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Implementation of University Result Decision Support Systems

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Abstract: ***The World Wide Web and global Internet have provided a technology platform for further extension of the capabilities and deployment of computerized decision support systems. The release of the HTML 2.0 specifications with form tags and tables were turning points in the development of web-based decision support systems. This rapid change has transformed the entire design, development and implementation process for all types of decision support systems. The proposed application is University Result Decision Support Systems which is an application package developed for the easy processing of university results and online checking of results. Software development tools involved are as follows: Visual Basic and Hypertext Preprocessor (PHP) were used to design and develop the offline and online applications in order to ensure flexibility. Microsoft SQL Server 2011, Crystal Pro and MySQL were used to design the database for effective computation, generate reports and accurate querying of records. The goal of this paper is to register university, faculty and department name, student records, matriculation number, students score in different courses, and perform the computation of results at a single click on a button. Reports are generated and also raw scores are uploaded for online checking exercise. In this research work, it is shown that DSS and agent technologies could prove a very powerful tool for rendering decision support in the whole university system.***
Keywords: MySQL, Support, System, Result, University, Visual Basic

I. INTRODUCTION

Information and communication systems and technologies are essential infrastructure for competitiveness of all economic sectors, and the basis for trade, provision of services, production, transport, education and entertainment. They are now one of the major driving forces of change, allowing the transformation of the organizations into global networked structures, not just global and distributed, but virtual, creating a huge role of opportunities, and simultaneously of challenges to the organizations and to the society. A Web-based application, on the other hand, would not require special installation in users' personal computers and would work across all computing platforms. Anyone with a computer connected to the Internet and a Web browser would be able to access and use it. Because of its centralized nature, application improvements and new developments would be instantly available to users without the need of software redistribution and reinstallations. [1] concluded that methods for executing simulation models via a Web interface had to be developed in an expedient manner to effectively deliver decision support systems to industry and policymakers. This is a computerized system of helping make decisions when it comes to university examination result. It is a specific class of computerized information system that supports educational decision-making activities and policies. A properly designed UERDSS is an interactive software-based system intended to help decision makers compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions. The model is intended to support managerial decision making in semi-structured or unstructured situations and not meant to replace a decision maker, but to extend his/her decision making capabilities. It uses data, provides a clear user interface, and can incorporate the decision maker's own insights. Some of the major UERDSS capabilities are the following:

1) Brings together human judgment and computerized information for semi-structured decision situations.
2) A UERDSS is designed to be easy to use, user friendly, have graphical capabilities, and an interactive human-machine interface.
3) It improves the effectiveness of decision making rather than its efficiency.
4) A UERDSS provides support for various managerial levels which can be PC-based.

The perceived ease of use is just one important feature in the design of systems. The other important feature of decision support systems that will affect their adoption is their perceived usefulness. According to [2], perceived ease of use is a measure of the reduction (or increase) in physical or mental effort to use the decision support system. Alternatively, perceived usefulness is a measure of how well the decision support system will enhance a user's decision-making capability. [3] suggested that (i) software

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that rates low in ease-of-use and low in usefulness will be rejected, (ii) software that is high in ease-of-use and low in usefulness may be embraced by users initially but there is little chance of lasting acceptance, and (iii) software that is low in ease-of-use but high in usefulness will only be used by very competent computer users, while most users will avoid this type of software because the time and effort required to learn how to use it outweighs the potential benefit. [4] concluded that the aim should be to develop software that rates high in ease-of-use and high in usefulness.

The study of computerized support systems involves many disciplines of research. The most popular and successful example is DSS. Turban summarizes DSS as *"computer-based information systems that combine models and data in an attempt to solve non-structured problems with extensive user involvement through a friendly user interface"* after discussing various definitions. DSS can be viewed as a hybrid product of two domains of studies. It is an approach or methodology for supporting decision making. It uses interactive, flexible, adaptable computer-based information systems specifically developed for supporting the solution to a specific nonstructural management problem [5]. DSS are derived from management science and computer science. The same principle applies to other types of support systems.

