of all the covariates which are categorical except age

$f^{'}x$ is the vector of unknown smooth function of age which is continuous and nonlinear

b_i is the random effect of district

We used effect coding for all the categorical variables. The BayesX version 2.1 [17] was used for the analysis. We carried out 20000 iterations with the first 2000 considered as a burn-in sample. We thinned every 10^{th} iteration of the remaining 18000 used for parameter estimation. Convergence and mixing were monitored through plotting and estimation of sampling paths and autocorrelation. Sensitivity analysis was carried out by varying the hyperparameters. The different choices of hyperparameters considered were a = 1 and b = 0.005, $a = b = 0.005$ and a = b = 0.001. We reported the latter as the results were less sensitive to variation of the choices of the parameters [18].

4.2 Presentation and Discussion of Results

The results of the three dependent variables considered are given in Tables 1, 2 and 3 respectively. Table 1 gives the posterior estimates of dependent variable 1(if a relative became sick with HIV/AIDS, would you be willing to care for him or her?). The stigmatization of relative sick with HIV/AIDS by those who stay in the urban area is 28% [OR: 1.2801, CI: 1.0256, 1.6610] more than respondents in the rural areas. Stigmatization is significantly associated with people who stay in the urban areas. Zambia is demarcated by nine provinces. The discriminatory attitude in each province are: Central [OR: 0.4583, CI: 0.2776, 0.7379], Copperbelt [OR: 1.1382, CI: 0.6323, 2.2076], Eastern [OR: 1.2657, CI: 0.9422, 2.5374], Southern [OR: 2.6732, CI: 1.9023, 2.9013], Luapala [OR: 0.4622, CI: 0.2905, 0.7371], Lusaka [OR: 3.2791, CI: 1.5104, 4.1973], North [OR: 0.5424, CI: 0.3497, 0.8562], Northwest [OR: 0.3320, CI: 0.2098, 0.5508]. The result of Lusaka province reported the highest likelihood of discriminatory attitude towards a relative sick with HIV/AIDS than the Western province. Respondents who stay in Central, Luapala, North and Northwest are 46%, 46%, 54% and 33% respectively are significantly less likely to report that they will not take care of a relative who is infected with HIV/AIDS than respondents who stay in the Western province. The Southern and Lusaka provinces are significantly more likely to discriminate against a relative who is sick with HIV/AIDS. The wealth index quintiles show that the richest/richer [OR: 1.9824, CI: 1.2919, 2.0735] are 98% significantly more likely to discriminate against a relative who is sick with HIV/AIDS than the poorest/poorer group.

The middle class is 7% more likely to be unwillingly to take care of a relative who is sick with HIV/AIDS, although this is insignificant. Respondents with primary education [OR: 0.8668, CI: 0.6868, 1.0838] are 86% less likely to discriminate against their relative who is sick with HIV/AIDS than respondents with no education. The respondents with secondary education [OR: 1.3513, CI: 1.0082, 1.8880] are 35% significantly more likely to discriminate against PLWHA than respondents with no education. The highest odds was given by respondents with higher education [OR: 1.7919, CI: 1.5923, 2.2304], which is about two times more than respondents with no education. This informs us that the educated stigmatize PLWHA more than people with no education. The

married/living together [OR: 9.2952, CI: 1.2434, 12.1122] will significantly discriminate nine times more than respondents who were never married while those who are separated or divorced are 55% less likely to discriminate against a relative who are sick with HIV/AIDS more than those who were never married. The posterior odd ratio of nonlinear effect of age [OR: 1.0588, CI: 1.0014, 1.2872] and the random effect of district show positive significant association between age and district on the discriminatory attitude of respondents toward their relatives who are sick with HIV/AIDS. The discriminatory attitude according to respondents age shows that from ages 30+ to about 62 years, respondents will be unwilling to care for relative sick with HIV/AIDS (Fig. 1).

We also considered dependent variable 2 (if a teacher has HIV/AIDS, should s/he be allowed to continue teaching in school?), to estimate the level of stigmatization of PLWHA in Zambia. Table 2 gives a summary of the reactions of respondents to a teacher who is living with HIV/AIDS. Respondents living in the urban [OR: 1.4715, CI: 1.2941, 1.6869] areas discriminate more against a teacher who is sick with HIV/AIDS and believe s/he should not be allowed to continue teaching in school more than respondents who reside in rural areas. Respondents who live in the Southern province [OR: 1.8365, CI: 1.6971, 1.9098] are 84% more likely to discriminate against teacher who is sick with HIV/AIDS than respondents who stay in the Western province. Also respondents who stay in Central [OR: 1.3711, CI: 0.5404, 2.0915] and Lusaka [OR: 1.2700, CI: 0.9114, 1.7186] are 37% and 27% more likely to report that teacher infected with HIV/AIDS should not be allowed to teach, although these results are not significant. Respondents who stay in Copperbelt, Eastern, Luapala, North and Northwest provinces are 74%, 92%, 92%, 83% and 61% less likely to report that teacher sick with HIV/AIDS should not be allowed to teach respectively. The richest/richer class [OR: 2.0034, CI: 1.9819, 2.4751] are twice as much more likely to discriminate against teacher sick with HIV/AIDS than the poorest/poorer class. The middle class [OR: 1.0168, CI: 0.9151, 1.1377] are just about 2% more likely to report that teacher who is sick with HIV/AIDS should not be allowed to teach, although at 95% CI this is not significant. As the Zambians increase in academic knowledge, so is the increase in the discriminatory attitude toward PLWHA. Respondents with primary education are 83% less likely to report that teacher infected with HIV/AIDS should not be allowed to teach. The respondents with secondary education are 117% more likely to report that teacher sick with HIV/AIDS should not be allowed to teach. The highly educated are 185% likely to discriminate more. People that are well educated have the highest odds of stigmatization. Respondents who are married or living together with partner [OR: 6.1973, CI: 5.6669, 7.1233] are six times more likely to report that teachers sick with HIV/AIDS should not be allowed to continue to teach than respondents who were never married. The nonlinear effect of age [OR: 1.0172, CI: 1.0014, 1.0689] and random effect of district [OR: 1.3838, CI: 1.1922, 1.6418] imply that there is positive association between age and district on the discriminatory attitude of respondents toward a teacher who is sick with HIV/AIDS. The nonlinear effects of age on teacher who is sick with HIV/AIDS are shown in Fig 2. Respondents who are less than 18years are less likely to discriminate against a teacher who is sick with HIV/AIDS. However, a steady increase is noted from about 20+ with its peak around 40years, which decreased drastically from age 60+. This implies that respondents within the age bracket 20 to 60 years are more likely to discriminate against a teacher who is sick with HIV/AIDS with the highest level of stigmatization from respondents who are about 40 years of age.

