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# Design And Implementation Of A Statistical Software For Processing Students' Semester Results: A Case Study Of Abia State College Of Education (Technical), Arochukwu, Nigeria

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***Abstract*—In Abia State College of Education (Technical) Arochukwu, students' semester results are processed manually. The manual processing system is costly, time consuming and often prone to errors compared to computerized one. Hence, the authors present the design and implementation of a software for processing students' semester results. The developmental process of the software commenced with examination of the existing manual system. This was followed by system analysis which culminated into both functional and non-functional requirements. The software architectural design followed client-server architecture with two layers of application and database system. The software was implemented using Java programming language in netbeans(8.2) IDE( Integrated Development Environment).The developed software can calculate total credit unit ,total GP,GPA, CGPA as well as take decision on whether a student pass all courses or has carry over(s).The developed software was tested by the potential users with real data from students' past semester result in the College. The result of the test showed that the software was effective, efficient and accurate in calculating GPAs and CGPAs. Hence, the potential users recommend its usage in the College.**

***Keywords—Statistical Software, Students' Results Processing System, Computerized Results Processing System, Abia State College of Education (Technical) Arochukwu***

## 1.0 Introduction

Abia State College of Education (Technical), Arochukwu, like any other tertiary education institution in Nigeria run semester system. A semester is one half of a year of academic programme. A semester according to National Commission for Colleges of Education, [1] must not be less than 15 weeks of teaching and a total of 2 weeks for registration and examination, making a total of 17 weeks. The academic activity that follows examination is processing of students' results. Processing of first semester, first year students' results involves recording of students' scores for each course registered, conversion of such scores into letter grades, calculation of Grade Average Point (GPA) for each student and compilation of the entire students' semester result in broad sheet. However, processing of first year, second semester and other semesters involves calculation of Cumulative Grade Point Average (CGPA) for each student in addition to calculation of GPA. Calculation of both GPA and CGPA in Abia State College of Education (Technical), Arochukwu, is done manually. Such manual calculation is tedious, time consuming and error prone. Furthermore, error in the results detected during presentation at Academic Board often resulted to re-working of the processed semester results. In summary, manual processing of students' semester results lead to errors and delay in approval of students' semester results.

One solution to the above observed problems is the use of computerized system of processing of students' semester results. In computerized system, software automatically computes student's GPA and CGPA using students' scores for given inputs. The calculation of GPA and CGPA for each student is automatic and accurate when correct scores of a student are inputted appropriately. Software developers have developed a number of softwares for calculation of GPA and CGPA and such softwares proved to be automatic and accurate. For example, [2] developed a computer software application to

facilitate the automated processing of the results. [3] developed a computer software application to facilitate the automated processing of the results. [4] designed and developed result processing system for Adamawa State University, Mubi. These systems were reported to function effectively.

In view of the remarkable performance of above softwares in area of processing students' semester results, this study aimed at developing a software for processing of students' semester results in Abia State College of Education (Technical), Arochukwu (ASCETA). With such software in place, the issues of errors in computation of GPA and CGPA as well as delay in approving students' semester results by the Academic Board will be a thing of the past.

## 2.0 Problem Statement

Each department in Abia State College of Education (Technical), Arochukwu prepares students' semester results manually and thereafter present such to the Academic Board for scrutiny and approval. Preparing semester result manually for a large number of students is not only tedious but also time consuming. Furthermore, most of the results presented to the Academic Board contain some errors which in turn often resulted to decision of re-work and representation to the Academic Board. Therefore, manual preparation of semester result delays approving students' semester result. To prepare accurate students' semester results and quicken the process of approval, the researchers set out to develop software that will lead to quick preparation of accurate students' semester results.

## 3.0 Objectives of the Study

The objectives of the study are as follows:

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

## 4.0 Literature Review

This section review literature on GP, GPA and CGPA. The section also review some softwares developed for computations of GPA and CGPA.

### 4.1 Computation of GPA and CGPA

Calculation of students' GPA and CGPA begins with conversion of students' numerical scores in each course into letter grades. Table 1 shows the grading system used by most tertiary institutions in Nigeria and Abia State College of Education (Technical) Arochukwu in particular.

***Table 1: Five-Point Grading System***

| Score (%) | Letter Grade | Grade Value | Remark |
|---|---|---|---|
| 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 |

As can be seen in table 1, grade letters A, B, C, D, E and F have grade values of 5, 4, 3, 2, 1 and 0 respectively. All the courses in NCE (Nigeria Certificate in Education) programme have weights (credit units, credit hours or credit loads).