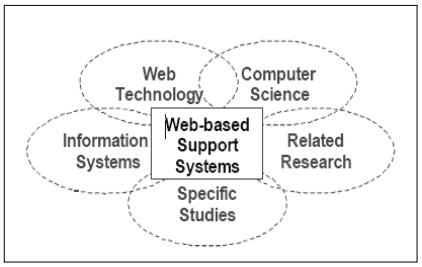


Fig 1: A UERDSS: A multidisciplinary research

Finally, the study of UERDSS aims to take the opportunities of the web, to meet the challenges of the web, and to extend the human physical limitations of information processing. We define UERDSS as a multidisciplinary research field (as depicted in Fig 1) that focuses on supporting human activities in specific domains based on computer science, information technology, and web technology.

II. LITERATURE REVIEW

Nigeria University system comprises the undergraduate and the postgraduate schools. The undergraduate school spans a period range of 4 to 5 years while that of the postgraduate school spans a period range of 2 to 3years. University result system consist of a process in which students sit for an examination, the result is computed and the result is presented to the students as report sheet or viewed over the internet. It has been a thing of difficulty for students to retrieve their past result or to check for a result from anywhere they are until they get to their various schools. In viewing these problems faced by students in universities, it is essential to find a means of putting an end to it. To augment the efforts of Schools in providing effective university result system, this research work is being carried out to develop a "University Examination Result Decision Support System"

Modern Decision Support Systems provide institutions/researchers a wide range of capabilities. Computerized systems support decision tasks like information gathering, model building, sensitivity analysis, collaboration, alternate evaluation and decision implementation. Also, decision support is increasingly integrated in educational and business processes and DSS are used for ad hoc analyses. These positive developments are facilitated by Web Technologies. The global Internet and the World Wide Web are now the primary enabling technologies for delivering decision support. The phrase *"**University Examination Result Decision Support System**"* comprises different words. In reviewing the topic very well, in-depth knowledge of each of these words is very essential.

Decision support systems (DSS) disciplines deal with the use of information technology to support human decision-making processes. Michael Scott-Morton, who virtually invented the discipline in the early 1970s, offered this definition of DSS: Decision support systems couple the intellectual resources of individuals with the capabilities of the computer to improve the quality of decisions. It is a computer-based support system for management decision-makers who deal with semi-structured problems. [4] concluded from his research that decision support systems could be categorized in terms of the generic operations that can be performed by such systems. These generic operations extend along a single dimension, ranging from extremely data-oriented to extremely model-oriented. Alter conducted a field study of 56 DSS that he categorized into seven distinct types of DSS. His seven types include:

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1) File drawer systems that provide access to data items.
2) Data analysis systems that support the manipulation of data by computerized tools tailored to a specific task and setting or by more general tools and operators.
3) Analysis information systems that provide access to a series of decision-oriented databases and small models.
4) Accounting and financial models that calculate the consequences of possible actions.
5) Representational models that estimate the consequences of actions on the basis of simulation models.
6) Optimization models that provide guidelines for action by generating an optimal solution consistent with a series of constraints.
7) Suggestion models that perform the logical processing leading to a specific suggested decision for a fairly structured or well-understood task.

Donovan and Madnick classified DSS as institutional or ad hoc. Institutional DSS support decisions that are recurring [6]. An ad hoc DSS supports querying data for one time requests. Hackathorn and Keen identified DSS in three distinct yet interrelated categories: Personal DSS, Group DSS and Organizational DSS [7]. Robert Bonczek, Clyde Holsapple, and Andrew Whinston explained a theoretical framework for understanding the issues associated with designing knowledge-oriented Decision Support Systems [8]. They identified four essential "aspects" or general components that were common to all DSS:

A. A language system (LS) that specifies all messages a specific DSS can accept
B. A presentation system (PS) for all messages a DSS can emit
C. A knowledge system (KS) for all knowledge a DSS has
D. A problem-processing system (PPS) that is the "software engine" that tries to recognize and solve problems during the use of a specific DSS.