The dependent variable 3, that we explored to estimate the stigmatization trend is "if you knew a vendor had HIV/AIDS, would you buy vegetables from him/her?" The results are summarized in Table 3. The discriminatory attitude toward a vendor sick with HIV/AIDS by those who stay in the urban area is 30% [OR: 1.3030, CI: 1.1844, 1.4395] (highly significant at 95%) more likely than respondents in the rural areas. Respondents who stay in Central, Copperbelt, Eastern, Southern, Luapala, Lusaka are North provinces are 27%, 37%, 54%, 79%, 59%, 10% and 23% more likely to report that they will not buy vegetables from a vendor who is sick with HIV/AIDS. The middle class [OR:

1.1316, CI: 1.0271, 1.2412] and richest/richer [OR: 2.0114, CI: 1.8754, 2.6518] are 13% and 101% more likely to report that they will not buy vegetables from a vendor who is sick with HIV/AIDS. People with higher education [OR: 2.1173, CI: 1.7987, 2.6753] are 118% more likely to discriminate against a vendor who is sick with HIV/AIDS more than respondents with no education, this is significant at 95% CI. Respondents with primary are 82% less likely to discriminate against a vendor who is sick with HIV/AIDS, while respondents with secondary education are more likely to discriminate twice as much than respondents without education. Respondents who are married or living together with partner [OR: 6.7770, CI: 5.7823, 13.7834] are six times more likely to report that they will not buy vegetables from a vendor who is sick with HIV/AIDS than respondents who were never married. The divorced or separated respondents are 78% less likely to report that they will not buy vegetables from vendor who is sick with HIV/AIDS. The odds of the nonlinear effect of age and random effect of district suggest that discriminatory attitude will be displayed towards a vendor who is sick with HIV/AIDS. Figure 3 also corroborated that the discriminatory attitude towards a vendor who is sick with HIV/AIDS is from age group 20 to 60years.

Table 1: Posterior estimates of Dependent Variable 1 within 95% Credible Interval (CI)

Variable	OR	SD	95% CI
Constant	3.1648	5.6536	(1.0069, 9.6359)
Place of Residence			
Rural (ref)	1.0000		
Urban	1.2801	0.1220	(1.0256, 1.6610)
Province			
Western	1.0000		
Central	0.4583	0.2496	(0.2776, 0.7379)
Copperbelt	1.1382	0.3150	(0.6323, 2.2076)
Eastern	1.2657	0.4182	(0.9422, 2.5374)
Southern	2.6732	0.2102	(1.9023, 2.9013)
Luapala	0.4622	0.2402	(0.2905, 0.7371)
Lusaka	3.2791	0.4252	(1.5104, 4.1973)
North	0.5424	0.2331	(0.3497, 0.8562)
Northwest	0.3320	0.2370	(0.2098, 0.5508)
Wealth Index			
Poorest/Poorer (ref)	1.0000		
Middle Class	1.07110.	0973	(0.8936, 1.3175)
Richest/Richer	1.98240.	0793	(1.2919, 2.0735)
Educational Attainment			
No Education (ref)	1.0000		
Primary	0.8668	0.1167	(0.6868, 1.0838)
Secondary	1.3513	0.1692	(1.0082, 1.8880)
Higher	1.7919	0.8966	(1.5923, 2.2304)
Marital Status			
Never Married (ref)	1.0000		
Married/Living Together	9.2952	5.6515	(1.2434, 12.1122)
Divorced/Separated	0.5539	0.3389	(0.2877, 1.0094)
Continuous Covariate			
Age	1.0588	0.1160	(1.0014, 1.2872)
Random Component			
District	2.0511	0.2536	(2.0511, 3.5719)

*OR- Odd Ratio **SD- Standard Deviation

Table 2: Posterior estimates of Dependent Variable 2 within 95% Credible Interval (CI)

Variable	OR	SD	95% CI
Constant	7.8586	2.8365	(3.7753, 14.0218)
Place of Residence			
Rural (ref)	1.0000		
Urban	1.4715	0.0674	(1.2941, 1.6869)
Province			
Western	1.0000		
Central	1.3711	0.1646	(0.5404, 2.0915)
Copperbelt	0.7353	0.1586	(0.6323, 0..9894)
Eastern	0.9174	0.1312	(0.7138, 1.2061)
Southern	1.8365	0.3451	(1.6971, 1.9098)
Luapala	0.9205	0.1487	(0.6892, 1.2365)
Lusaka	1.2700	0.1619	(0.9114, 1.7186)
North	0.8268	0.1489	(0.6074, 1.1021)
Northwest	0.6084	0.1440	(0.4577, 0.8223)
Wealth Index			
Poorest/Poorer (ref)	1.0000		
Middle Class	1.0168	0.0559	(0.9151, 1.1377)
Richest/Richer	2.0034	0.1954	(1.9819, 2.4751)
Educational Attainment			
No Education (ref)	1.0000		
Primary	0.8294	0.0627	(0.7319, 0.9348)
Secondary	2.1669	0.0959	(1.8025, 2.6052)
Higher	2.8453	0.4166	(1.9873, 3.4151)
Marital Status			
Never Married (ref)	1.0000		
Married/Living Together	6.1973	0.3115	(5.6669, 7.1233)
Divorced/Separated	0.3453	0.1728	(0.3156, 0.8876)
Continuous Covariate			
Age	1.0172	0.0227	(1.0014, 1.0689)
Random Component			
District	1.3838	0.0810	(1.1922, 1.6418)

Table 3: Posterior estimates of Dependent Variable 3 within 95% Credible Interval (CI)