#### *4.1.1 Calculation of GPA*

Let CU be credit unit for a course. The Total Credit Unit (TCU) is given by

$$TCU = CU_1 + CU_2 + CU_3 + CU_4 + CU_5 + .....CU_n = \sum_{i=1}^{n} CU_i .....1$$

Where n=positive integer.

The product of grade value and corresponding credit unit is termed as Grade Point (GP). GP is expressed mathematically as:

GP = Grade Value x Credit Unit …… (2)

Thus, a score of 59 by a student in a course with a credit unit of 2 result to a grade point of 6 (3x2). GP represents student performance in a single course. But in NCE as well as other academic programmes, students offer more than one course in a semester. To calculate the overall student performance in all the courses registered by a student in a semester, the concept of Grade Point Average (GPA) is used. GPA is a parameter that measures student performance in a semester. It represents the performance of a student in a semester. GPA is expressed mathematically as:

$$GPA = \frac{\text{Total grade points of the courses earned in a semester}}{\text{Total number of credit units of the courses offered in a semester}} ...(3a)$$

$$GPA = \frac{\text{TGP}}{\text{TCU}}. = \frac{\sum_{i=1}^{n} GP_i}{\sum_{i=1}^{n} CU_i} \text{.....(3b)}$$

$$GPA = \frac{\sum_{i=1}^{n} \text{GP}_i}{\sum_{i=1}^{n} CU_i} = \frac{\text{GP}_1 + GP_2 + GP_3 + GP_4 + GP_5 \text{.....} + GP_n}{\text{CU}_1 + \text{CU}_2 + \text{CU}_3 + \text{CU}_4 + \text{CU}_5 \text{.....} + \text{CU}_n} \text{...(3c)}$$

### *4.1.2 Calculation of CGPA*

GPA as discussed above measures student performance in only one semester. A parameter that measures student performance for more than one semester is referred to as Cumulative Grade Point Average (CGPA). CGPA is defined as the cumulative sum total of GPs of the courses from first semester one to the present semester divided the cumulative sum total of CUs of the courses from first semester one to the present semester. CGPA can be expressed mathematically as

$$CGPA = \frac{\sum_{i=1}^{n} \text{TGP}_i}{\sum_{i=1}^{n} TCU_i} = \frac{\text{TGP}_1 + TGP_2 + TGP_3 + TGP_4 + TGP_5 \text{.....} + TGP_n}{\text{TCU}_1 + TCU_2 + TCU_3 + TCU_4 + \text{TCU}_5 \text{.....} + TCU_n} \text{.....(4a)}$$

Where I =1, 2, 3, 4 and 5 stands first, second, third, fourth and fifth semesters respectively.

Using equation 4(a), the student CGPA for first semester is given by

$$CGPA = \frac{0 + TGP_1}{0 + \text{TCU}_1} \text{.....(4b)}$$

Similarly, the student CGPA for the second semester is given by

$$CGPA = \frac{TGP_1 + TGP_2}{\text{TUC}_1 + \text{TCU}_2} \text{,,,,,,,,,,,,(4c)}$$

### 4.2 Studies on Development of Students Result Processing Systems

[3] developed a computer software application to facilitate the automated processing of students' results. The software was developed using the Waterfall Software Life Cycle model. It was designed in the form of a database capable of running on a network. It has four sessions, namely, the Super Administrator, the Staff/Administrator, the Staff, and the Guest. The software tools employed included MYSQL Relational Database Management System, Dreamweaver Integrated Development Environment, PHP, and JavaScript. When tested, the developed software worked well and produced expected results.

[4] developed a computer software application to facilitate the automated processing of the results. The software was developed using HTML5, CSS8, and Java Script for client side, PHP (Hypertext Pre-Processor) as server side programming language and MySqli (My Structural Query Language Improved) as relational database. This language was chosen according to the authors because of its flexibility and features for developing online based applications. WAMP (Window Apache MySql and PHP) server was used for local hosting and testing. The data used for testing was obtained from the Department of Computer Science. The developed software was tested and found to perform well and produced expected results on completion. [4] concluded that, with the developed software, it was possible to compute Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) for each student based on examination scores entered or uploaded. Furthermore, the new system offers some qualities such as reduction in the cost of processing of information, reduction in time spent in computing GPA and generating transcripts, increase in accuracy and efficiency, and elimination of redundancies.

