Development Of A Software For Final Grading Of Students' Results And Documentation: A Case Study Of Abita State College Of Education, Arochukwu, Nigeria

Ifegwu, Chukwu
Department of Political Science
Abia State College of Education (Technical)
Arochukwu, Nigeria

AK. Jibril Ph.D
Department of Electrical/Electronic Technology
Abia State College of Education (Technical)
Arochukwu, Nigeria.

Abstract—**Final grading of students' academic performance in Abia State College of Education (technical), Arochukwu and other Colleges of Education in Nigeria involves calculation of students Cumulative Grade Point Average (CGPA) in education, General Studies Education (GSE) and department(s) as well as passing decision on the final grade to be assigned to each student in these areas based on a pre-determined scale. Thereafter, students are issued statement of results and finally documents such results, all manually. The manual final grading of students performance and subsequent results documentation is laborious, prone to errors and sometimes result to misplacement of records. Hence, the researchers proposed a computerized final grading and documentation system that will reduce the above enumerated problems. The system has five users, namely, admin, College registrar, Head of Exams, statistics and records(HOD),exams and records officer one and exams and records officer two respectively. The exams and record officer one receive approved final year results from all the departments in the college and compile the list of graduating students alongside with their CGPAs. The exams and record officer two receive the list of graduating students and determine their final grade based on the values of their CGPAs and a pre-determined scale. The HOD prints the student's statement of results and finally documents the list of graduated students in MySQL database. The system was implemented using Java programming language in netbeans development environment (8.2).The developed system was evaluated by the College staff with real data. There reports on the evaluation of the software shows that the new developed system is accurate, effective and efficient.**

Keywords—NCE, Grading, Documentation, Abia State College of Education (Technical), Arochukwu

1.0 Introduction

Abia State College of Education (Technical) Arochukwu like other Colleges of education in Nigeria has Examinations, Statistics and Records Unit. The basic functions of the unit are analyzing, preparing and safe keeping of NCE (Nigeria Certificate in Education) students' statements of result. The unit has three sections and the office of the head of Examinations, Statistics and Records. The three sections include result reception, result preparation and records room. The result preparation section is divided into seven sub-sections which reflect the existing seven schools, namely, School of Arts and Social Sciences, School of Business Education, School of Education, School of Science Education, School of Technical Education, School of Vocational Education and GSE (General Studies Education) respectively. One staff is assigned for each section for preparing students' statement of result. However, due to the recent decrease in student's enrolment, one staff two or three schools.

The main duty of staff in preparation of statements of result section is final grading of NCE students. Grade is the description of student's performance while grading is a method of evaluating student's performance [1]. The method involves collection and evaluation of evidence on students' achievement or performance over a specified period of time, such as nine weeks, an academic semester, entire school year or more [2]. Grading indicates the degree of accomplishment achieved by a learner [3]. Students are graded using marks, percentages and letter grade or pass/fail designation in courses they wrote examination on. The overall (final)

grading in Abia State College of Education (Technical) Arochukwu and other Colleges of Education in Nigeria take the form of distinction, credit, merit, pass, low pass and fail level. The final grading of NCE students in examinations, statistics and records unit involves: (1) recording of all the courses registered by a student for the three years alongside the scores and credit units in four areas; educational theory, educational practice, departmental and general studies education, (2) calculation of student's Cumulative Grade Point Average (CGPA) in each of the four areas and (3) assigning grades for each area. The levels of the grades are distinction, credit, merit, pass, low pass and fail. For student to graduate, he or she must have at least pass in each of the four areas.

Presently, there are only two staff in preparation of statement of result section saddled with the responsibility of preparing of statements of result of students from the seven Schools in the College. The two staff are overloaded. Such overloading often results to delays in preparation of students' statements of results as well as inaccuracies in grading students. It is against this backdrop that the researchers set out to develop a software that will grade NCE Students' results. The software will ease the stress staff encounter in preparation of students' results manually as well as improving the accuracy of grading students in Abia State College of Education (Technical), Arochukwu.