Variable	OR	SD	95% CI
Constant	6.0001	3.9845	(5.6367, 7.4607)
Place of Residence			
Rural (ref)	1.0000		
Urban	1.3030	0.1220	(1.1844, 1.4395)
Province			
Western	1.0000		
Central	1.2715	0.1192	(1.0049, 1.5834)
Copperbelt	1.3664	0.1267	(1.0637, 1.7515)
Eastern	1.5442	0.1060	(1.2621, 1.8906)
Southern	1.7921	0.3145	(1.3125, 1.9100)
Luapala	1. 5876	0.1170	(0.9626, 1.5416)
Lusaka	1.1039	0.1167	(0.8749, 1.3882)
North	1.2269	0.1107	(0.9928, 1.5233)
Northwest	0.4638	0.1168	(0.3665, 0.5802)
Wealth Index			
Poorest/Poorer (ref)	1.0000		
Middle Class	1.1316	0.0490	(1.0271, 1.2412)
Richest/Richer	2.0114	0.1246	(1.8754, 2.6518)
Educational Attainment			
No Education (ref)	1.0000		
Primary	0.8196	0.0516	(0.7413, 0.9038)
Secondary	1.9022	0.0705	(1.6563, 2.1933)
Higher	2.1173	0.3189	(1.7987, 2.6753)
Marital Status			
Never Married (ref)	1.0000		
Married/Living Together	6.7770	3.9838	(5.7823, 13.7834)
Divorced/Separated	0.7819	0.1671	(0.5923, 0.9917)
Continuous Covariate			
Age	1.0045	0.0068	(1.0004, 1.0245)
Random Component			
District	1.1488	0.0435	(1.0624, 1.2597)

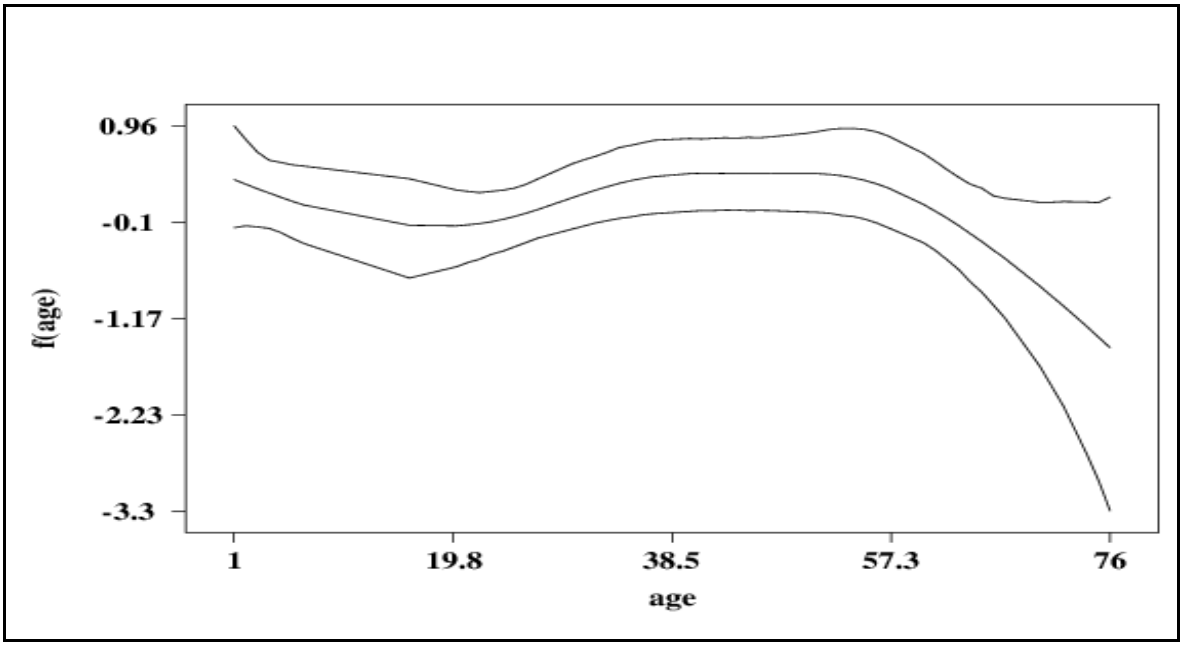

Figure 1: Stigmatization of if a family member is sick with HIV/AIDS will you be willingly to take care of him

