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Automated Students Result Management System Using Oracle's Database, Forms and Reports

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Abstract

This research is focused on creating an automated students result management system using oracle's database, forms and reports. This is a computerized examinations results management system for tertiary student's examination records. The manual method of students' academic result processing was found to be tedious, especially when carried out for a large number of students, this makes the entire process time-consuming and error prone. The system designed is meant to register students as soon as they have paid their departmental registration and only then will they be able to view their results. The system presents a single platform that will be used to manage the processing of all examination records within the institution. The data used for testing was obtained from the Department of Physics, Nasarawa State University and an empirical evaluation of the system shows that the system expedites the processing of students' examination results and the reporting of it.

Keywords: Oracle Database, Oracle forms, Oracle

1.0 Background.

Eludire (2011) noted that the data generated by organizations are usually created in files for use by different departments/units within the organization. If the data contained in these files are not carefully delineated it is very likely that the same data will appear on several of these files. That is these files would contain redundant data for example the University registry file and college or department file would contain the name and address of a student. This would mean that a simple change of address has to be processed in two and probably three or four places, depending on the number of other files on which these data appears. This results in data redundancy. Vecchioli (1999) noted that organizing and managing student records into a cohesive and efficient system might seem like an impossible task. This study was carried out to verify the manual process involved in generating students examination result and to seek a way of automating the system for effective operations. It is pointed out in the research work Student Examination Result Processing System (2012) that the effort expended in the process of registration of students and computation of their examination results is enormous. Hence, the need to evolve a computerized process that will effectively and efficiently capture all the important data associated with the registration and examination result processing within the University.

Barrett (1999) notes that in an effort to efficiently document and maintain accountability data, schools are relying more on technology in the form of Student Management Information Systems (SMIS). This system is designed to efficiently handle processes like inputting scores, storing results, automatically calculating grade points, and interpreting the student's overall result. The usual manual process has now reached a level where it is difficult for the available man power to cope with the magnitude of examination work, in the given time. The imbalance between man power availability and the magnitude of work to be done in processing examination results, leads to the delay in the declaration of examination results. An effective measure, which can improve the efficiency of the examination result processing is therefore the introduction of computerization, especially with the use of examinations result processing software. Computerized relational database systems (RDBMS) like Oracle database, Microsoft SQL server, MySQL etc. were developed with goal of reducing data redundancy.

Brian (2009) stated that databases are collections of interrelated data of such a nature that the collections can be represented as a number of files but not a single file. Garcia-Molina et al. (2008) also stated that depending on the Database Management System (DBMS) used, these files may be integrated permanently into a single connected structure or integrated temporarily for each interrogation, known as a query. Nearly all departments within an organization require data to be processed into information in a timely manner. Timely information processing and dissemination leads to efficiency and customer satisfaction. Schools are organizations as well and

timely information processing and dissemination is needed to run a school efficiently. Many schools have their own system to manage students profile and assessments. Common practice as earlier stated is by recording the student information in a record book(s). Students' information is obtained from the registration forms obtained from the practices that have always been used. This practice has some weaknesses such as it takes a longer time to search the student's profile, the possibility of misplacing these record books and the vulnerability of student's record as the records could be accessed by unauthorized persons. Eludire (2011) stated that other problems associated with manual course system management include; improper registration, late release of students' results, Inaccuracy due to manual and tedious calculation, Retrieval difficulties/inefficiency. It is unfortunate that most educational institutions in the developing world still operate the manual methods of record keeping and computation. Although the manual methods still works, it is prone to errors. Automation of school administration processes should be encouraged computers can be used for this automation process and processing student's results can be done quickly and efficiently to the satisfaction of the students, lecturers, parents and school authority.

My research focuses on the design and implementation of an application where student results can be stored, users can access this software from anywhere as long as the computer they are working on is on the network same as the application server. This application enables users with the right permission to insert new user details, student's examination records as well as updated these records whenever necessary. The tools which I used in designing this application is oracle's database for keeping the records (data), oracle forms for creating the user interface and oracle reports for presenting information to the user. This research seeks to provide an alternative to the manual system of presenting results to students

1.1 literature review.