Finally, Ralph Sprague and Eric Carlson's book "Building Effective Decision Support Systems" was an important milestone. Much of the book further explained the Sprague (1980) DSS framework of data base, model base and dialog generation and management software. Also, it provided a practical and understandable overview of how organizations could and should build DSS. Sprague and Carlson defined DSS as "a class of information system that draws on transaction processing systems and interacts with the other parts of the overall information system to support the decision-making activities of managers and other knowledge workers in organizations.[9]"

III. UERDSS ARCHITECTURE

A UERDSS application contains five components: database, model base, knowledge base, GUI, and the user (see Fig 1.2 below). The database stores the data, model and knowledge bases store the collections of models and knowledge, respectively, and the GUI allows the user to interact with the database, model base, and knowledge base. The database and knowledge base can be found in a basic information system. The knowledge base may contain simple search results for analyzing the data in the database. For example, the knowledge base may contain how many students in a departmental database have been in the university for four years. A decision support system is an *intelligent information system* because of the addition of the model base. The model base has the models used to perform optimization, simulation, or other algorithms for advanced calculations and analysis. These models allow the university examination result decision support system to not only supply information to the user but aid the user in making a decision.

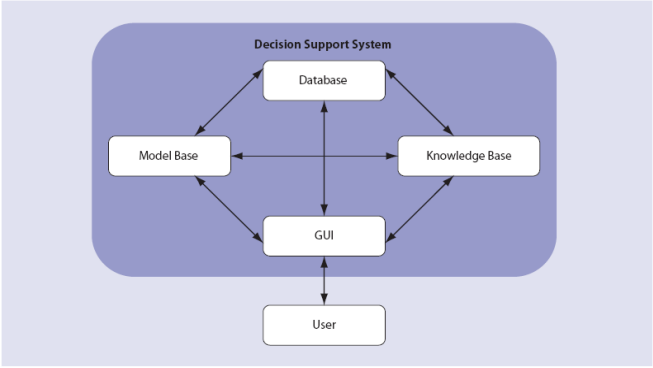


Fig 2: A schematic view of a decision support system

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1) *The Database:* The database contains information about internal data and external data that will contribute to the decision making process. This data is in most cases more extensive than traditional relational models. The database provides the data with which decisions are made. The data may reside in databases or even in a data warehouse, a repository for decision-making data relevant to a corporation. The database allows a user to access, manipulate, and query data.
2) *The Model Base:* This module contains a set of algorithms that makes decisions based on the information in the database. This information is then summarized and displayed as tables or graphs. For instance, the Model base of Visual Basic is a little bit different from Macromedia Dream Weaver 8 and Microsoft SQL Server 2011. In Visual basic, we work with the Objects, which have Properties and Methods.

a) *Object:* Object is a thing or better still a noun. Examples of objects are forms and controls. Forms are the windows and the dialog boxes you place on the screen; controls are the elements you place inside the form, such as text boxes, command buttons and list boxes.
b) *Properties:* properties tell something about an object, such as its name, colour, size, location and how it will behave. When referring to a property, the object is named first, add a period, and then name of the property. For instance, referring to a caption property of a form called UERDSS as UERDSS. Caption (say "UERDSS dot caption").
c) *Methods:* actions associated with objects are called *methods.* Methods are the verbs of object-oriented programming. Some typical examples of methods are print, resize, clear, and move.

In general, a model base contains statistical, financial, optimization, or simulation models that provide the analysis capabilities in a DSS.

3) *The Knowledge Base:* Many managerial decision-making problems are so complex that they require special expertise for their solution. The knowledge base part of a UERDSS allows this expertise to be stored and accessed to enhance the operation of other UERDSS components.
4) *User:* The person who uses the UERDSS to support the decision-making process is called the user, or decision maker. A DSS has two broad classes of users: Administrator and ordinary user. When designing a UERDSS, it is important to know for which class of users the UERDSS is being designed.

IV. RESEARCH METHODOLOGY

This can be defined as the techniques used for the successful execution of a research work. In developing the application, Visual Basic programming language will be used as the developing tool and Microsoft SQL Server 2011 is the DBMS that will be used to design the database. Crystal Report pro or Adobe Report will be used in designing and generating the report. These languages are chosen because they use a technology which provides efficiency and security in the development of both desktop and web applications. Also they reduce complications encountered in the development of packages.

In order to design and develop the University Examination Result Decision Support System, various methodologies will be exercised to gain access to information and also for the design of the application; these are:

A. Observations in different Universities. This includes a personal tour of some universities in Nigeria.
B. Interviews and archive information from stakeholders in university education.
C. Reviews of past papers, journals on DSS and university education.

