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Multi-Dimensional Student's Result Analytical Processing For Tertiary Institutions

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ABSTRACT : The objective of this paper work is to develop a web based analytical processing of students' record in a tertiary institution which will accept student data at all levels, determine students' performance over a period of time, extract specific information available from the database when there is need and improve the privacy, user-friendliness and enable convenient access to students' information mounted on the portal. This is done in other to determine the quality of students being graduated over time from the institution. our motivation was bourne out of the need to reduce the stress and discomfort departments encounter during students reconciliation of result. This will help in obtaining accurate information. It will also reduce bribery whereby people with money gets faster attention than others. In other to mine the database of students' results, the Structured System Analysis and design approach to software engineering was used in the course of this work. This involves identifying the problem which involved looking at the students' results for area of weaknesses and designing how to go about this identification, acquisition of knowledge and problem solving strategies. The data were collected majorly by interviews and observation. The result generated will help the staff (Lecturers) of the department to remotely input and monitor their results without stress after it has been approved by the senate of the Institution. The department can also have a quick view of student's record and make a quick decision on it.

Introduction

The manual extraction of patterns from data has occurred for centuries. Early methods of identifying patterns in data include Bayes' theorem (1700s) and regression analysis (1800s). The increasing power of computer technology has dramatically increased data collection, storage, and manipulation ability. As data sets have grown in size and complexity, direct "hands-on" data analysis has increasingly been augmented with indirect, automated data processing, aided by other discoveries in computer science, such as neural networks, cluster analysis, genetic algorithms (1950s), decision trees (1960s), and support vector machines (1990s). OLAP (Online Analytical Processing) OLAP allows users to analyze database information from a multiple database system at one time and its data is stored in multi-dimensional database. It has been well recognized that online analytical processing (OLAP) is an essential data analysis service and can provide critical insight into huge archives of application data. In contrast to online transactional processing (OLTP) as stated by Jian (2005). OLAP, support queries about multi-dimensional, multi-level aggregates and summarization of the data at various granularities to identify trends, exception and interesting regions. OLAP

allows users to analyze database information from multiple database systems at one time. While relational databases are considered to be two-dimensional, OLAP data is multidimensional, meaning the information can be compared in many different ways. For example, a company might compare their computer sales in June with sales in July, and then compare those results with the sales from another location, which might be stored in a different database. Adèr, H.J et al (2008). In the 1990's, the talk was about decision support systems and executive dashboards. The maturation of those concepts is realized in online analytical processing (OLAP). And is designed to convert data into usable information by allowing the aggregation of data. OLAP tools also allow a breakdown structure of the data where you start with a single piece of data and you dissect it into a series of levels looking at the data for something interesting. OLAP software is one of a number of analytical tools for analyzing data. It allows users to analyze data from many different dimensions or angles, categorize it, and summarize the relationships identified. The need for evaluation of the performance of admitted students in a high institution is imperative. This will go a long way to know when to change track, make slight changes or a complete u- turn in the method of operation or approach of learning. Analytical processing is optimal for this evaluation by searching for information in the results database in order to locate certain patterns and relationship within the data over a period of time. This activity enables inference drawn among positive, normal or negative gauges. Multi-dimensional analytical processing is necessary for various Universities, in order for the institution to maintain its academic integrity of provision of qualitative education and technical hands – on graduates. Using this software, the institution can determine overtime the pattern of success or failure rates of its admitted students and then take actions from the inference drawn. Most institutions needs to know whether it is delivering qualitative education or not. It needs to ascertain in a summary over a period which of its admitted students are graduating with good grade and those that are not. It will also determine whether to overhaul its present academic system or give it an appraisal. The institution needs to analyze the academic report of its admitted students' results in the institution.

Review of Related Literature

A number of researchers have studied the in this area of multi-dimensional and Relational database. This work will review formal works on multi-dimensional database and data warehouse. Today, most discussions on the relational data model, which was introduced by Codd (1970) and earned him the Turing Award a decade later, constitutes a significant part of the foundation of today's

multi-billion-dollar database industry. During the 1990s, a new type of data model, the *multidimensional data model*, emerged that has since made inroads on the relational model when the objective is to *analyze* data, rather than to perform on-line transactions. The multidimensional data model underpins the multi-billion-dollar business intelligence industry, and it plays a role in this industry that is similar to the role that the relational model plays in the database industry.