Information systems used to manage student data have been referred to in various ways: Student Information Systems (SIS), Student Management Information Systems (SMIS), Student Data Systems (SDS), Student Data Warehouse (SDW), Student Academic Information Systems (SAIS), or Student Information Management Systems (SIMS), (Ngoma, 2009). Barrett (1999) encapsulates the essence of a student information system. He defines SMIS as "an integrated software package that maintains, supports, and provides inquiry, analysis, and communication tools that organize student accountability data into information to support the educational process" (p. 4). A result management system (RMS) is only an aspect of a complete SIS package. The U.S. Department of Education (2008) views student data systems as encompassing "hardware and software that provide many different functions to users, such as storing current and historical data, rapidly organizing and analyzing data, and developing presentation formats or reporting interfaces"(p. 2). My aim is to design and implement a University's RMS, this system will have the capability of storing current and historical data, organize and analyze this data as required and the software will have the ability to be integrated with other SIS packages if the need arises.

1.2 Historical Perspective.

In the Early 1970's the first automated Integrated Student Information System using punch card input is implemented.

In 1984 Punch-card system replaced by a database system on an Intercom platform. In 1988 Intercom system replaced by an Integrated Database Management System (IDMS) database system. An IDMS is primarily a network database management system for mainframe computers, (Wikipedia, 2014).

1988 through to 2005 IDMS systems were continually enhanced and modified to meet new requirements and changing technology using the Internet, hundreds of interfaces have been built and extracts created to service a large number of independent systems across colleges and campus, (North Carolina State University, 2006).

1.3 Theoretical framework

Emmanuel and Choji (2012) stated that the introduction of computer into information technology has massively improved the information need of organizations. Anigbogu (2000) defined a computer as an electronic device capable of accepting data and instructions, processing the data based on the instructions to generate results or output in such a manner that is yet to be equaled by any other known machine to mankind. Since the computer is capable of accepting data and instructions, store this data and often time this instructions and then generate an output, it is therefore necessary that we harness this quality and use it to our advantage. The process of school administration and in this case result processing is as already stated a time consuming and strenuous exercise

prone to errors, if done manually, hence the need for us to seek out ways to lift this burden from the individuals involved in this exercise. Obiniyi and Ezugwu (2010) observed that Student enrolment in tertiary institutions is increasing at a very alarming rate. The increase in students' population over the years has made the work of administrative officer in charge of processing students' result a very tiresome exercise to deal with. The rise in the number of students in schools today has made it imperative that we continue to seek out the best and most efficient ways to handle schools and school administration. Mohini and Amar (2011) indicated that Publication of student's results in the manual system takes a very long time owing to which students remain idle for months together. Sometimes the delay in declaration of result cause heavy losses to the students as generally they cannot join further studies or appear in competitive exams or join jobs because of the non-availability of examination result in time. Nmaju *et al*. (2013) also observed that many higher institutions in Nigeria still adopt the manual method of managing students' data which is time consuming and demanding, and are often prone to a variety of errors and disasters. Hence, it brings to the fore the need to properly address how these shortcomings could be resolved and improved. They further stated that the solution to these shortcomings lies in an efficient information management system, or simply, information system. Okonigene et al. (2008) further stated that, with the use of computers for information processing, the following are possible: instant access to students' personal and course information, instant student information updating, automatic computation of the Grade Point Average (GPA), generation of the graduating students list, monitoring of failed courses, keeping an up-to-date record of the entire student body in the University, storing course information such as course code, course description, course unit, and scores for the purpose of GPA computation, and producing user friendly data entry screens for ease of use.

There exist several programming Languages, programming packages and database management systems that can be used to develop a result processing software. Java is a programming language used to build programs that can work on stand-alone computers and on the internet, its primary features are that it is object-oriented and a cross platform language. By cross platform, I means that the programs can run across several platforms such as Microsoft Windows, Apple Macintosh, and Linux etc. Oracle's Procedural Language/Structured Query Language (PL/SQL) is the choice of programing language used in the development of this application, because it's Oracle Corporation's procedural extension language for SQL and the Oracle relational database. PL/SQL's general syntax resembles that of Pascal. It is also one of three key programming languages embedded in the Oracle Database, along with SQL itself and Java. PL/SQL supports variables, conditions, loops and exceptions. Arrays are also supported, though PL/SQL collections. Implementations from version 8 of Oracle Database onwards have included features associated with object-orientation. Once the program units have been stored into the database, they become available for execution at a later time.