2.0 Problem Statement/Justification

Examinations, Statistics and Records unit is saddled with the responsibility of preparing NCE students final results as well as keeping records of students' results. In 2019, the unit has a staff strength of 11 persons. Five out of the 11 staff engaged in preparing NCE students final results. But the recent downsizing of the staff strength reduced the staff strength in the unit. In fact, presently, only two staff are preparing students results. The two staff are overloaded as they are to prepare the whole NCE final year students' results for the College. The consequences of this overloading manifest in delay of the issuance of statements of results to graduating students as well as inaccuracies in grading of students. In addition, the staff have to waste sizable amount of time retrieving students past records which in turn make the process is tedious owing to their number. Sometimes, important records are misplaced. Developing a software for final grading of NCE students and documenting their records will not only make the procedure less tedious, but also reduce the delay in preparing NCE results and improve the accuracy of the results prepared.

3.0 Objectives of the Study

The objectives of the study are as follows:

1. Determine the software requirements
2. Design the software.
3. Develop the software.
4. Test the software
5. Determine user's satisfaction with the performance of the software.

4.0 Grading System

Grade as stated earlier is the description of student performance. Grading on the other hand is a method of evaluating a student's performance [1]. The method involves collection and evaluation of evidence on students' achievement or performance over a specified period of time, such as nine weeks, an academic semester, entire school year or more [2] .The grading system used by most tertiary institutions in Nigeria and Abia State College of Education (Technical) Arochukwu in particular is five point grading system as shown in table 1.

Table 1: Five-Point Grading System

Score (%)	Letter Grade	Grade Value	Rating
70-100	A	5	Excellent
60-69	B	4	Very Good
50-59	C	3	Good
45-49	D	2	Average
40-44	E	1	Pass
00-39	F	0	Fail

The scores of students in percentages are expressed in letter grades such as A, B,C,D, E and F with corresponding grade values of 5,4,3,2,1, and 0 respectively as shown in table 1.Each of the courses offered by students in NCE programme is allocated with a course weight (credit unit, credit hours or credit load as the case may be) in form of numerical value. The number of the credit unit allocated to a course depends on its importance as well as its scope within the course, having 1, 2, 3, 4 and more respectively.

Student performance in a course is measured by grade-point (GP). GP is simply the product of grade value obtained in a course multiply by the

credit unit of that course. Thus, a student that has grade value of 5 (A) in a course with credit unit of 2 will have grade point of 10 (5x2). In school system, students usually register for more than one course in a semester. To measure students' performance in all the courses they wrote exams on in a semester, Grade Point Average (GPA) is used. GPA as the name implies is average measure of students' performance in a semester or term as the case may be. It is defined as the total grade points of courses offered divided by the total number of credit units of the courses offered in a semester. GPA is expressed mathematically as

$$GPA = \frac{\text{Total grade points of the courses earned in a semester}}{\text{Total number of credit units of the courses offered in a semester}}.$$

[4] noted that the grade earned for a repeated course is used for calculating grade point average (GPA), even if it is lower than the original grade.

As can be seen above, GPA is a measure of student performance over a semester. It does not permit the measurement of students' performance within a session, term or complete programme. A measure that permits measurement of student's performance in a session is Cumulative Grade Point Average (CGPA). CGPA is defined as the sum total of GP earned in a session divided by the total credit units of the courses offered in a session. CGPA is expressed mathematically as:

$$CGPA = \frac{\sum_{i=1}^{n} TGP_i}{\sum_{i=1}^{n} TCU_i}.$$

Where:
TGP=Total GPs
TCU=Total Credit Units
i=1, 2, 3, 4 and 5 stands first, second, third, fourth and fifth semesters respectively.
CGPA is calculated for each student at the end of each semester (except first semester year one). It represents the overall performance of a student within semester, session or programme. The value of CGPA determines the academic progress of a student as well as use for decision making

such as pass/fail. [4] stated that a CGPA of less than 1.00 earns student probation of one academic session and any student that obtained a CGPA of less than 1.00 during probation is required to withdraw from the institution. The value of students' CGPA determine the overall level of student's performance and by extension the level of his/her pass as shown in table 2.