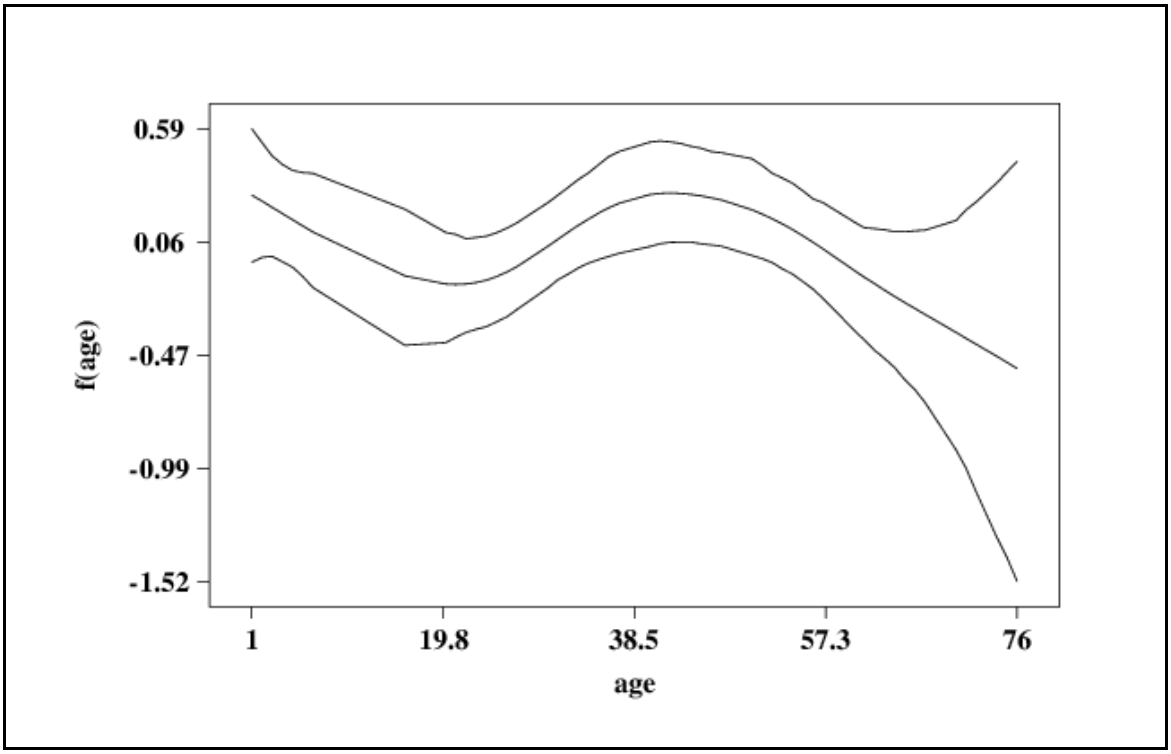

Fig 2: Stigmatization of if a teacher has HIV/AIDS but is not sick, should s/he be allowed to continue teaching in school?

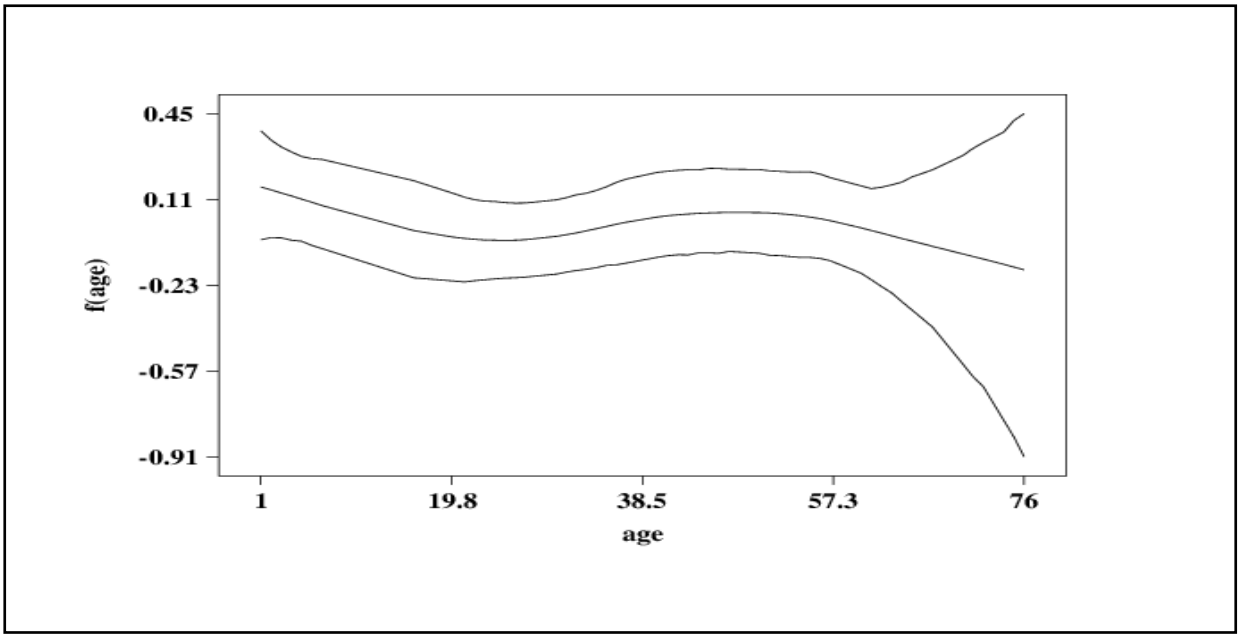

Figure 3: Stigmatization of if you knew a vendor had HIV/AIDS, would you buy vegetables from them?

5. Summary

The generalized additive mixed model was used to investigate the factors responsible for stigmatization of PLWHA in Zambia. The Binomial distribution was used to handle the dichotomous nature of the three dependent variables considered. The dependent variables are stigmatization towards relative sick with HIV/AIDS, teacher who has HIV/AIDS and a food vendor who has HIV/AIDS by using the 2007 ZDHS data.

The diffuse prior was used for the fixed effect of categorical variables, penalized spline with second random walk for the continuous variables and the exchangeable normal priors were used for the random effect of the district. The Bayesian framework based on Markov Chain Monte Carlo (MCMC) simulation techniques was used for estimation of the unknown posterior distribution.

Respondents who are likely to discriminate against a relative who is sick with HIV/AIDS are those who live in urban areas; stays in Eastern, Southern and Lusaka provinces; middle, richer/richest class; who have at least secondary school education; married/living together with partner and aged 20 – 62 years. Respondents who are more likely to discriminate against a teacher who is infected with HIV/AIDS are those who stay in the urban areas; stays in Central, Southern and Lusaka provinces; middle, richer/richest class; who have secondary or higher education; married/living together with partner and aged between 20 – 60 years. The third dependent variable considered was whether respondents will buy vegetables from a food vendor who is infected with HIV/AIDS. Respondents living in the urban area; all the provinces except Northwestern province; middle, richer/richest class; who have at least secondary education; married/living together with partner and aged 20 – 60 years reported that they will not buy vegetables from a vendor who is infected with HIV/AIDS.

6. Conclusion

We found that the people who are responsible for discriminatory attitude towards PLWHA in Zambia are predominantly those who stay in the Southern and Lusaka provinces, the urban areas, who are from at least the middle class wealth index, elite, age 20^{+} and who either are married/living together with partner.