1.4 Materials and Methods

Hardware requirements;

i. HP Proliant Micro Server with 6GB Memory, Processor speed of 1.5GHz, 250GB HDD and 1Gbps NIC.
ii. Client computer with 2GB Memory, Processor speed of 2.5GHz, 250GB HDD and 100Mbps NIC.
iii. Two Monitor Units.
iv. Two pairs Keyboard and mouse.
v. A Network Switch.
vi. A pair of 3 yards of Ethernet cables.

Software Requirements;

i. Windows Server 2003 operating system.
ii. Windows XP professional operating system
iii. Oracle database 11gr2 software
iv. Oracle Web Logic server 10.3.5
v. Oracle forms and report 11g.
vi. Adobe reader 11.

1.5 Research design

In my work I will make use of both the traditional waterfall approach to software development and incremental build model. As my work is designed in a sequence from the start to finish. Ukem and Ofoegbu (2012) referred

to the Waterfall software life-cycle model as a traditional model because it was the first widely used software development life cycle. They stated that it is part of Structured Software Engineering or the Structured Paradigm, which is the older of the two earliest approaches to formal software engineering. I will also acknowledge that at every stage of the development, improvements were made based upon the tests I carried out on the application being developed, until I got my expected outcome. This research is about gathering students results to a centralized location for users of the application to have access to. Hence in trying to address the identified problems, as well as the deficiencies in the existing manual methods of students results management, I interviewed stakeholders at the Nasarawa State University Keffi (NSUK), surveyed and analyzed the different academic documents in use in the school, reviewed best practice literature regarding information technology projects, I reviewed other Students Information Management Systems (SIMS) to gain in-depth understanding of what my system should look like, I also collected comprehensive academic records from the Physics Department, Nasarawa State University Keffi (NSUK) which I used for testing the system. This application must be accessible to users from anywhere on campus so I had to make use of what I will classify as design models. I made use of two levels of system design models. The first model is the logical model and the second model is the physical model.

The logical model is about the database tables, data within these tables and the relationship between the tables that make up the application. They logical model identifies entities (i.e. data), and what these entities are, can be shown in a normalized and fully attributed entity-relationship diagram (ERD) representing the data model. An entity-relationship diagram (ERD) is a data modeling technique that creates a graphical representation of the entities, and the relationships between entities, within an information system, (Searchcrm, 2014). The entities identified in my design are; faculties, departments, students, users, academic sessions, students registration and academic courses registration. I will be going through these in details in chapter four of this dissertation.

The second model, physical model, and defines how the system is physically and technically implemented. The output of the physical modeling is the database model. The database model contains the database table which holds the data as described in the logical model, it also contains the physical datafiles in which the database tables together with their data will be stored. I will be designing an application software utilizing oracle's database, forms and reports. This application will run on a server (computer) with network connectivity to the client systems. It is recommended that both the application server and database server be on separate computers, but because of the cost implication we will run both applications on the same computer, which is also fine. A local area network (LAN) or intranet for this research will be set up for connectivity between the application server, database server and client computers. Data will be stored in database tables, users will be able to key in data to tables though forms which have been designed for this purpose, these forms will be the interface between users and the database. These forms will run in web browsers, preferably internet explorer or Mozilla Firefox. Users will be authenticated at the Welcome and Login pages before they can interact with the application and database, therefore usernames and passwords will be required from users at the point of login, once successfully authenticated by the system at login, users are re-directed to the appropriate page, depending on their system defined privileges, where they can perform whatever actions their user privilege is entitled to perform. Student records from the manual process already in use will be utilized in order to obtain data for testing the application.