[5] designed and developed result processing system for Adamawa State University, Mubi. The system was engineered on internet platform with five (5) major web programming languages. The frontend interface was designed using PHP, HTML, CSS3 and JavaScript, while the backend functionalities are powered by MySQL Database

server side scripting language and which runs on a WAMP server. The data used for the system testing were obtained from the Department of Computer Science, Adamawa State University Mubi. Nigeria. An empirical analysis of the system showed that the application quickens the process of Students examination results, preserves and provides students quick access to their records as at once required.

## 5.0 Methodology

This project adopted System Development Life Cycle (SDLC). SDLD according to [6] is a framework that describes the activities performed at each stage of a software development project. It starts with system analysis, design and implementation, and continues through the maintenance and disposal of the system.

## 5.1 Software Requirement Specifications

The following are the software requirement specification for the project.

### *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 (e.g. Version 8.2)
(f) Connector J 5.6

### *5.1.3 System Users*

1. Admin
2. Exams Officer
3. HOD

### *5.1.4 Functional Requirement Specifications*

**Admin**

1. Login and logout.
2. View, add, delete, update and print general and admin usernames and passwords
3. View student results

**Exams Clerk/Officer**

1. Login and logout.
2. Process students' result
3. View, add, delete, update and print students departmental result
4. View, add, delete, update and print individual students results

**HOD**

1. Login and logout.
2. View 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. Be Scalable
7. Be robust
8. Maintainable

## 5.2 Design

### *5.2.1 System Architecture*

The project 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). The system architecture is shown in figure1.

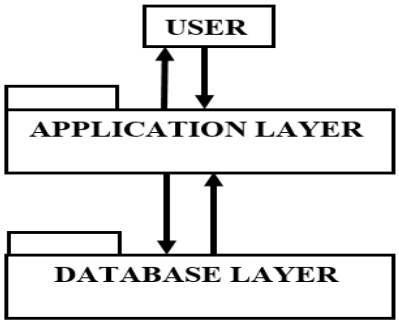


***Figure 1: Two Layer Architecture***

### *5.2.2 Use Case*

The Use case diagram that shows the major functions of the users using UML (Unified Modelling Language) is shown in figure 2.

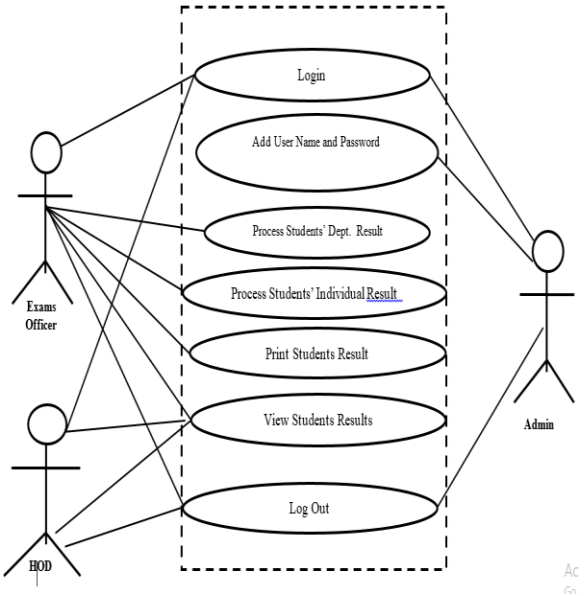


***Figure 2: Use case***

### *5.2.3 Input Forms Design*

The system main input form is CGPA form. It is a form where the exams clerk/officer input students' personal information. It is also a form where the exams officer enter students' semester results and then calculate GPA, CGPA and make decision on whether a student has carry over or not. The form has JTextFields for accepting students' information, students' results as well as outputting result of calculations such as GPA, CGPA and remark. The form also contain fifteen (15) submit buttons. Six of the buttons are for sending students' departmental semester results to result-tables in the database (See figure 3) while the other six are for sending students individual results to the tables. The remaining three buttons are back, reset and exit buttons (Figure 6)

#### *5.2.3.1 General Login Form*

The software has a general login form where the users such as admin, exams officer and HOD can login. The general login form contain JFrame with JPanel on it. JTextField for username and JPasswordField for password were positioned on the JPanel appropriately. The two fields were labeled appropriately with two Jlabels bearing username and password respectively. Additional Jlabels were used for writing the name of the institution as well as the name of the system. The JtextField and JpasswordField will enable users to enter their usernames and passwords. Another Jlabel carrying the College logo was positioned near the center of the JPanel. Thefor also contain two other buttons where students can view their departmental and individual results. Three Jbuttons with letters login,reset and exit inscribed on them were positioned at the lower part of the JPanel(see figure 4).The JtextField, Jpassword and Login button enable the users such as exam clerk/officer, admin and HOD gain entry into the system after entering correct username and password, The default username and password for the general login form concerning admin, exam clerk/officer are as follows: **Admin** and **Admin**, **Exam clerk** and **Exam clerk** and **HOD** and **HOD**. However, the three users can change the usernames and passwords for security reasons. Figure 5 shows the admin username and password manipulation form that contains the username and password of the three users in a Jtable.