Multidimensional data models are designed expressly to support data analyses. A number of such models have been proposed by researchers from academia and industry. In academia, formal mathematical models have been proposed, while the industrial proposals have typically been specified more or less implicitly by the concrete software tools that implement them. Briefly, multidimensional models categorize data as being either *facts* with associated numerical *measures* or as being *dimensions* that characterize the facts and are mostly textual. For example, a book retailer sells *books* at certain *times* in certain *amounts* and at certain *prices*. A typical fact is a *purchase*. Typical measures are the amount and price of the purchase. Typical dimensions represent the location of the purchase, the purchased book, including its genre and author, and the time of the purchase. Queries then aggregate measure values over ranges of dimension values to produce results such as the total sales per month and author. Multidimensional data models have three important application areas within data analysis. First, multidimensional models are used in *data warehousing*. Briefly, a data warehouse is a large repository of integrated data obtained from several sources in an enterprise for the specific purpose of data analysis. Typically, multidimensional modeling is applied to such data, as this yields good support for data analyses.

Analysis of the Present System

The mode of operation and procedure is done manually, various forms serves as input to different processes involved in the present system used by exams and records.

The processes presently handled by the exams and records are explained consequently.

Students Result Request – the result is traced by exams and records Unit, through their various departments, when found is retrieved and reassigned to student records. In this case, insufficient or no inference for decision making is drawn.Hence, this process takes a lot of time and very difficult as well; because of inefficiency and inability of the staff to achieve the desire outcomes within a specific time.Due to the operation is based only on student result; the exams and records lack the performance evaluation of admitted students as well as those that graduated with different class of degrees, thereby making it difficult for the management to make a sound decision on students' performance evaluation. The institution has a method of ascertaining the process of result related

problems which involves the use of the office of the exams and records department. In this department, records of students' result are kept and accessed in the event of a student having a problem in his result. The results are generated per semester and the school has two semesters namely: 1st and 2nd semesters making up a session. The school runs four (4) and five (5) years program and is made up of four and five sessions. Therefore result generated in the program for a student will be of different sessions and semesters as the case may be. This will have to be the case in order to justify the B.Sc., B.Eng, B.Tec, B.Ls, LLB etc, certificates issued at the end of the students' academic session.

The process in the current system is only carried out in the event of a student result related problem. This is where missing or omitted result is traced, retrieved and reassigned to the student's record in question. This process flow is very shallow and does not draw up inference. It has no contribution to decision making and future planning.

Management Structure

The management structure of the school comprises of two divisions namely the Academic and Non-Academic division, which is the Administration. The Non-academic division comprises of the exams and records department and the security department. The exams and records department is headed by the HOD Exams, who is also in charge of the affairs of the Computer Science department (CSC) department. The CSC department reports directly to the Exams and Records department. The exams and records department is in charge of handling students' results issues.
The Academic department (Computer Science) is made up of the HOD, lecturers, and system analyst, who go about the business of teaching the students and conducting tests and examinations (Theory and Practical) that generate results in various courses for the students' appraisal and future graduation

Weakness of the Present System

The current system's operation on students' results database in the institution is mainly manual. This is rather very slow and often unproductive. A lot of time is spent in search of maybe a result of a particular student which might take place for more than a day. The records are manually kept, involving files with no central database and inconsistent query; this leads to stagnant data and dust accumulation. Records of results are just kept and no conclusive information can be drawn from it

overtime. Nothing tangible can be deciphered from a huge wealth of database of students' results rusting away in the exams and records department of the institution. Due to the fact results are stored physically in files and folders overtime, leaking roofs and mucus tend to act on the files and rendering the entire data useless and condemned. For instance, if a student comes back after fifteen (15) years to apply for his transcript, he/she might encounter issues of lost worksheet which could be as a result of leaking roof or some other unforeseen hazards that might occur. Should the current system fail, the institution has no laid out backup plan to combat an entire system failure. Therefore, it is the current system or nothing. Assuming the department of exams and records catches fire, no plan has been made prior to take care of this unforeseen circumstance and deal with data safety and recovery.

Proposed solutions to the problems (HLM)

Having carefully analyzed the present system, with regard to the aforementioned problems and their effects, it becomes necessary that a new Multi-dimensional Analytical processing Information System should be designed and implemented. This will go a long way in solving the problems associated with the present system and improve the services of the exams and records effective management decision making. With regards to the above consideration a new Multi-dimensional Software Model for Students Result is here by proposed for Tertiary Institutions.

Maintenance – This involved periodic updating and enhancement of the software and its users. The concept of this project therefore is to eliminate the weakness area and tidy up the academic system within the institution and provide a better platform for qualitative education and enhanced graduates productivity.

Some of the benefits of the new system are as follows:

1. The recent NUC student grade standard is implemented in this new system.
2. Work is made easy and less stressful in the Exams and Records department
3. With ease lecturers in the department can upload their various results to the Central result sever for further processing by Result Admin.
4. With ease, registered and duly qualified student of the Department can check their result and know their CGPA at the same time.
5. Accurate and efficient inference is drawn for management decision.