1) *Methods of Data Acquisition*: Data collection for the work was done using both the primary and the university acquisition methods.

a) *Primary Data:* These are data collected through interviews and observation. The interviews did include that of members of the administrative board, examiners and HODs and ICT staff. Also, data were collected through observation pass list, fail list sheets and broadsheets
b) *University Data:* These include data collected through Decision Support System books, existing and relevant literatures, and source information via the internet.

2) *University Examination Result Decision Support System Architectures*: There are basically two types of architectures for developing a University Examination Result Decision Support System: "Front-end / client-side" and "server-side / back-end".

a) *Front-end / Client-side* architecture allows user to enter/input their data. It enhances the interaction between the user and the system hiding all the detailed underlining architecture from the user. It can be in Graphical form (GUI – Graphical User

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Interface) or Console form. Validation of data is performed at this end before it is sent to the back end. It is usually implemented in standalone applications.

b) *Back end / Server-side* architecture stores the data of the user after input. It is also known as the database of an application. It can reside on a server or a standalone system. It stores data in the format which is supported by the database management system being used to implement it.

3) *Calculation*

$$TPE = \sum (\text{Credit Unit} * \text{Credit Earned})$$
$$GPA = TPE / TCC$$
$$CGPA = \sum TPE / \sum TCC$$

where

TCC	-	Total Credit Carried
TCE	-	Total Credit Earned
TPE	-	Total Point Earned
GPA	-	Grade Point Average
CCC	-	Cumulative Credit Carried
CCE	-	Cumulative Credit Earned
CGPA	-	Cumulative Grade Point Average

V. RESULT AND DISCUSSION

1) *Output Design*: The output design is the result obtained from the processed data that has been fed into the computer partly through the standalone, web-based application and some other data that are supplied by the administrator of the standalone application being uploaded to the web server. This aspect of the application will only be available at the standalone end and will be administered by the authorized staff of the department. The system automatically generates series of useful reports that are very necessary for adequate and prompt decision making by the management. Some of the reports that can be generated by the proposed system are listed below:

a) Student Result Report
b) Student Pass / Fail List
c) Broadsheet showing performance of students in all courses
d) Graphical Representation of Performance
e) Student Bio-data Report
f) Graduating list

This section introduces the full documentation of the designed system, the decision support system integration into university examination result process, the hardware requirements needed for the system and the testing of the system for verification and validation of functioning modules or features.

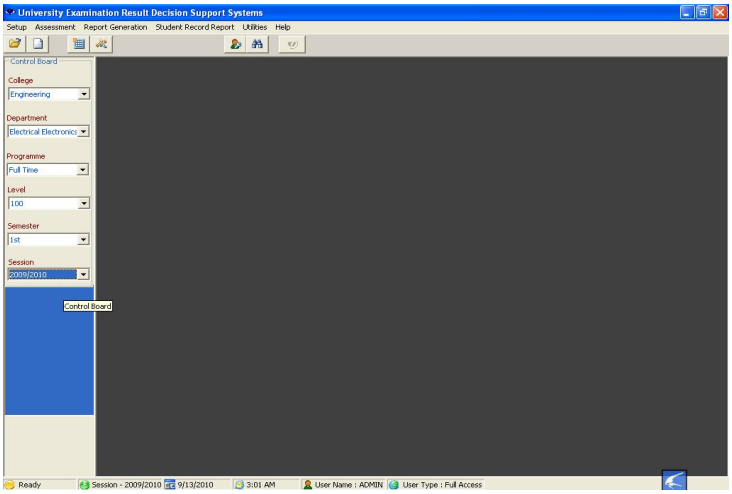


Fig 3: University Examination Result System Main Menu

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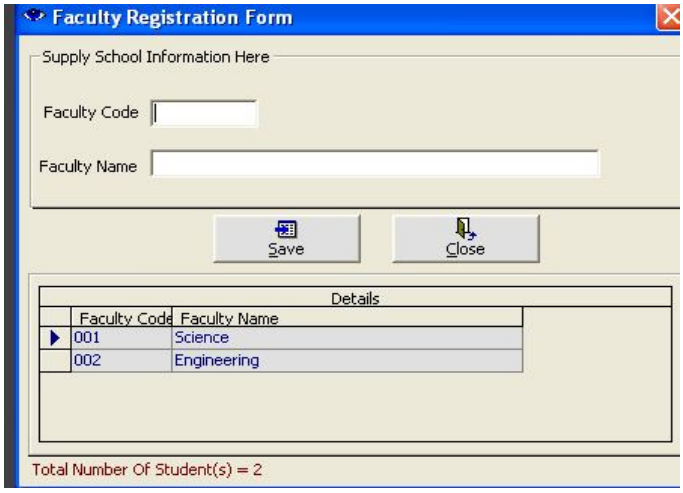