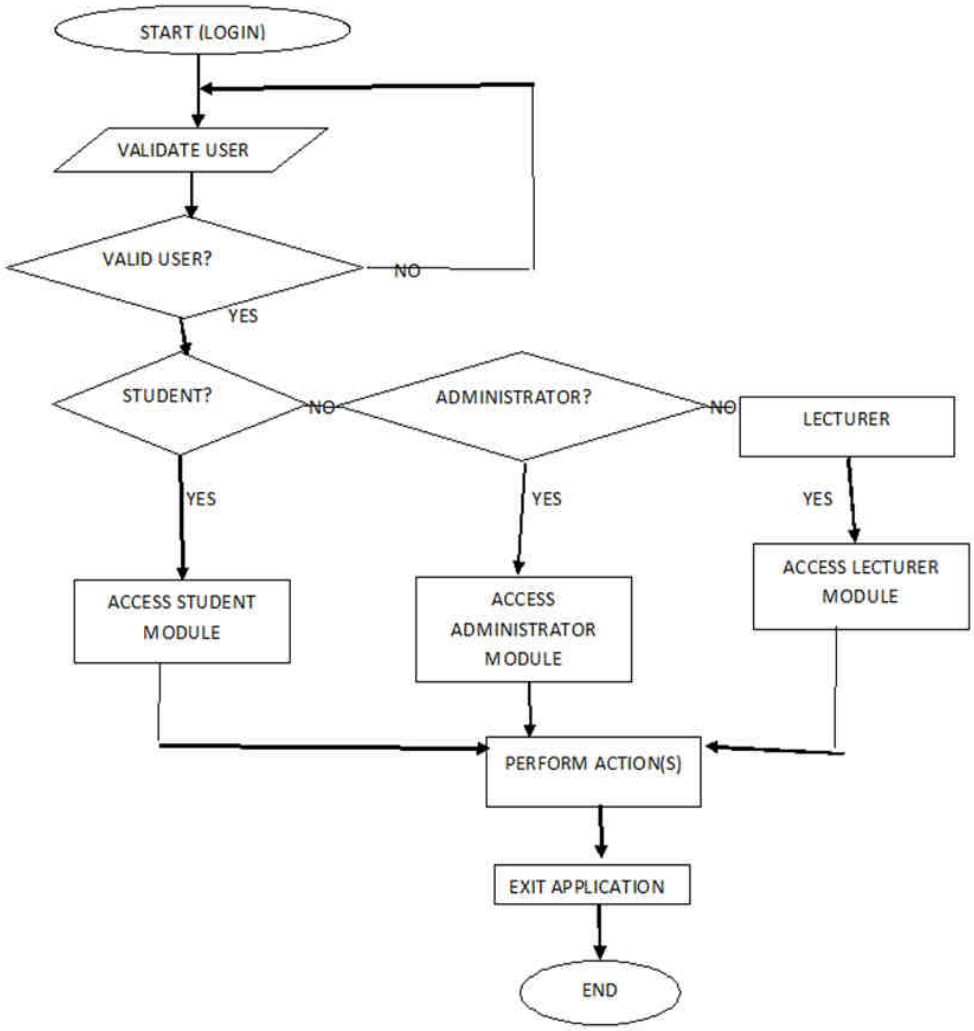


Fig1. Application flowchart

1.6 Database Tables

i. ADMINISTRATOR Table

This table holds the profile information of the application super users otherwise known as system administrators. They have control of the software meaning that they can perform additional tasks that other users cannot ordinarily perform. Every software of this nature has such users and this one is no exception. The table contains the following columns; ADMIN_ID, TITLE, FRIST_NAME, LAST_NAME, and DEPARMENT_ID. The column ADMIN_ID is the primary key column (primary key disallows duplicate values and nulls in a column) every table should have a primary key column, as this acts like table indexing.

ii. ALL_COURCES Table

This table keeps the courses offered by students in different departments in the school. The table contains the following columns; COURCE_ID, COURCE_TITLE, and COURCE_CODE. The COURCE_ID is the primary key column.

iii. APP_USER_A Table

This table contains application login details for application administrators. The table columns are; USRNAME, PASSWD and ADMIN_ID. The column ADMIN_ID is the primary key column.

iv. APP_USER_L Table

This table contains application login details for application lecturers. The table columns are; USRNAME, PASSWD and LECTURER_ID. The column LECTURER_ID is the primary key column.

v. APP_USER_S Table

This table contains application login details for application students. The table columns are; USRNAME, PASSWD and MATRIG_NO. The column MATRIG_NO is the primary key column.

vi. DEPARTMENTS Table

This table holds information about the schools departments. The table contains the following columns; DEPARTMENT_ID and DEPARTMENT_NAME. The column DEPARTMENT_ID is the primary key column.