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Sub-Saharan Africa And The Transformation Question: Franchising and Transforming the Hospitality Industry

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Abstract

This paper sets out to examine franchising of the Hospitality Industry as a means of standardizing the industry in the Sub-Saharan Africa. Franchising involves granting a license by a company to a person or group allowing them to use or sell certain products. The world is a global stage; there should not be barriers between the Sub-Saharan Africa and the rest of the world. The operations in the Hospitality industry in Tokyo should be replicated or be franchised in Port Harcourt, Nigeria and vice versa. As [22] would say, "Think Globally, Act locally". Every organization or industry needs cooperation and understanding with its superpowers in the industry in order to survive and have the Hospitality Industry transformed in the Sub-Saharan Africa for the global uniformity of the Industry. The Hospitality Industry in the Sub-Saharan Africa requires industrial franchising to standardize the industrial system and improve the operations and thereby, increase the productivity, reduce unemployment and poverty and these will lead to transformation of the Sub-Saharan Africa. This paper posits that franchising of the Hospitality Industry is a necessary instrument for transforming Sub-Saharan Africa as it will create global uniformity of operations, increase productivity and reduce unemployment which will in turn transform the Sub-Saharan Africa.

KEY WORDS: Franchising, Management, Globalization, Hospitality Industry, Hotels, Transformation

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Introduction

Sub-Saharan Africa is the part of Africa that is south of the Sahara Desert. It covers about 4/5 or 80 % of Africa. It is sometimes called "Black Africa". Generally, sub-Saharan Africa is the poorest region in the world, still suffering from the legacies of colonialism, slavery, corruption, economic policies, and inter-ethnic conflicts. The region contains many of the least developed countries in the world.

Franchising could be described as a license that could be granted by a government or a company to a person or a group through co-operations allowing them to use or sell certain products. The world has become a global village; everything is changing or things are being transformed positively. For the Sub-Saharan Africa to be transformed or be changed in a positive direction, every organization or industry in the region requires proper re-orientation of their firms for proper functioning of the system. The Hospitality Industry in the Sub-Saharan Africa is no exception. The Firms need some directions in the management systems to improve on their business attitudes so as to affect productivity, employment generations and touch lives of the people in the region as compared with the rest of the world. As [22] would say, "Think Globally, Act locally". Planning, Communications and Decision making will be analyzed. The main decision to make in transforming Sub-Saharan Africa is to franchise the Hospitality industry. As the inevitable process of globalization increasingly sets into hospitality industry through franchising, our business performance in the industry would be improved. The paramount goal in Hospitality industry is its continuing effort and dedication to service in providing decent and nourishing foods, beverages and rooms to the public in a hospitable manner and, at a profit. Hence, careful deliberations as regards planning

communication and decision making are in dare need for modalities, systems and standard setting for the Hospitality Industry in the Sub-Saharan Africa. In this way, effective transformation of the regions will result.

Objectives

To examine the role of franchising in the Hospitality Industry in Sub-Saharan Africa.

1) To show the need for transforming the Hospitality Industry of Sub-Saharan Africa.
2) To identify some barriers and constraints militating against franchising the hospitality industry in Sub-Saharan Africa.

Characteristics Of Sub-Saharan Africa

Sub-Saharan Africa can be identified as the part of Africa that is south of the Sahara Desert, [21]. It covers about 4/5 or 80 % of Africa. It is sometimes called "Black Africa". Generally, Sub-Saharan Africa is the poorest region in the world, and it is still suffering from the legacies of colonialism, slavery, corruption, economic policies and inter-ethnic conflicts. The region contains many of the least developed countries in the world, [12].

[21], has stated that in the mid-2010, private capital was brought into Sub-Saharan Africa primarily from the BRIC countries (Brazil, Russia, India and China) private-sector investment portfolios, and remittances began to exceed official development assistance.

By 2011, Africa was one of the fastest developing regions in the world. Six of the world's ten fastest-growing economies over the previous decade were situated below the Sahara, with the remaining four in East and Central Asia. Between 2011 and 2015, the economic growth rate of the average nation in Africa is expected to surpass that of the average nation in Asia. Sub-Saharan Africa is by then projected to contribute seven out of the ten fastest growing economies in the world. According to the World Bank, the economic growth rate in the region had risen to 4.7% in 2013, with a rate of 5.2% forecasted for 2014. This continued rise was attributed to increasing investment in infrastructure and resources as well as steady expenditure per household.

With these promissory standards of progress in the Sub-Saharan Africa, Hospitality Industry should be rising and contributing to the accelerating transformation of the region.

The Hospitality Industry

Hospitality, according to [18] and [6] is a friendly reception and generous treatment of guests or strangers. Hospitality Industry is one of the oldest industries in the world. It is important to note that the first explorers, traders, missionaries, needed lodgings, food, drink and break from their travels. People opened their homes and kitchens to the tired travelers and by doing so, an industry was born. This is to say that hospitality industry offers travelers a home away from home. [9], has argued that Food and beverage management is a division of hospitality. A person with this title works in the food service industry, usually in a restaurant, hotel, catering facility, hospital or any other enterprise that serves food and drinks.

Hospitality Industry, in a wider sense, includes any group that is engaged in tourism, entertainment, transportation, rental companies and tour operators. [4], has said that there is a guide to understanding the relationship between hospitality and Tourism industries. The hospitality is related to hotels (Motel, Inns and Restaurants) which take good care of guests. Tourism, on the other hand, is related to travel package, which involves moving from one location to another by air, road, sea, etc. by travel industries. And so, the people on the move (tourists) surely need very friendly and decent environment in the community, city, state or country of their choice. Hospitality industry is the offset of tourism. Tourists should not feel any sense of under-treatment even as they travel far from their homes. Some kind of uniformities in the operations in the Hospitality Industry should be felt in the Sub-Saharan Africa as tourists in the region relax for their Breakfast, Lunch or Dinner in Hotels or Restaurants.

Hotels

[6], has described Hotel as a place which supplies boarding and lodging or a place for the entertainment of the travelers. Lodging establishments (hotels) represent the seventh largest industry in the world and generate

approximately $36 billion in annual sales. For a total commercial concept, a Hotel is an institution of commercial Hospitality which offers its facilities and services for sale. The world has become a global village due to the available technology. This technology in form of computers and labor-saving mechanical equipment has major effect on the way hotels are managed and operated. As a result, the techniques of management of modern Hotels have to adapt to changing circumstances. The management of Hotels and Restaurants services is becoming more competitive in their hiring requirements. For example, [9] has stressed that for a position of Food and Beverage Manager, superior managerial, interpersonal and time management skills will be required. A superior staff is the cornerstone of any successful food and beverage establishment.