#### *5.2.3.2 Exams Clerk/Officer Login Form*

It is only the departmental exams Clerk/officer that is allowed to process students' semester result. Therefore, there must be login form for the clerk/officer. The exams clerk/officer login form has the same design and structure with that of the general login form. The default username and password for exams clerk/ officer login is **exam clerk** and **exam clerk**. The exams clerk/officer can change these username and password for security reason.

#### *5.2.3.3 Admin Login Form*

In this design, only admin is authorized to add username and password of users into the database. This informed the inclusion of admin login form. The design and structure of the form is the same as that of the general login form. The default username and password for admin login is **admin** and **admin**. The Admin can change these username and password for security reason

### **5.2.5 Main Menu**

Main menu screen contains admin, exam clerk, departmental result views, and individual students' result views. Other buttons appended to the main menu frame are back, and exit button (see figure 7).

### *5.2.6 Database Design*

. This project made use of MySQL database to store all the information required by the system to function. The database named result contain five (15) tables. Figure 3 shows 5 of such tables. The database and its tables were created using workbench.

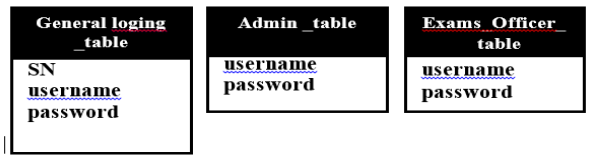


*Figure 3: A sample of database tables*

## 5.3 Implementation

### *5.3.1 Writing Program Code*

The project was implemented using Java programming language. The codes were written in Java netbeans (8.2) IDE (integrated Development Environment).

## 6.0 Sample Output

The following are a sample of the outputs of the system when running.