Table 2: CGPA and Level of pass

CGPA	Level of Pass
4.50-5.00	Distinction
3.50-4.49	Credit
2.40-3.49	Merit
1.50-2.39	Pass
1.00-1.49	Low pass
0.00-0.99	Fail

Source [5]

The performance of graduating NCE students are measured in four areas, namely, educational theory, educational practice, departmental and general studies education. In each of these areas, CGPA is calculated and the level of pass is allocated which corresponds to the value of the calculated CGPA. Below is a hypothetical portion of NCE statement of result. Thus s student with CGPA of 3.62 in education theory will be graded with credit in education theory using table 2 above.

Computation of CGPA in the four areas for each graduating student manually is not only tedious, time-consuming, but also error prone. For these reasons, computer softwares are used in the computations of students' CGPAs.

5.0 Methodology

Rational unified process model was used as a guide to the development of the software. Rational unified process according to [6] is an object-oriented methodology, which suits better the development of graphical user environment. Using the rational unified process, the software lifecycle is broken into cycles, each cycle working on a new generation of the product. The process divides one development cycle in four

consecutive phases; the Inception, the elaboration, the construction and the transition phase.

In inception stage, users are focused on the problem domain, where the systems features are the primary concern, whereas developers are focused on the solution domain. That is meant to be usable in real world situation, it is crucial to describe users requirement in a way that all participants can comprehend. The purpose of the elaboration phase is to analyze the problem domain, establish a sound architectural foundation and produces a first prototype system to serve as a basis for the iterative development of the final product. In this stage, architectural decisions have to be made with an understanding of the whole system. In addition, while the process of the development must always accommodate changes, the elaboration phase activities ensure that the architecture, requirements. During the construction phase, all remaining components and application features are developed and integrated into the product. In addition, the resulting software is thoroughly tested among all aspects. The outcome of the construction phase is a product ready to be used by its end-user [6].

5.1 Software Requirement Specifications
5.1.1 Hardware Requirements
    (a) RAM: 1 GB or above

    (b) Hard disk: 4 GB or above

(c) Processor: 2.4GHZ or above

5.1.2 Software Requirements
    The following specification are needed
(a) Window 10
(b) MySql
(c) J.D.K
(d) J.R.E.
(e) Netbeans (eg. Version 8.2)
(f) Connector J 5.6

5.1.3 System Users
1. Admin
2. Exams and Records Officer one
3. Exams and Records Officer two
4. HOD
5. Registrar

5.1.4 Functional Requirement Specifications
Admin
1. Login and logout.
2. Add username and password

Exams and Records Officer 1
1. Login and logout.
2. Compile list of graduating students

Exams and Records Officer 2
1. Login and logout.
2. Determine the final grades of graduating students

HOD
1. Login and logout.
2. View graduating students' results
3. Prepare and Print Statement of Result

College Registrar
1. Login and logout.
2. View graduating students' results

5.1.5 Non-Functional Requirement Specifications
1. Provide data security
2. Be efficient during operations
3. Be portable
4. Be reliable
5. Accommodates more than 10,000 records
6. Maintainable

5.2 Design
5.2.1 System Architecture

The new software adopted client-server architecture with two layers; the application and the database layer. The application layer is the Graphical User Interface (GUI) while the database layer serves as the database system (MySQL).Figure1 shows the systems architecture
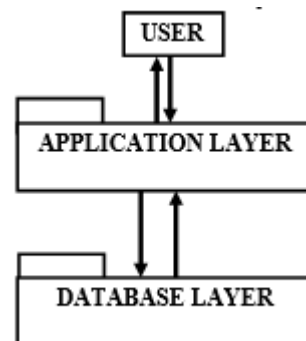