How can this be effective in the Sub-Saharan Africa, when in Nigeria, to be specific, most of the Hospitality staff came into the industry with little or no formal education. Many of these employees have failed in the industry because their need for training was not identified and provided for by the management. [3], shared his experience as he had managed Hotels in Europe and he compared the skills available in Nigeria, a region in Sub-Saharan Africa. He has stressed that the technical skills of the staff in Hotel Industry in Nigeria is lacking. [6], has stressed that Hospitality Industry is both national and international in nature and in terms of accommodation it could range from luxury to budget Hotel, from city center business properties to tourism resorts and from motels to health spas. [13], has identified training as one of the organizational tools that should be encouraged at different levels in the industry so as to help employees to acquire basic skills required for the efficient execution of the activities and functions for which they were hired. It is therefore important to identify the specific areas of need that would need some reinforcement in the way of training

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Table 1.0: **Functions Of Service Staff**

Occupation	Job summary
Bartenders	Bartenders mix drinks and serve them directly to customers or through wait staff
Chef and head Cooks	Chefs and head cooks oversee the daily food preparation at restaurants and other place where food is served. They direct kitchen staff and handle any food related concerns
Cooks	Cooks prepare, season, and cook a wide range of foods. This may include soups, salads, entrees and desserts.
Food and Beverage serving and related Workers	Food and beverage serving and related workers perform a variety of customer service, food preparation, and cleaning duties in restaurants, cafeterias, and other eating and drinking establishments
Food Preparation Workers	Food preparation workers perform many routine tasks under the direction of cooks, chefs, or food service managers, Food preparation workers prepare cold foods, slice meat, peel and cut vegetables, brew coffee or tea, and perform many other service tasks.
Waiters and Waitresses	Waiter and Waitresses take orders and serve food and beverages to customers in dining establishments.

Source: U.S. Bureau of Labor Statistics (2014). Food Preparation and Serving Occupations. Retrieved on February 10th, from: http://www.bls.gov

Looking at the above Table 1.0, we can see the various occupations and job summaries of the food service staff. According to [2], an increasing number of employers now prefer managers with a two-to four-year degree in a Hotel or Restaurant management-related field.

This is to say that, getting ahead in a Hotel Management career means, taking courses and getting real world experience in the field.

In this vane, some systems need to be put in place. This brings to mind the story of the law of the lid. According to [10], leadership ability is the lid that determines a person's level of effectiveness. The leadership ability, for better or for worse, always determines our effectiveness and the potential impact of the organization. This is the right time to let open the lid on the Sub-Saharan Africa to set free the barriers which have been hindering development and then accelerate transformation of the region.

Franchising

Franchising of the Hospitality Industry is what will transform the Hospitality Industry in this new millennium in the Sub-Saharan Africa. Franchising allows for many outlets to be set up nationally and by doing so, maximizes on economies of scale in purchasing promotional material in the development of the brand image.

Franchising is an agreement whereby one pays a fee and some set-up costs in exchange for the use of an established name or brand that is well known by potential purchasers. This is likely to generate more businesses than an unknown or start-up brand.

According to [6], a franchise is a license given by a company or franchisor, to use the company's ideas, methods or trademarks in a business. By paying a fee, a private investor or franchise can obtain a trademark, license, architectural plans, designs, training and operating methods. An example of this, as stated by [5], could be where the contract caterer – Compass Group, franchises the Burger King brand from its owner in exchange for a fee and a proportion of the turnover.

There are normally strict guidelines, or "brand standards", laid down for the franchisee (franchise user) to perform to, and these will govern which ingredients and raw materials are used and where they come from, together with portion sizes and the general product and service offer.

Making the biggest moves in the Hospitality Industry needs franchising; it is an opportunity to make money anywhere in the world, because there is no restriction in a franchise business globally.

How Franchising Works

The franchisor (the franchise provider) will check on the brand standards and operational standards regularly to ensure that the brand's reputation is not being jeopardized. The franchisor will normally also provide advertising and marketing support, accounting processes, staff training and development, design provision for merchandising and display materials.

Responsibilities of The Franchisee

The franchisee (the franchise user) is responsible for financing the construction of the property. The franchisee may be an individual, a partnership, a small corporation or group of investors. Thus, many Hotels that have Holiday Inn, Sheraton or Hilton signs are actually owned by local independent investors. A franchisee pays an initial fee upon signing the franchise agreement. Franchisees also pay ongoing royalties based on the total income of the Hotel.
Many companies that supply caterers with products like soft drinks, ice cream and coffee distribute their products by means of purchased operators.

Some suppliers providing food and drink to caterers have "brand franchise, sometime, backing their product with appropriate equipment and advertising material to ensure that caterers prepare, present and promote the products in a consistent way.

Operating Styles Of Franchising

Operating styles vary considerably, from pizzas, hamburgers, doughnuts and baked croissants to full menu restaurants, coffee shops and pancake houses. Despite all the differences, all the franchise schemes work on the same principle:

The Principles Of Pranchising

An established catering company offers a complete package of experience, operating systems and ongoing marketing support sufficient to enable outside operators to set up and operate their own units within the chain.

The investor makes an initial franchise payment and then pays a continuing royalty or

commission, which is often expressed as a percentage of the gross turnover

All investment in property, building, and equipment is borne by the franchise; in some cases, the franchise might play some part in securing the property and assisting with design, building and fitting out so that a consistent look and feel are established.

Advantages Of Franchising

1) Franchising allows for many outlets to be set up nationally and by doing so, maximizes on economies of scale in purchasing promotional material in the development of the brand image.
2) The franchisee gains because the opportunity is shared to invest in a pre-tested catering concept, backed by advertising, research and development, training and other resources that might otherwise be beyond their financial parameter.
3) The banks also show an interest in franchising – in many ways they see it as a reasonably safe investment because of its establishment, tried-and tested nature. See the Tables 2.0, 3.0 and 4.0 below :

Table 2.0: Structure of the food and service management market by number of outlets, **2008**

Sector	**No. Of Outlets**
Business and industry	8719
Health care	653
State education	5136
Independent schools	637
Local authorities	282
Ministry of Defense	421
Oil rigs	163
Catering for the public	972
TOTAL	16,983

Source: Foskett, D. and Patricia Paskins, (2011), 12 ed. The Theory of Hospitality and Catering.