vii. GRADES Table

This is more like the main table in the database as all other tables relate to this table directly or in some other way. This table holds students examination records. The table contains the following columns; GRADES_ID, SESSION1, REG_NUMBER, DEPARTMENT_ID, LEVEL1, MATRIG_NO, FRIST_NAME, LAST_NAME, COURCE_CODE, GRADE, CREDIT_UNIT, SCORE, LECTURER_ID and GRADE_POINT. The column GRADES_ID is the primary key column.

viii. LECTURERS Table

This table holds the profile information of the application lecturers. The table contains the following columns; LECTURER_ID, TITLE, FRIST_NAME, LAST_NAME, and DEPARMENT_ID. The column LECTUTER_ID is the primary key column.

ix. REG_TABLE Table

This table contains student's registration details i.e. if a student is registered for the semester this table is used to store that information. The table contains the following columns; REG_ID, REG_NUMBER, MATRIG_NO, FRIST_NAME, LAST_NAME, LEVEL1, DEPARTMENT_ID and SESSION1. The column REG_ID is the primary key column.

x. STUDENTS Table

This table holds the profile information of the application students. The table contains the following columns; MATRIG_NO, TITLE, FRIST_NAME, LAST_NAME, and DEPARMENT_ID. The column MATRIG_NO is the primary key column.

1.7 Application forms

i. Welcome Screen

To access the application a web browser (internet explorer, Mozilla etc.) short cut with the address of the application server will be placed on the desktop of all computers (computers to access the application have to be on the same network with the application server) that will be accessing the software for easy access to the application. Upon double clicking this short cut the welcome page will be displayed.

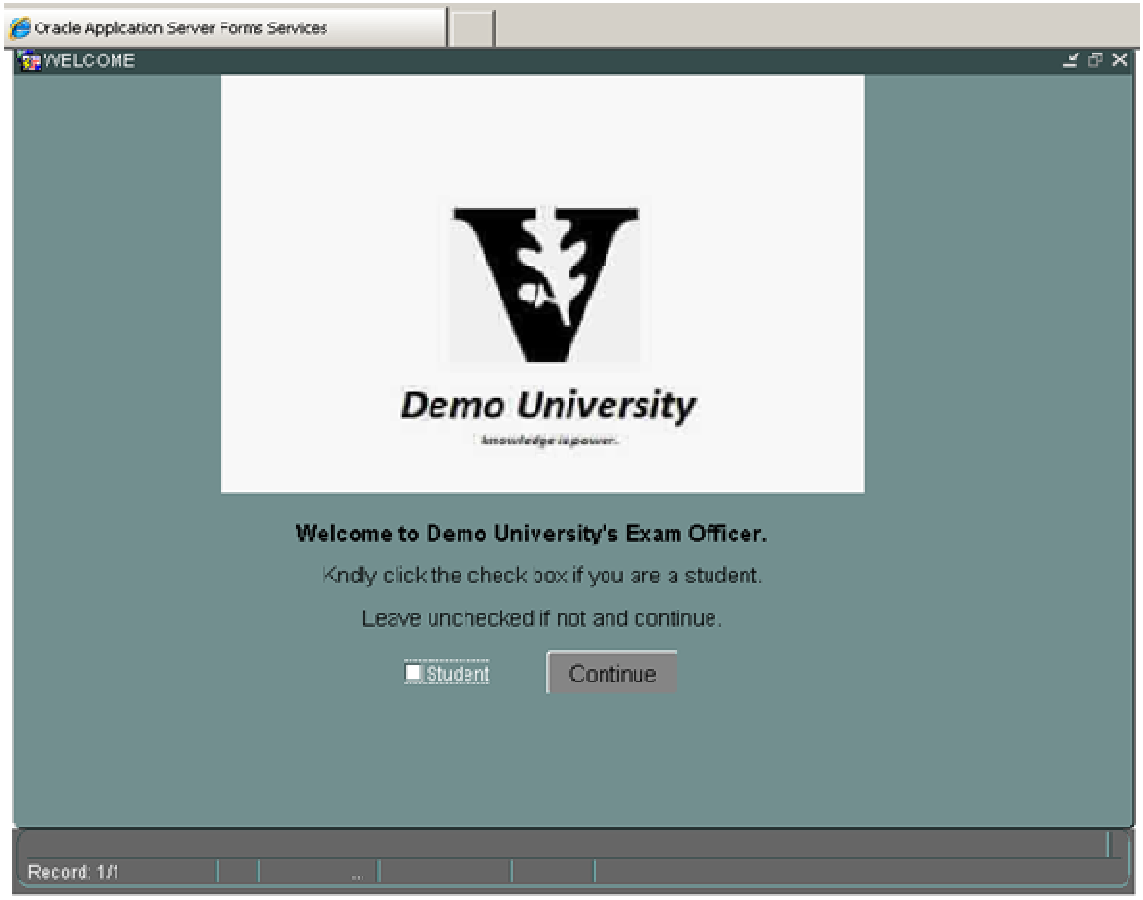


Fig. 2 Welcome Screen.