Fig. 4: College registration form

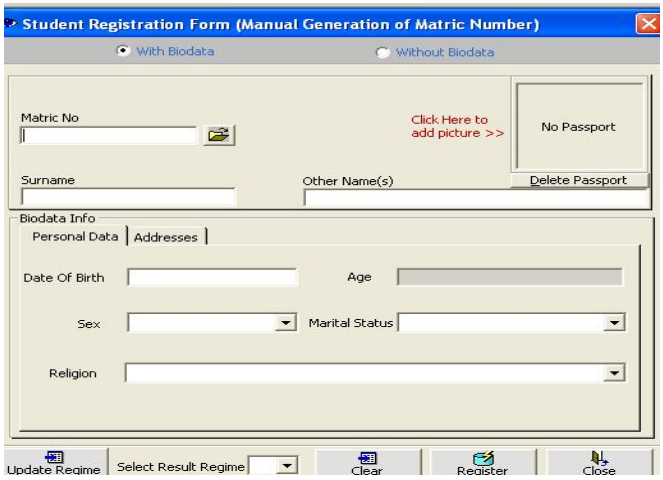


Fig 5: Student Registration Form

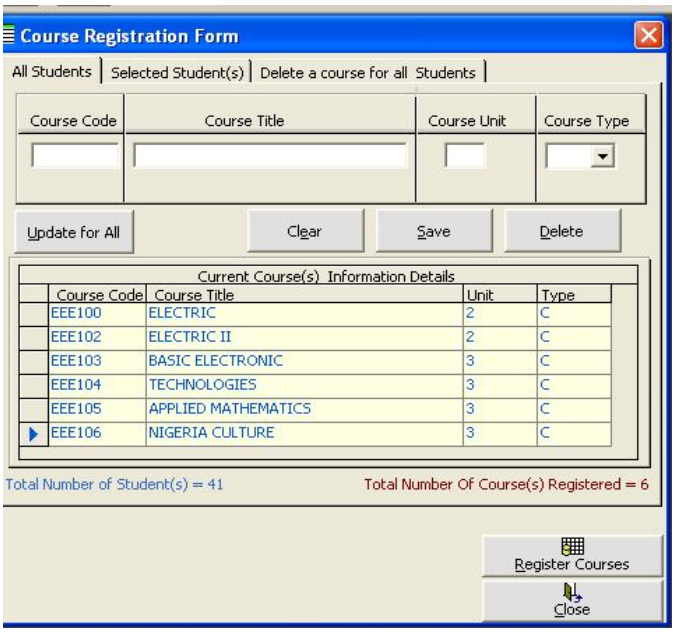


Fig 6: Semester Course Registration Form

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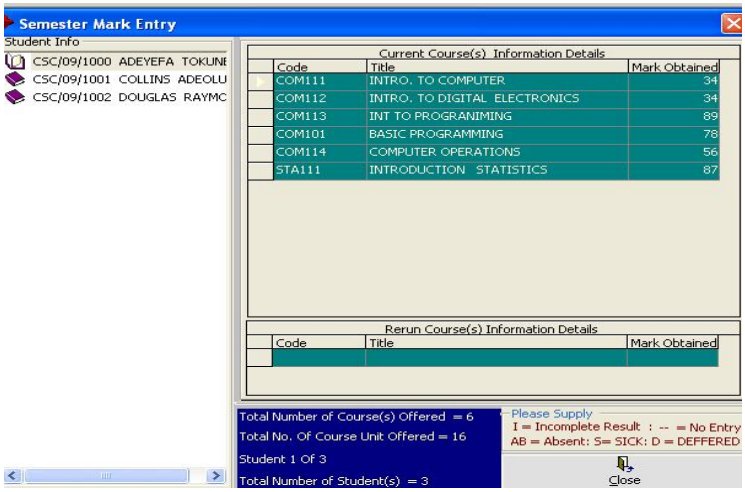