Figure 1: Two Layer Architecture

5.2.2 Use Case

The Use case diagram was used to model the basic functions of the new system. Figure 2 shows the use case diagram for the new system.
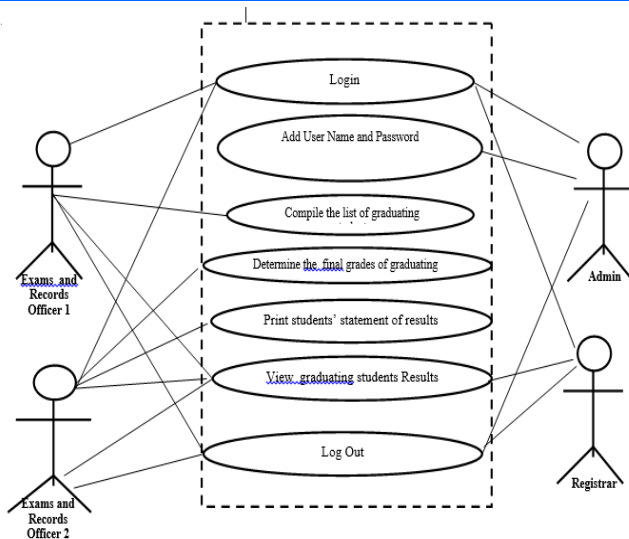
Figure 2: Use case

5.2.3 Input Forms Design

The system has three main input forms; the form for compiling the list of graduating students, form for final grading of students' academic performance and result documentation form. Other forms are general login, admin login, exams and records officer one login, exams and records officer two login form.

5.2.3.1 General Login Form

The software has a general login form that will enable the five users to login. The form has JtextField and JpasswordField. The form contain a button where student can view his/her result. It also contains login, reset and exit buttons (see figure 4). The username and password for the five users are **admin** and **admin**, **HOD** and **HOD**, **registrar** and **registrar**, **officer one** and **officer one** and **officer two** and **officer two** respectively. These are default values. Each user is free to change his/her respective username and passwords. Figure 5 shows the database table that contain the username and passwords of the five users.

5.2.3.2 Exams and Records Officer one Login Form

In the system design, exams and records officer one is the only officer responsible for compiling the list of graduating students alongside with their respective CGPAs. Therefore, he/she must have a login form. Of course, the design and structure of the form is not different from that of general login form. The default username and password for exams officer one is **officer one** and **officer one**. The officer can change these username and password at any time.

5.2.3.3 Exams and Records Officer two Login Form

The main work of exams and records officer two is to grade the overall performance of students in four areas of the programme. A login form was provided for the officer. Such login form allow only him/her to do the job of final grading. A gain, the design and the structure of the login for is the same as that of the general login form. However, the username and password differs. The username and password for this officer is **officer two** and **officer two**. The officer can change these username and password as he/she wish.

5.2.3.4 Admin Login Form

In this design, only admin is allowed to add username and password of users into the database table. Therefore, admin must have a login form that will allow only him/her to carry out this task. The default username and password for admin login is **Admin** and **Admin**. The Admin can change these username and password for security reason.

5.2.3.5 Compiling Graduating Students List Form

The main function of exams and records officer one is to compile the list of graduating students. For the officer to carry out this function, he/she must have a form to enter graduating student's details and their respective CGPAs. The form enable the officer to carry out two functions. Firstly, it enable the user to enter graduating student's personal data and their respective CGPAs in JTextFields as shown in figure 6. Secondly, the form contain a submit button that when clicked will transfer the data enterd into the JtextField into database tables. Other buttons appended to the form include reset, back and exit buttons. Figure 7 shows the view of the graduating students records domiciled in the database table as result of entering data in the compiling graduating students form.

5.2.3.5 Final Grading Form

The final grading form is to be used by the exams and records officer two has three functions. Firstly, it allows the officer to enter graduating students' personal data .This calls for the presence of JtextFields shown in figure 8. Secondly, the form should allow the officer to determine the final grades of each graduating

student for given CGPA inputs. To achieve this objective, the form is fitted with Jbuttons with inscription "determine final grade" between JtextFields. The first of such buttom carrying inscriptin "Determine Edu Theory final grade" was place between two JtextField labelled "CGPA Edu Theory" and "Final grade Edu Theory" as shown in figure 8. The Button and the two JtextFields work in this way: The officer first enter student CGPA in the "CGPA Edu Theory" JtextField (3.67) and then click on the "Determine final grade button. This produce the corresponding final grade as shown in figure 8.Thirdly, the form enable the officer to submit all the information entered and generated to the database. This is achieved through the "ADD". The form also contain reset, back and exit. Figure 9 shows the view of students' result.

5.2.3.6 Registrar/HOD Login Form

Registrar and HOD are the only officers responsible for the preparation of statement of result. Therefore, there must be a login form for registrar/HOD. The structure and design for this form is the same as that of the general login form.