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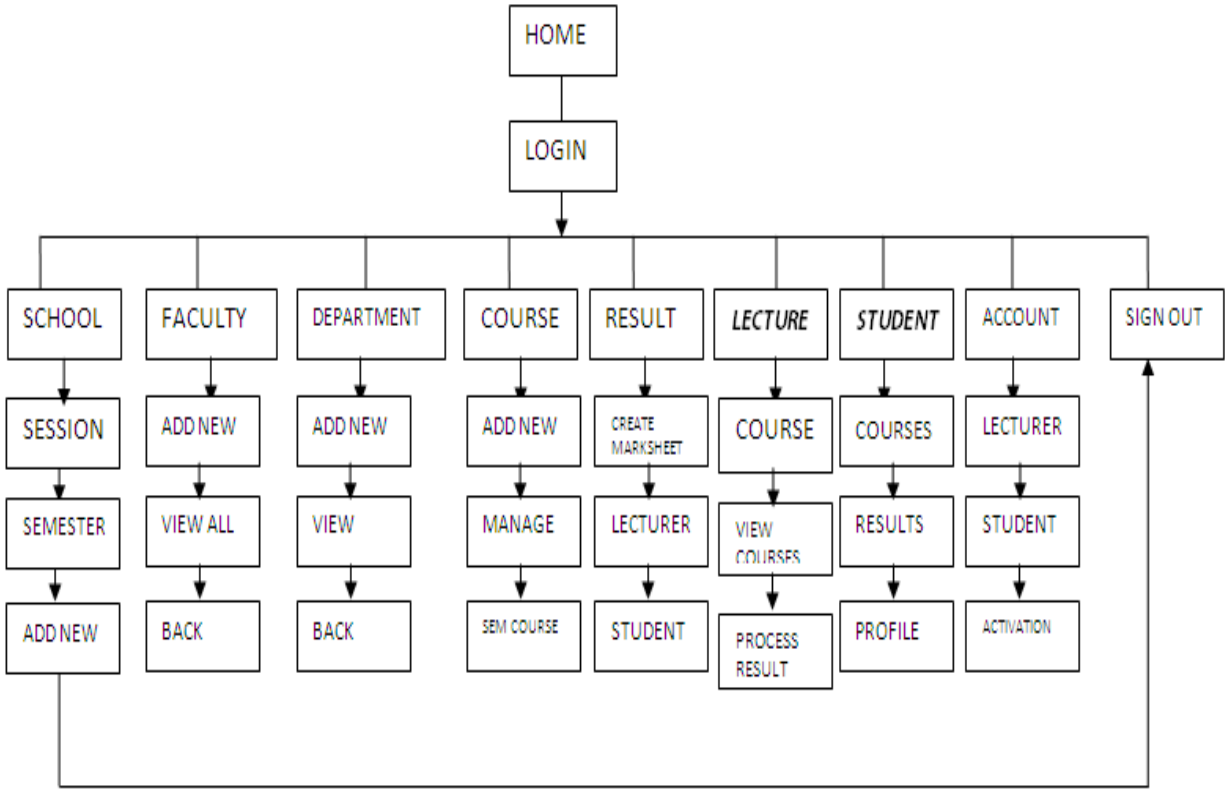

Figure 1.1 the diagram of proposed system

Database Structure

This program database was designed using MySQL database. The information systems process can be split between database development and online application developed. The database development phase is developed from the data requirement otherwise known as data specification acquired from the system analysis stage. The data specification of the new system consists of tables, relationship between the tables and so on. Data requirements are defined as a representation of users' data in terms of entities, attributes, relationships and rules. It is usually expressed in format that is independent of the technology that can be used to store the data.

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Database Design

School Session

In the school calendar, we have session which has attributes, entities and relationship between tables that contains various records.

Table 1.1: Create Session Database

S/N	ATTRIBUTE	DATATYPE	SIZE
1	SESSION ID	VARCHAR	10
2	SESSION CODE	VARCHAR	9
3	SESSION NAME	VARCHAR	15
4	SESSION START	VARCHAR	10
5	SESSION END	VARCHAR	10
6	CURRENT SESSION	BOLEAN	1
7	VICE CHANCELLOR	VARCHAR	30
8	DIR. AC. PLANING	VARCHAR	30

Database Login

In the Admin database window, Login Attempts are recorded. This table has various attributes that enable it to accept data.