TABLE 3.0: Size of food and service management market by number of meals served (m), 2008

SECTOR	NO. OF MEALS SERVED (m)
Business and industry	717
Health care	I97
State education	266
Independent schools	88
Local authorities	23
Ministry of Defense	170
Oil rigs	18
Catering for the public	140
TOTAL	1619

Source: Foskett, D. and Patricia Paskins, (2011), 12 ed. The Theory of Hospitality and Catering.

Table 4: Number of outlets in which food and service management companies invested, 2009

	$0- $25k	$26 - $50k	$51 - $100k	$101 - $500K	Over $501k
Business and industry	81	30	13	36	8
Health care	-	1	-	1	1
Education	8	9	6	6	1
Ministry of Defense	-	2	2	2	2
Leisure	1	1	-	5	-
Other	-	-	-	4	7
TOTAL	90	43	21	54	19

Source: Foskett, D. and Patricia Paskins, (2011), 12 ed. The Theory of Hospitality and Catering.

4) The oldest franchising scheme in the UK are Wimpy, establishes in the mid 1950s, and the KFC, which started in the early 1960s. Many of the most active franchise schemes are based on a fast-food style of menu and operating system.
5) Now, there is a growing market involving wider menus and medium-spend restaurants, mainly licensed. Examples are: Pizza Hut, Mr. Biggs, Kreme Bakery products, TGI Friday's, etc.

Hotel Classification

Tourist accommodation is the most important component of tourism. And so, the United Nations Conference on International Travel and Tourism held in Rome in 1963, according to [6] recommended standardization in the methods of classification of Hotels. The classification is five categories and each identified by a star. This star classification is essentially a guard to the type of Hotel, indicating the character of the accommodation and services the hotels set out to provide. The Stars are as stated below:

1) One Star: These are Hotels and Inns which are generally of small scale with acceptable facilities and furnishings.
2) Two Star: Hotels offering a higher standard of accommodation and some private bathrooms and showers. A wider choice of food is provided.
3) Three Star: Three Star Hotels are those with more spacious accommodation, large number of bedrooms with private bathroom and showers. Fuller meals facilities are provided.
4) Four Star: These Hotels are the one offering a high standard of comfort and service.
5) Five Star: Five Star Hotels are Luxury hotels offering the highest international standard.

Management

According to [5], the quality and style of management in any food service operation are the most important elements in achieving success. [13], has stressed that, management is the coordination of all the resources of an organization through the process of planning, organizing, directing and controlling in order to attain organizational goal and objectives. This is to say that it is the process of coordinating work activities so that they are completed efficiently and effectively with and through other people. [8], has emphasized that management is the harnessing of resources to achieve organizational goals. As we sum up these ideas, we could say that management is saddled with the responsibility of planning, organizing, directing, controlling and monitoring the activities of individuals towards a common goal. [20], have stressed that the management is concern, in general terms, about the six M's: Which are: Men, Money, materials, machinery, Markets and minutes. As for the resources, according to authors, they are common to any organization, whether it is a church, a lodge (hotels), the government, or a business firm. Hence, [7] have stressed that all leaders of people are concerned with setting goals and

motivating the individuals to strive towards those goals. In these cases, the Hotel and restaurant management is no exception. The management of hotels and restaurants in Sub-Saharan Africa should set priorities and goals that would determine directions and promote incentives as well as the determinations to reach the goals. The accomplishment of the goals and .

standard setting in Hospitality industry in the Sub-Saharan Africa would require setting global standards in the Hospitality industry. Franchising the Hospitality Industry in the Sub-Saharan Africa would increase our global best practices, increase productivity, reduce unemployment and the regions would be transformed

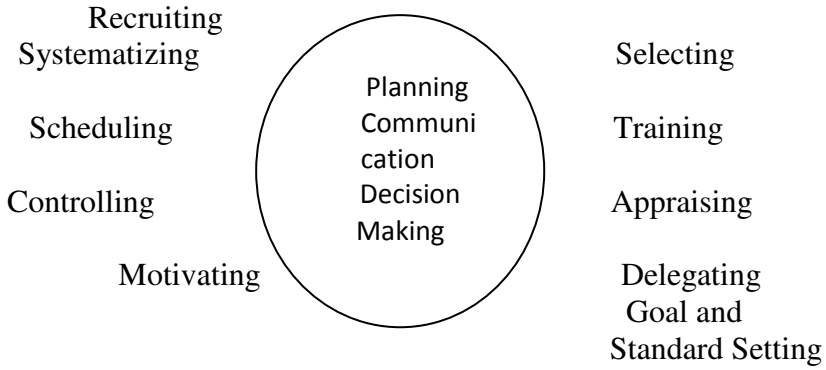

Figure 1.0: The Management Wheel

SOURCE: Lundberg and Armatas (1980). "The Management of People in Hotels, Restaurants, and Clubs", 4th ed.

As we examine the Figure 1.0 above, we can see that planning, communication and decision making are at the center of the wheel. This could mean they are basic to and part of the other functions of management. Around the wheel are other management activities. Management could be seen engaging in recruiting, selecting, training, appraising, delegating, goals and standards setting. Management also has the responsibility of motivating, controlling, scheduling and systematizing for efficiency and ease of operations of the industry. Let us look at the manager and his operational activities that could assist in making the organization successful.

Efficent and Effective Management

Planning

[18] defines planning as the process of making plans for something. [17], has said that management starts with planning and that good management starts with good planning. [20], have stated that planning is the basic function of management and all others are dependent on it. The objective of planning is to think ahead, determine clearly the objectives and policies, and set a course of action toward the accomplishment of the goals. Forecasting is an important factor in effective planning for the future operating programs. This could mean that proper prior planning would prevent business failures. [13], has argues that planning is a blueprint for action. Many projects have failed in Nigeria because adequate plans were not made. Planning is an activity performed by all levels of management. [14], have indicated that planning determines what to be achieved, setting goals and identifying appropriate action steps.