5.2.3.7 Result Documentation Form

One of the functions of the exams, statistics and records unit as stated earlier is for safe keeping of students' records Graduated students records must be kept safely for future references. To achieve this objective, the software must document graduating student's records as well as the other records related to them. Indeed, this records in the database will reduce the problems of fake results and result racketeering. The form for achieving this purpose is shown in figure 10. Figure 11 shows the view of students whose record were documented.

5.2.4 Main menu

As we have five users so shall be five buttons that enable each user to access frame(s) to work with in main menu. The main menu also contains three button as well as back and exit buttons (see figure 12).

5.2.5 Statement of Result

After determining graduating students CGPAs, the next logical step is to write the students statement of result. Figure 13 shows a sample of student's written statement of result.

5.2.6 Database Design

MySQL database was selected for the new software. The database was named grading_DB and it contain seven (7) tables as shown in figure 3. The database and its tables were created using workbench.
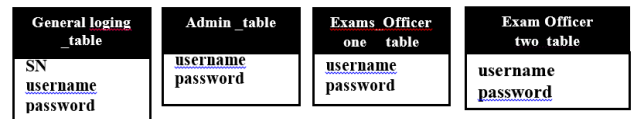

Figure 3: A sample of database table diagrams

5.3 Implementation

The design was implemented using Java programming language under netbeans (8.2) development environment. The project was implemented using Java programming language.

6.0 Outputs

The following are a sample of the outputs of the developed software when running.
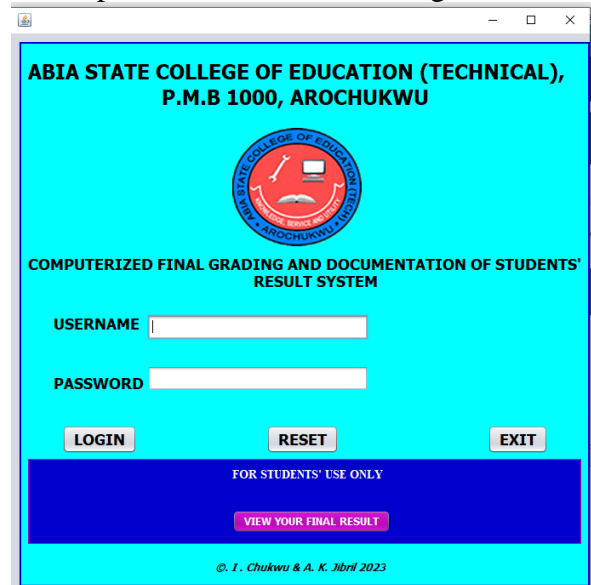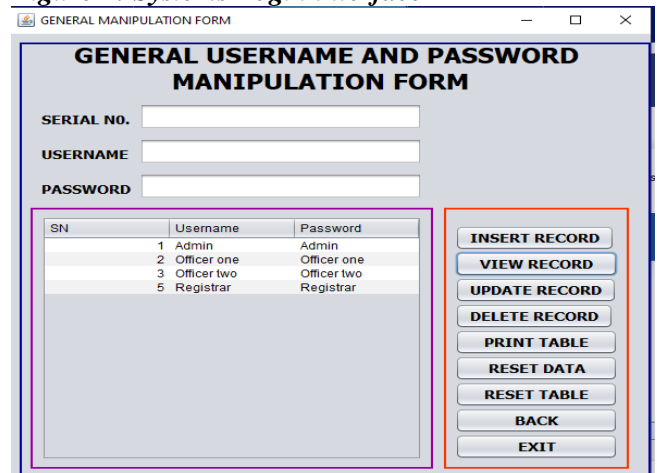