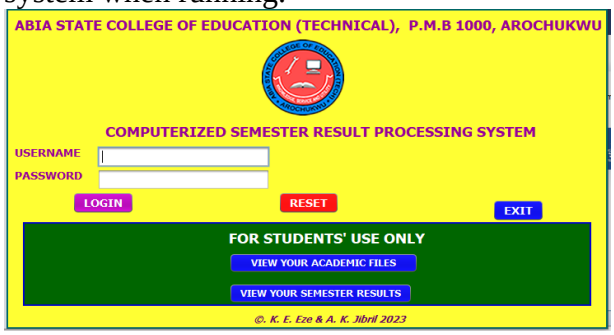


*Figure 4: General login form*

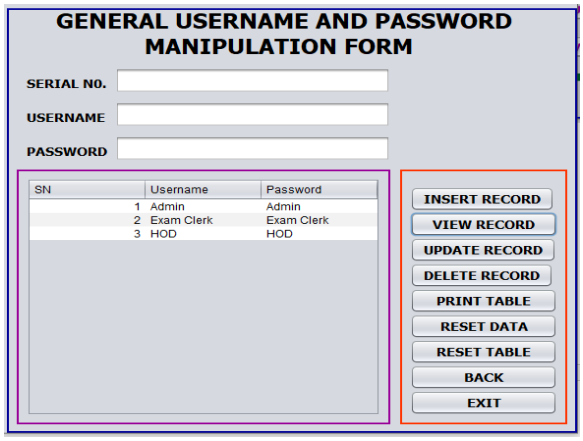


***Figure 5: A view of user names and passwords stored in login table***


*Figure 6: CGPA Form*

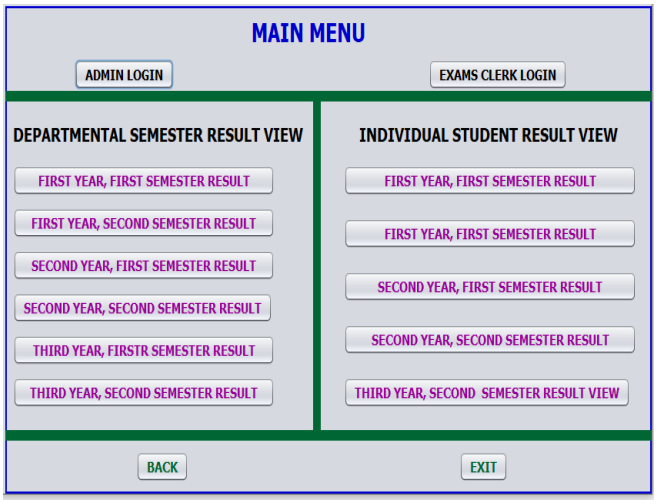


*Figure 7: Main menu Interface*

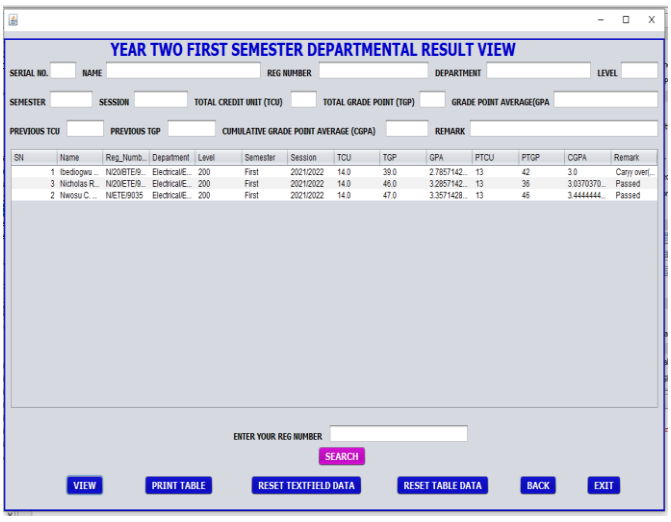


*Figure 8: Departmental Result View*

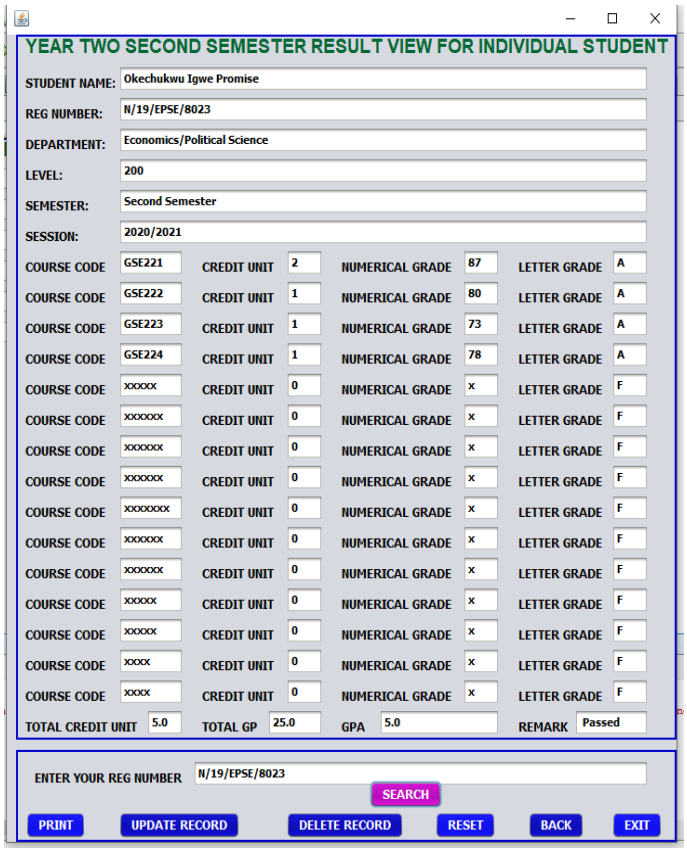


*Figure 9: Individual Student Result View*

## 7.0 Training/ Performance Evaluation

The potential users of the developed software were first trained on how to use the software. Thereafter, the software was handed over to various departmental examination clerks/officers to test its efficacy. The reports from officers shows that the new software is accurate, effective and efficient as depicted in table 1.