The display in figure 2 is the application's welcome screen. As can be read from the screen if the user to log in were to be a student, then the check box with student written beside it will be checked, before the continue button is pressed. Otherwise if the user to log in was a lecturer or an administrator then the student check box should be left unchecked.

1.8 Administration screen

If the student check box is left unchecked and the continue button is pressed then the administration screen is displayed as shown in Fig 3.

1.9 Login Screen

On the application login screen as shown in figure 4, should a user fail to provide a valid username or password he or she gets the Invalid username or password error message shown in figure 5

1.10 Result Screen

Once a student logs in he or she is presented with the result screen where the student result can be accessed as shown in figure 4.5

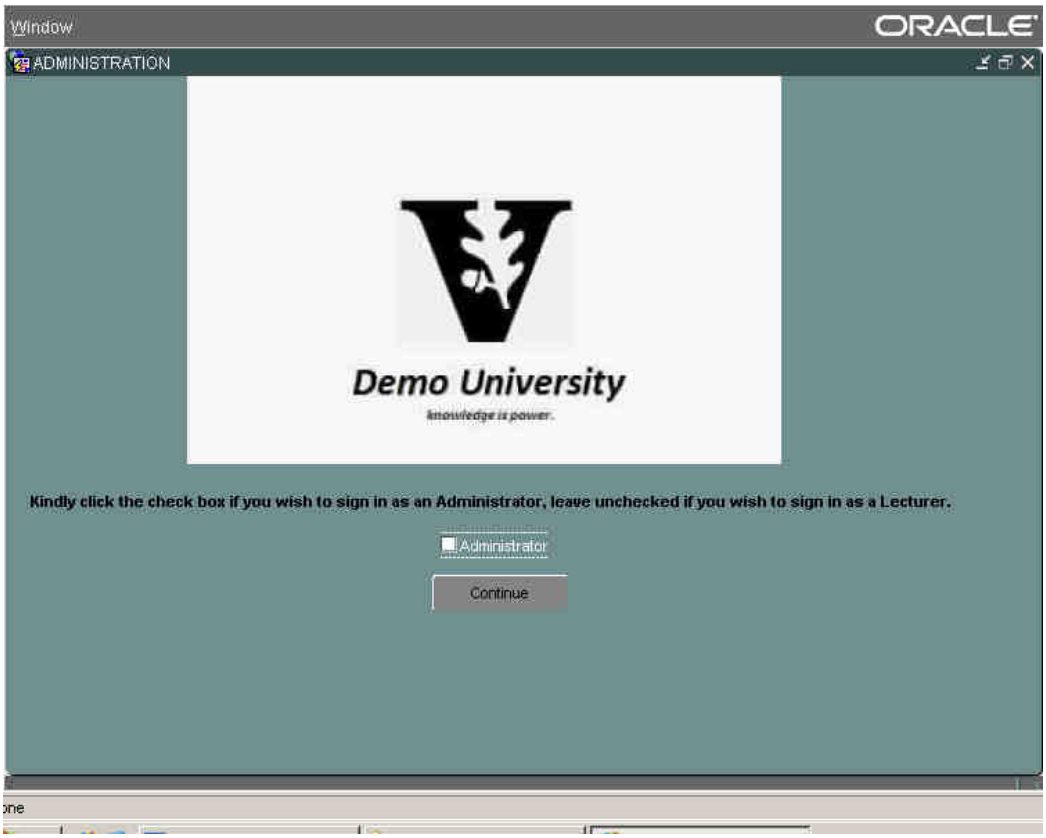


Fig. 3

Fig. 4 Login Screen

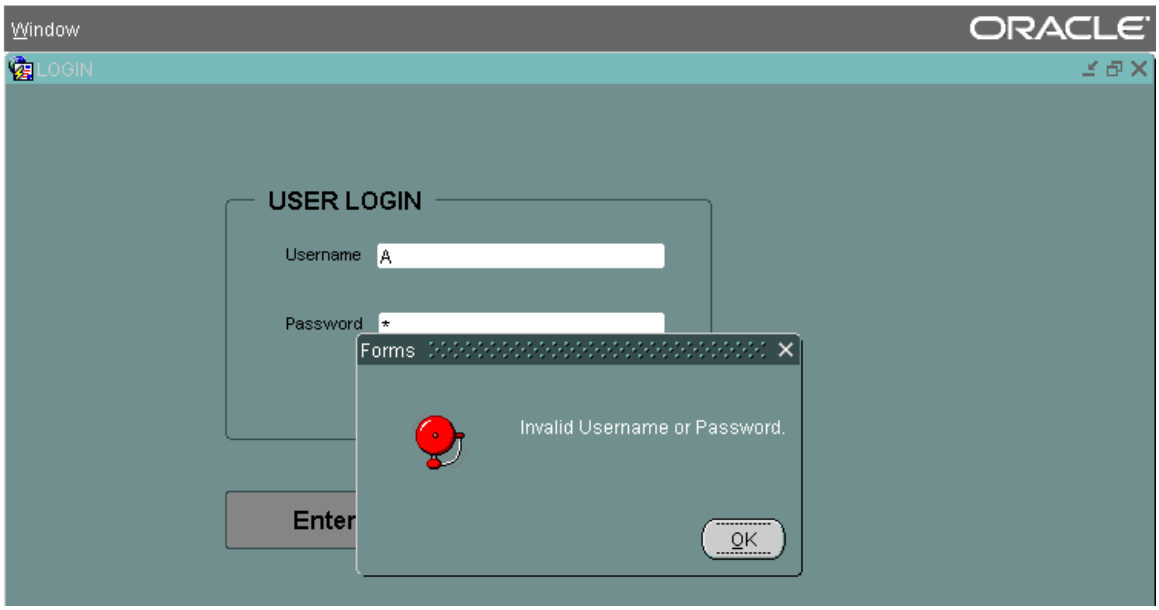


Fig. 5 Invalid username or password message

1.11 Other forms used in the application are;

The **Administrator form**, this is the system administrator's main form from where they can perform administrative tasks, such as creation of new student, lecturer and other administrator's profile with the **Student/lecturer/administrator profile forms** also the administrator can edit these profiles with the **Student/lecturer/administrator profile edit forms.** Also there are the **Student Registration from**, for registering students, **Course Menu form, for academic courses. Grades form** for inputting student grades.

Grades Edit form for editing erroneously entered grades**.**

1.12 Summary of the Findings

Clearly this report has helped to emphasis the necessity of an automated student result system in schools, as it simplifies the process of compiling and presenting students results. Computerization of this process reduces the time, human involvement and errors that could occur while making use of the manual