Figure 4: Systems Login interface

Figure 5: A view of user names and passwords stored in login table

Figure 6: Form for compiling graduating students' results

Figure 7: View Graduating Student Records

Figure 8: Final Grading Form

Figure 9: View of approved Student Result

Figure 10: Result Documentation form

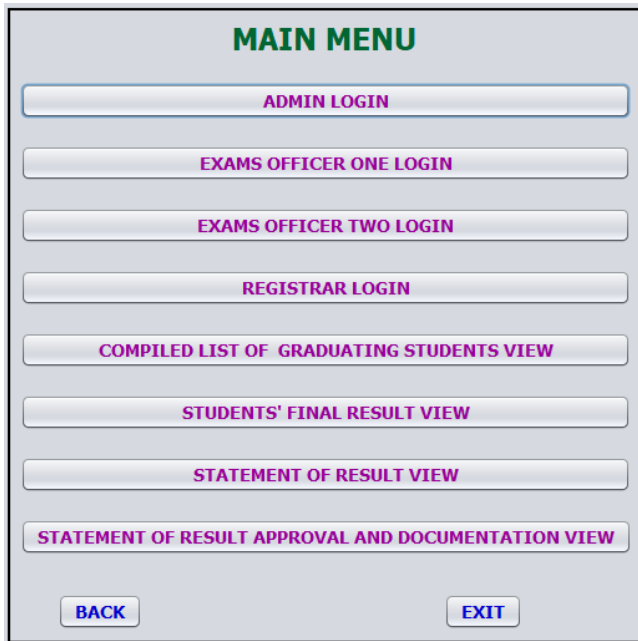Figure 11: Approved and documented Result View frame
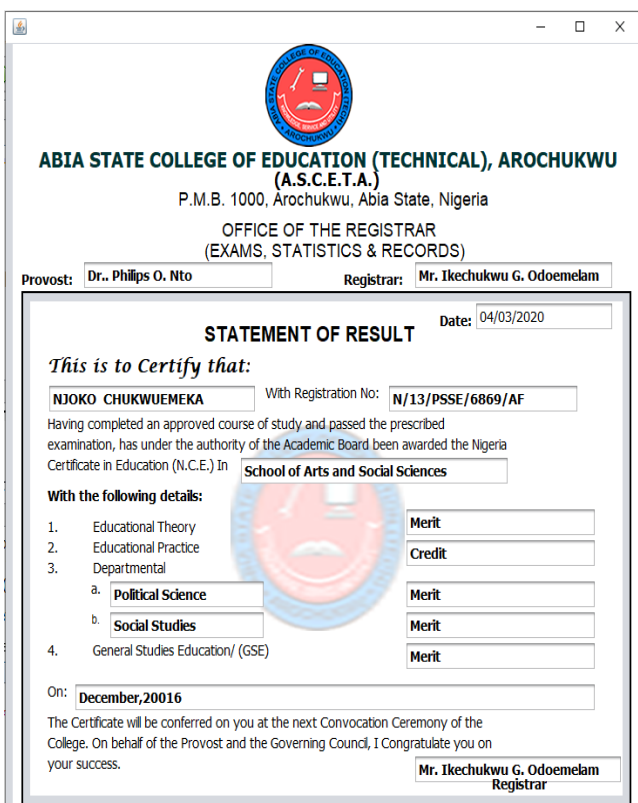
Figure 12: Main menu

Figure 13: A sample of Student statement of Result

7.0 Training/Performance Evaluation

The potential users of the new developed software were trained on the usage of the software. The developed software was then handed over to the staff for testing its functionality. The reports from the staff shows that the developed software is accurate, effective and efficient.