Fig 7: Semester Mark Entry Form

2) *Result Computation:* In this section, result computation / processing of already entered scores are performed. Result computation can only be performed for students whose overall examination scores have already been entered. The form is shown below

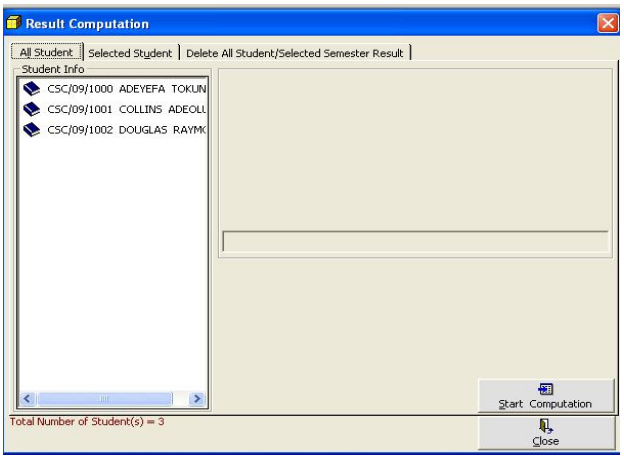


Fig.8: Result Processing Form

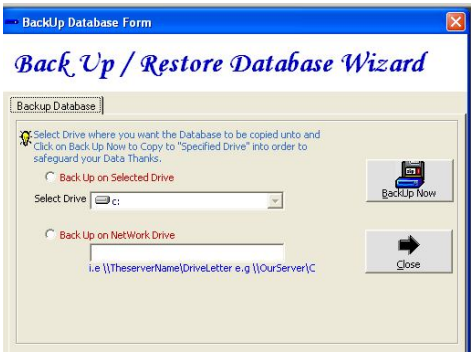


Fig. 9: Backup/Restore Form

3) *Student Record Report Menu:* In the report, different operations based on report generation can be performed. The menu contains six sub menus. These are

1) *Result Report:* Result report sheet is processed and displayed in this section. Report sheets are automatically generated for all students. The report processing form is shown below

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Table 1: Result Report (Passed List)

UNIVERSITY OF AGRIULTURE
P.M.B 2373, MAKURDI, NIGERIA
PRESENTATION OF SUMMARY OF RESULTS TO SENATE
EXAMINATION RESULTS

SEMESTER / SESSION: 1ST SEMESTER 2009/2010
COLLEGE: Engineering
DEPARTMENT: Electrical Electronics
PROGRAMME: Full Time
LEVEL: 100
A:PASSED

PASSED LIST

The following students have passed all courses registered for the semester

S/N	REG.NO	FULL NAME	CGPA
1	EEE/09/2000	OMOLAYE PHILIP	5
2	EEE/09/2001	FIDEL CASTROL	4
3	EEE/09/2002	ADEBAYO SALAMI	3
4	EEE/09/2004	KUREVE DOUGLAS	4.63
5	EEE/09/2005	AGBO DAVID	4.13
6	EEE/09/2009	AIYELABOLA TEMIDAYO	4.44
7	EEE/09/2010	AFEKHARE JANET	5
8	EEE/09/2011	OWOEYE MOJI[illegible]	4.5
9	EEE/09/2012	FELA ANIK[illegible]	4.56
10	EEE/09/2013	OLUS[illegible]SANJO	5
11	EEE/09/2015	[illegible]HEHU	3.75
12	EEE/09/2019	IC[illegible]NEDION LUCKY	3.56
13	EEE/09/2022	GEORGE AKUME	3.81
14	EEE/09/2024	BILL GATE	4.31
15	EEE/09/2025	BARAK OBAMA	4.44
16	EEE/09/2026	GEORGE BUSH	4.25
17	EEE/09/2030	ROBIN VAN PERSIE	3.75
18	EEE/09/2031	CHRISTIAN RONALDO	4.06
19	EEE/09/2033	NICHOLAS BENDTNER	4.13
20	EEE/09/2037	WANDOO WANGER	4.19
21	EEE/09/2038	TEFA TERKA	4.75
22	EEE/09/2040	RODNEY KABILA	3.69