method. "Most student information systems in use today are server-based, with the application residing on a central computer server and being accessed by client applications at various places within and even outside the school" (Nmaju et al., 2013). My application is no different as it utilizes an applications web and database server. The application runs as already stated using a multitier architecture.

The application is meant to ease the processing of students' results in tertiary institutions. The application was successfully developed, tested, and found to be working as expected. It is capable of storing and retrieving academic records with high speed and accuracy, and presenting useful information to its users. Its qualities are the reduction in the cost of processing students results (an example would be the cost of purchase of papers) reduction in the time spent in the computation of student's grades and the elimination of duplication of duplication of resources in terms of manpower and infrastructure. The system is flexible and runs in a web browser. It is reasonably secure, enforces data integrity from the use of a relational database management system, it also minimizes data redundancy and is user-friendly. With this application, the processing of students' results is automated, thereby reducing processing time and increasing accuracy. "Automation Minimizes Redundancy: The use of Relational Database Management System for storage of students' data will help in minimizing the redundancy in database in addition to maintain consistency, integrity and security of data." (Ezenma et al., 2014).

1.13 Conclusion.

During the course of my dissertation, I found out that a computer aided information management system makes information management much more convenient and efficient, it also makes for a more accurate information

management system in schools. This is opposed to the manual method, which is stressful, time consuming prone to mistakes due to excessive dependence on the human element involved.