*Table 1; Evaluation of Developed Software*

N=32

| S/N | Item | $\bar{X}$ | SD | Remark |
|---|---|---|---|---|
| | **Functional Software Requirements** | | | |
| | *Admin* | | | |
| 1 | The software enable admin to login and logout | 3.83 | 0.39 | Agree |
| 2 | The software enable admin to add new username and password | 3.33 | 0.49 | Agree |
| 3 | The software enable admin to update username or password | 3.42 | 0.52 | Agree |
| 4 | The software enable admin to delete username and password | 3.00 | 0.79 | Agree |
| 5 | The software enable admin to view username and password | 2.75 | 0.29 | Agree |
| | *Exams Officer* | | | |
| 6 | The software enable Exams Officer to login and logout | 3.75 | 0.45 | Agree |
| 7 | The software enable Exams Officer to add new username and password | 3.33 | 0.25 | Agree |
| 8 | The software enable Exams Officer to update Exams Officer username and password | 3.25 | 0.45 | Agree |
| 9 | The software enable Exams Officer to delete username and password | 3.08 | 1.08 | Agree |
| 10 | The software enable Exams Officer to view username and password | 3.50 | 0.52 | Agree |
| 11 | The software enable Exams Officer to calculate students' GPA | 3.75 | 0.45 | Agree |
| 12 | The software enable Exams Officer to calculate students' CGPA | 3.33 | 1.15 | Agree |
| 13 | The software enable Exams Officer to add students exams record in students' individual file | 3.42 | 1.04 | Agree |
| 14 | The software enable Exams Officer to view students exams records | 3.67 | 0.49 | Agree |
| 15 | The software enable Exams Officer to update students exams records | 3.75 | 0.45 | Agree |
| 16 | The software enable Exams Officer to delete students exams records | 3.33 | 0.25 | Agree |
| 17 | The Software enable Exams Officer to print Students' academic records | 3.67 | 1.63 | Agree |
| | *HOD* | | | |
| 18 | The software enable HOD to login and logout | 3.75 | 0.62 | Agree |
| 19 | The software enable HOD to view all the academic records in the software | 3.50 | 0.30 | Agree |
| | *College Registrar* | | | |
| 20 | The software enable College Registrar to login and logout | 3.58 | 0.51 | Agree |
| 21 | The software enable College Registrar to view all the academic records in the software | 3.58 | 1.04 | Agree |
| | **Non-Functional Software Requirements** | | | |
| 22 | The Software window environments are attractive | 3.33 | 0.65 | Agree |
| 23 | The software buttons are responding to mouse click quickly | 3.25 | 0.75 | Agree |
| 24 | The feedback massages provided by the software through dialog boxes are self-explanatory | 3.33 | 0.49 | Agree |
| 25 | I felt comfortable when using the developed software | 3.42 | 0.67 | Agree |
| 26 | It is easy to navigate to different parts of the software | 3.00 | 0.85 | Agree |
| 27 | The software provided adequate data security | 3.50 | 0.52 | Agree |
| 28 | The software produce accurate calculated results | 3.67 | 0.65 | Agree |
| | *Recommendation* | | | |
| 29 | The developed software can be use for processing students' semester results in the College | 3.67 | 0.65 | Agree |

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

The data from table 1 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 29 (3.67) indicated that the potential users agreed that the developed software can be used for the processing of students semester results in the College.

## 8.0 Conclusion/Recommendation

This paper presented the design and implementation of software for processing students' semester result. The software was developed using developmental procedure such as information gathering, system analysis, design, implementation and evaluation. The potential users of the software were trained on how to use it. The developed software was then handed over to its potential users for evaluation. The results from the evaluation exercise shows that the new software is accurate, effective and efficient. The potential users then recommended the software to be used in the College for processing students' semester results.

## 9.0 Future Scope

The new software developed is desktop –based application. Therefore, the three users (Admin,

Exams Clerk/Officer and HOD cannot use it simultaneously. Furthermore, they cannot use it at their comport homes. To solve this problems, the authors recommends the upgrade of the developed software to a status of web-based application.

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**References**

[1] NCCE (2012). *Curriculum Implementation Framework for Nigeria Certificate in Education*. Abuja: NCCE.

[2] Ukem,E.O. & Onoyom-Ita, E.O. (2011). A Software Application for the Processing of Students Results. *Global Journal of Pure and Applied Sciences*, 17(4), 487-502.

[3] Dada, O. M., Raji, A. K., Oyedepo, F. S., Yusuf, I. T., & Saka, T. O. (2017). Design and Implementation of an Integrated Result Processing System in a Networked Environment. *Biomedical Statistics and Informatics*, 2 (5): 131-137.

[4] Sarjiyus, O. & Manga, I. (2019). Result Processing System for Adamawa State University, Mubi. *International Journal of Engineering and Science (JESC)*, 9 (9), 23737-23743.

[5] Olumoye, M.Y (2013). The Development of a Computer-Based Staff Management System. *European International Journal of Science and Technology*, 2 (9), 41-51.