PASSED LIST

Table 2: Result Report (Failed List)

UNIVERSITY OF AGRIULTURE
P.M.B 2373, MAKURDI, NIGERIA
PRESENTATION OF SUMMARY OF RESULTS TO SENATE
EXAMINATION RESULTS

SEMESTER / SESSION: 1ST SEMESTER 2009/2010
COLLEGE: Engineering
DEPARTMENT: Electrical Electronics
PROGRAMME: Full Time
LEVEL: 100
A:PASSED

CARRY OVER LIST

The following students have reference in one or more courses for the semester

S/N	REG.NO	FULL NAME	CGPA
1	EEE/09/2003	ONOJA KAREM	2.25
2	EEE/09/2006	SHITTU MTECH	3.72
3	EEE/09/2007	UDOUGAN CHARLES	2.25
4	EEE/09/2008	SHOMEFUN FOLA	3.8
5	EEE/09/2014	SODANGI AMARU	3.73
6	EEE/09/2016	BABANGIDA IBRAHIM	3.92
7	EEE/09/2017	YUSUF ABACHA	2.25
8	EEE/09/2018	AMINU KANO	2.25
9	EEE/09/2020	OLUSEGUN MIMIKO	3.91
10	EEE/09/2021	OLUSEGUN AG[illegible]GU	2.25
11	EEE/09/2023	KLASS[illegible]HITE	2.94
12	EEE/09/2027	SA[illegible]HUSSEIN	3.34
13	EEE/09/2028	[illegible]WENGER	4.11
14	EEE/09/2029	[illegible]EX FERGUSON	3.78
15	EEE/09[illegible]032	ALEX SONG	3.2
16	EEE/09/[illegible]	DANIEL OSOBA	2.25
17	EEE/09/2035	MIKEL OBI	3.34
18	EEE/09/2036	AMADI OBI	3.34
19	EEE/09/2039	GABRIEL SUSWAN	2.8

CARRY OVER LIST

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Table 3: Summary of courses and grades distribution

UNIVERSITY OF AGRIULTURE, MAKURDI
Summary of Courses and Grades Distribution

COLLEGE: Engineering **LEVEL:** 100
DEPARTMENT: Electrical and Electronic Engineering **SEMESTER:** 1st
PROGRAMME: B.Eng **SESSION:** 2009/2010

S/N	Course Code	Course Title	Units	Number of Candidates	Letter Grades Distribution						PERCENT PASS
					A	B	C	D	E	F	
1	CSC201	Basic Programming	1	1	1	0	0	0	0	0	100.0
2	MTH202	Introduction to Engineering Maths	2	3	0	0	0	3	0	0	100.0
3	EEE201	Basic Electronic Circuit	2	6	0	0	1	0	1	4	33.3
4	EGS201	Engineer in Society	2	2	0	0	0	0	1	1	50.0

Table 4: Summary of Examination Results

UNIVERSITY OF AGRIULTURE, MAKURDI
Summary of Examination Results

COLLEGE: Engineering **LEVEL:** 100, 200, 300, 400, 500
DEPARTMENT: Electrical and Electronic Engineering **SEMESTER:** 1st
PROGRAMME: B.Eng **SESSION:** 2007/2008

LEVEL OF STUDY	STUDENTS REGISTERED	STUDENTS EXAMINED	STUDENTS ABSENT	STUDENTS PASSED	STUDENTS TO REPEAT FAILED COURSES	STUDENTS ON PROBATION	STUDENTS TO WITHDRAW
100	50	50	-	40	10	2	-
200	50	50	-	45	5	1	-
300	50	50	-	47	3	-	-
400	60	60	-	52	8	-	-
500	40	40	-	36	4	-	-

VI. CONCLUSION AND RECOMMENDATION

A. Conclusion

This paper (UERDSS) puts Decision Support System in university management on standalone machine, which when fully maximized will provide critical data and information required to serve the result presentation process. The result of this research work has have revealed that presenting result system in DSS in a personal computer environment offers an unparallel platform for the management and promotion of the university management system in Nigeria. Moreover, difficulties faced in the result processing of students could be eliminated making the process become less expensive, easier and less time consuming.