In hospitality industry, this could mean making preparations for something you are expecting to achieve in future. This could be why [8] defined planning as the process of deciding what to do in future which could involve selecting from among alternative future courses of action. By this definition, planning should be associated or linked between the present and the future; that is, between where we are, to where we want to be.

In any establishment, as in hospitality industry, a customer's first impressions on entering the service area are of great importance. Planning is therefore upmost importance. This could be why [5], have stressed that a customer may be lost or gained on his first impressions alone. For this reason,

proper planning concerning the designing of service area with the right choice of decorations, furnishings and equipment should be put in place as major factors that would contribute to the success of the food service operation. According to [17], one of the most overlooked management planning tools which are most effective are asking for the opinion of the people doing the work for their input. This brings us to the communication level with the people we work with.

Decision Making

Decisions are made when a person finds himself in a situation where he must act and he is not quite sure of the choice that will give the best rest. To be effective, keep decision making to a minimum but ensure that the decisions that have to be made are timed correctly, taking into account all the facts and information at your disposal.

Below are five (5) Decision Making Styles.

Decision making is one of the three processes which are involved in almost every aspect of management.

In hospitality industry, the food and beverage manager, according to [9], has the responsibility of creating enabling environment for staff by listening to them and trying to rectify any problems that may arise among them. Decision making is indicated here by the manager. No matter how good a manager is in a section, how well he motivates his staff or how good his ideas are, he will be judged by his superiors or his staff on the quality of the decisions he has made, either in hiring or firing of staff. [5], have stressed that quantity can be no substitute for quality. It is important to be on alert for this information because an excess of bad or short-term decisions will lead to a serious backlog of niggling problems.

Table 5.0: Decision Making Styles

Decision Making Styles	Manager's Actions
AUTOCRATIC	The manager solves the problem base on the information he has
INFORMATION FINDING	When the manager does not have enough information or skill, he asks other people, then makes his decision
CONSULTATION	The situation is explained to the group, the group generate and evaluate solutions and make recommendations. The leader makes the decision.
NEGOTIATION	The group is provided with information. The group members then negotiate a solution that is acceptable.
DELEGATION	Responsibility for the decision rests with a group or an individual. The manager may guide the discussion that leads to the decision, which is then implemented.

Source: Foskett and Paskins (2011: 302). The Theory of Hospitality and Catering

From the Table 5.0 above, we can see the different styles of decision making of managers. [5], have stressed that making decisions on impulse should be avoided. Premature or unnecessary decisions should not be entertained. They went further and stressed that routine decision making is often delegated by a departmental head to a junior. This is what [15] has said in his interview in the Nation Newspaper of March 16th, 2014. He has said

that his style is people centered and others have accused him of giving younger people big responsibilities. This delegation encourages and develops the staff in decision making process and allows the head to carry on with more strategic things. [20], have stressed that delegation of responsibility is essential to distribute workloads to qualified individuals at various levels. However, delegation of responsibility should not go without detailed instructions.

According to [13], all the styles are useful in a work environment as they have moderating influence on one another. It is important that a manager uses different styles and appreciates the fact that different people use different styles which does not make them less effective.

Basic Levels of Food Service In A Hotel

a) **Self-service:** With self-service, the customer orders and collects the food from a counter and takes it to a table where he consumes the food.

b) **Counter service:** Counter service involves the customer being presented with the food he had ordered and consumes it at the counter

c) **Table service:** In this case, the customer is served by a waiter who takes the order and serves the meal at the table.

d) **Specialized or in Situ Service:** In this case, food and drinks are taken to where the customer is, as in room service in a Hotel, Tray or Trolley service in hospitals, aircraft, etc.

According to [19] report, managers supervise all cooks and waiter staff to ensure the safety of all employees. The restaurant manager also walks through the restaurant, marking sure that all the guests are satisfied and treated well by the waiter.

i)

EVALUATING THE HOSPITALITY INDUSTRY IN NIGERIA

Hospitality implies friendly reception and warm greetings. It is imperative that hospitalityii) managers ensure that each guest has a pleasant experience during their visit. According to [6], guests arriving at the Plaza Hotel in New Yorkiii) City, find French perfume and chilled champagne waiting in their rooms. At the Bangkok Regent, guests wake every morning to find their shoes perfectly shined. At the Hotel Plaza Athenee in Paris, the staff memorizes the name of every client upon arrival. All these are images of hospitality of warm greetings, fine accommodations and friendly actions. Hospitality is not merely a tradition; it is a way of life. When customers are satisfied, they are more likely to return, and will pass on their positive experiences to their friends and colleagues. This will in turn result in many benefits for accommodation operators. The Nigerian situation is far from the norm. Something has to be done to improve the experience in Nigeria and in other region of the Sub-Saharan Africa.

Conclusions And Recommendations

The paper set out to examine the role of franchising in the Hospitality Industry in the Sub-Saharan Africa. Some barriers and constraints were found militating against franchising the hospitality industry in the region; these were poverty, inter-ethnic conflicts, and corruption.

Franchising allows for many outlets to be set up nationally and by doing so, maximizes on economies of scale in purchasing promotional material in the development of the brand image. It was also found that the franchisee gains because the opportunity is shared to invest in a pre-tested catering concept, backed by advertising, research and development, training and other resources that might otherwise be beyond their financial parameter.

Great selling is great customer service. It is worth knowing that great selling does not focus on the result, it focuses on the process. When the process is effectively executed, money flows in.

We therefore make the following recommendations:

Policy makers in Sub-Saharan Africa should aim for global competitiveness by creating an enabling environment for the growth of franchising in the region.

Entrepreneurs in the Hospitality Industry should negotiate franchising agreement with major global brands in the industry.

The transformed Hospitality industry should aim at standardizing Hospitality Industry systems and processes. The transformed Hospitality Industry should embark on training

and retraining of human resources to achieve global standards.

iv) Educational institutions offering courses at the degree levels in Hospitality Management and Tourism, should review their curricula to include Global Best Practices in the industry to enable graduates to compete in the emerging international Hospitality professions of the 21st century.

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