Table 3: Users Satisfaction with the Performance of the developed Software

N=32

S/N	Item	$\overline{X}$	SD	Remark
	Functional Software Requirements			
	Admin			
1	The software enable admin to login and logout	3.33	0.50	Agree
2	The software enable admin to add new username and password	3.17	0.52	Agree
3	The software enable admin to update username or password	3.00	1.48	Agree
4	The software enable admin to delete username and password	3.17	0.52	Agree
5	The software enable admin to view username and password	2.83	0.71	Agree
	Exams and Records Officer One			
6	The software enable Exams and Records Officer one to login and logout	3.42	0.65	Agree
7	The software enable Exams and Records Officer one to add new username and password	2.75	0.63	Agree
8	The software enable Exams and Records Officer one to update username or password	3.92	1.28	Agree
9	The software enable Exams and Records Officer one to delete username and password	3.00	0.60	Agree
10	The software enable Exams and Records Officer one to view username and password	2.75	1.11	Agree
11	The software enable Exams and Records Officer one to compile list of graduating students	2.92	1.21	Agree
12	The software enable Exams and Records Officer one to Update information about graduating students	3.25	0.69	Agree
13	The software enable Exams and Records Officer one to delete information about graduating students	2.75	1.34	Agree
14	The software enable Exams and Records Officer one to view the list of graduating students	2.83	1.14	Agree
15	The software enable Exams and Records Officer one to print list of graduating Students	3.17	0.69	Agree
	Exams and Records Officer Two			
16	The software enable Exams and Records Officer two to login and logout	3.64	0.50	Agree
17	The software enable Exams and Records Officer two to add new username and password	3.00	0.47	Agree
18	The software enable Exams and Records Officer two to update username or password	2.50	1.42	Agree
19	The software enable Exams and Records Officer two to delete username and password	2.58	0.60	Agree
20	The software enable Exams and Records Officer two to view username and password	3.17	0.52	Agree
21	The software enable Exams and Records Officer two to determine students' final grades	3.08	0.67	Agree
22	The software enable Exams and Records Officer two to add students' final grades	2.92	0.60	Agree
23	The software enable Exams and Records Officer two to update students' final grades	3.00	0.65	Agree
24	The software enable Exams and Records Officer two to delete students' final grades	2.50	0.90	Agree
25	The software enable Exams and Records Officer two to view students' final grades	3.00	0.72	Agree
26	The software enable Exams and Records Officer two to print Students' final results	3.08	0.67	Agree
	HOD			
27	The software enable HOD to login and logout	3.33	0.50	Agree
28	The software enable HOD to View list of graduating students	3.33	0.50	Agree
29	The software enable HOD to view the final grades of students	3.17	0.52	Agree
30	The software enable HOD to prepare statement of results	3.08	0.81	Agree
31	The software enable HOD to view the prepared statement of results	3.33	0.92	Agree
32	The software enable HOD to print the prepared statement of results	2.83	2.12	Agree
	College Registrar			
33	The software enable College Registrar to login and logout	3.00	0.65	Agree
34	The software enable College Registrar to add new username and password	2.66	0.83	Agree
35	The software enable College Registrar to update new username and password	2.50	0.90	Agree
36	The software enable College Registrar to delete new username and password	2.42	0.92	Agree
37	The software enable College Registrar to view new username and password	2.83	0.83	Agree
38	The software enable College Registrar to view Students' statement of results	3.42	0.47	Agree
	Non-Functional Software Requirements			
39	The Software window environments are attractive	2.92	0.69	Agree
40	The software buttons are responding to mouse click quickly	3.08	0.92	Agree
41	The feedback massages provided by the software through dialog boxes are self- explanatory	3.00	0.65	Agree
42	I felt comfortable when using the developed software	3.08	0.67	Agree
43	It is easy to navigate to different parts of the software	2.83	0.70	Agree
44	The software provided adequate data security	3.17	0.69	Agree
45	The software produce accurate calculated results	3.42	0.47	Agree
	Recommendation			
46	The developed software can be used for final grading and documentation of students results in the College	3.33	0.50	Agree

N=Number of respondent SD=Standard Deviation $\overline{X}$ =Mean

The data from table 3 shows that all the items had mean values greater than 2.50 which is the cut-off point. This implies that the developed software satisfies its functional requirements. In addition, the table shows that the values of the standard deviations (SD) are small, implying that the respondents' opinions on the items were very close. Finally, the mean value of item 46(3.33) indicated that the potential users agreed that the developed software can be used for the final grading and documentation of students results.

8.0 Conclusion/Recommendations

This paper presented the development of a software for final grading of students' results in Abia State College of Education (Technical)

Arochukwu. The software contained three main input forms for compiling the list of graduating students, grading students' academic performance as well as results documentation form. Other forms abound in the software includes general login, admin login, exams and records officer one and exams and records officer two. The software was developed using Java programming language. The developed software was handed over to its potential users for testing and evaluation. The results from the evaluation exercise shows that the new software is accurate, effective and efficient. The potential users recommends the software to be used in the College for final grading of students results and documentation.

9.0 Future Upgrade

The new software developed is desktop –based application. For effective and efficient usage it should be upgraded into web-based application.

Acknowledgments

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