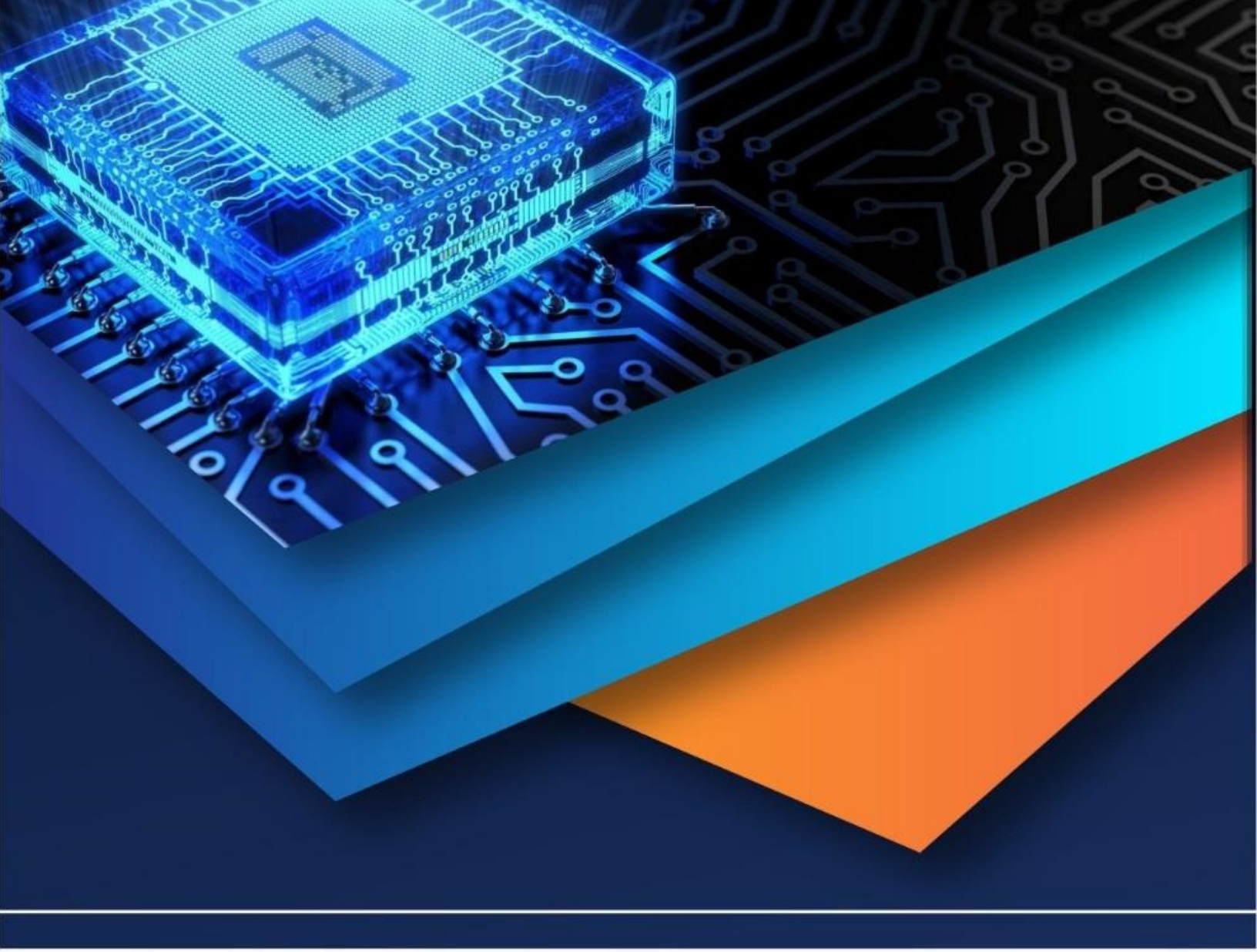
B. Recommendation

Examining the benefits provided by University Examination Result Decision Support System especially in resulting processing, and tremendous value creation in prompt result presentation to students and to the university senate thereby providing an effective university management, it is therefore recommended that further research should be carried out on this project. More visits should be made to different Government owned university and privately owned ones with the aim of assembling more information on such curriculum, grading system and sensitizing them about the effectiveness of the system. This will enable more universities to adopt the system for ease of presentation of results with attendant benefits.

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