1.14 Recommendations

Having highlighted the usefulness of a computer based students result management system to schools, I recommend the following to be implemented in schools;

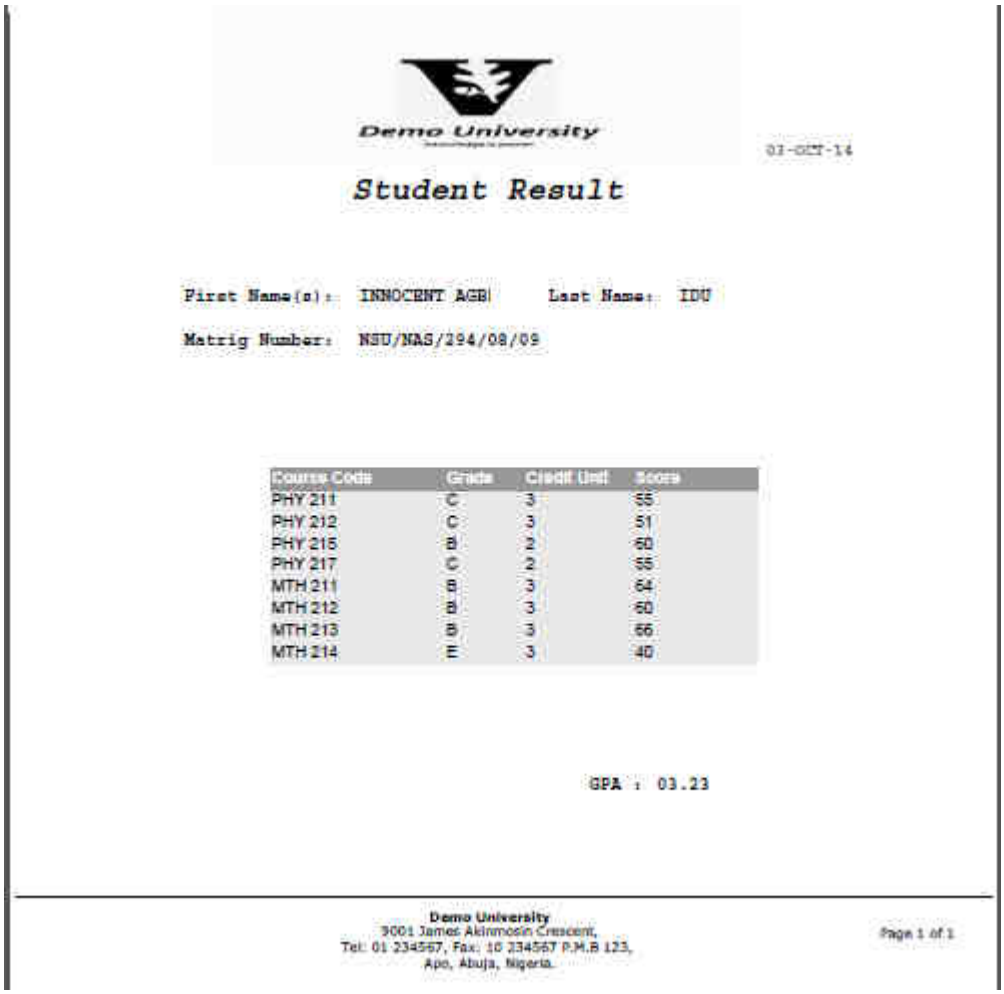
i. They should computerize all the department of the school, to ensure easy flow of information in the schools.

ii. They should ensure that all the staff of the user department are adequately trained to ensure smooth implementation of the new system.

iii. Even after computerization of the whole department, they must ensure that all the system are linked to one central local network, protected with high security measures

Appendix.

Sample student result



Demo University

03-OCT-14

Student Result

First Name(s): INNOCENT AGBI Last Name: IDU

Matrig Number: NSU/NAS/294/08/09

Course Code	Grade	Credit Unit	Score
PHY 211	C	3	55
PHY 212	C	3	51
PHY 215	B	2	60
PHY 217	C	2	55
MTH 211	B	3	64
MTH 212	B	3	60
MTH 213	B	3	66
MTH 214	E	3	40

GPA : 03.23

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