Table 1.2: Login Attempts Database

S/n	**Field name**	**Type**	**Size**
1	USERNAME	VARCHAR	20
2	PASSWORD	VARCHAR	20
3	LOG STATUS	TEXT	20
4	LOG DATE	VARCHAR	20
5	LOG TIME	TEXT	20
6	IP ADDRESS	VARCHAR	30

Create Semester

The Create Semester window contains various entities, attributes and relationship. The Admin creates semester for the session as shown in Table 1.3

Table 1.3: Create Semester Table Database

S/N	ATTRIBUTE	DATATYPE	SIZE
1	SEMESTER	VARCHAR	10
2	SEMESTER TYPE	VARCHAR	9
3	SEMESTER START	VARCHAR	15
4	SEMESTER END	VARCHAR	10
5	VICE CHANCELLOR	VARCHAR	30
6	DIR. ACADEMIC. PLANNING	VARCHAR	30

Create Faculty

The Create Faculty window contains various entities, attributes and relationship between tables usually expressed in format that is independent of the technology that can be used to store the data with a primary unique key identifier of faculty code. The Admin creates Faculty for the session as shown in Table 1.4

Table 1.4: Create Faculty Table Database

1	ATTRIBUTE	DATATYPE	SIZE
2	FACULTY NAME	VARCHAR	30
3	FACULTY CODE	VARCHAR	9
4	FACULTY DEAN	VARCHAR	30
5	FACULTY OFFICER	VARCHAR	30

Create Department

The Create Department window contains various entities, attributes and relationship between tables usually expressed in format that is independent of the technology that can be used to store the data with a primary unique key identifier of Department code. The Admin creates Department under the Faculty for the session as shown in Table 1.5

Table 1.5: Create Department Table Database

S/N	ATTRIBUTE	DATATYPE	SIZE
1	DEPARTMENT NAME	VARCHAR	30
2	DEPARTMENT CODE	VARCHAR	9
3	DEPARTMENT H.O.D	VARCHAR	30

Create Course

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The Create Department window contains various entities, attributes and relationship between tables usually expressed in format that is independent of the technology that can be used to store the data with a primary unique key identifier of Department code. The Admin creates Department under the Faculty for the session as shown in Table 1.5

Table 1.6: Create Course Table Database

S/N	ATTRIBUTE	DATATYPE	SIZE
1	COURSE TITLE	VARCHAR	30
2	COURSE CODE	VARCHAR	9
3	COURSE UNIIT	INTEGER	1
4	GST COURSE	BOOLEAN	1
5	COURSE DESCRIPTION	VARCHAR	80

Add Lecturer

The Add Lecturer window contains various entities, attributes and relationship between tables usually expressed in format that is independent of the technology that can be used to store the data with a primary unique key identifier of Staff ID. The Admin creates Add Lecturer under the Department of the selected Faculty as shown in Table 1.7

Table 1.7: Add Lecturer Table Database

S/N	ATTRIBUTE	DATATYPE	SIZE
1	STAFF ID	VARCHAR	30
2	GRADE LEVEL	VARCHAR	9
3	TITLE	INTEGER	1
4	SURNAME	BOOLEAN	1
5	OTHER NAMES	VARCHAR	80
6	GENDER	VARCHAR	30
7	BIRTH CERT	VARCHAR	8
8	PHONE NUMBER	INTEGER	12

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9	FACULTY	VARCHAR	40
10	DEPARTMENT	VARCHAR	40

Add Student

The Add Student window contains various entities, attributes and relationship between tables usually expressed in format that is independent of the technology that can be used to store the data with a primary unique key identifier of MAT NO. The Admin creates Add Student under the Department of the selected Faculty as shown in Table 1.8

Table 1.8: Add Student Table Database

S/N	ATTRIBUTE	DATATYPE	SIZE
1	MAT NO	VARCHAR	10
2	SURNAME	VARCHAR	15
3	OTHER NAMES	VARCHAR	30
4	GEDER	BOOLEAN	1
5	DATE OF BIRTH	VARCHAR	8
6	PHONE NO	VARCHAR	12
7	CONTACT ADDRESS	VARCHAR	50
8	HOME TOWN	INTEGER	50
9	LGA	VARCHAR	30
10	STATE(PROVINCE)	VARCHAR	20
11	NEXT OF KIN	VARCHAR	20
12	NEXT OF KIN PHONE NO	VARCHAR	12

Create Result

The Create Result window contains various entities, attributes and relationship between tables usually expressed in format that is independent of the technology that can be used to store the data with a primary unique key identifier of UNIT(S). The Admin creates result sheet of different courses with their credit unit as shown in Table 1.9

Table 1.9: Create Result Table Database

S/N	ATTRIBUTE	DATATYPE	SIZE
1	UNIT	INTEGER	2

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2	TOTAL SCORE	INTEGER	3
3	CLASS TEST	INTEGER	3
4	CONTINOUS ASSEMENT	INTEGER	3
5	ATTENDANCE	INTEGER	3

Table 1.10: Student Pin Activation Table Database

The Student Pin Activation window contains various entities, attributes and relationship between tables usually expressed in format that is independent of the technology that can be used to store the data with a primary unique key identifier of MAT NO. The Student activates their PIN given to them by the Admin in their various Departments as shown in Table 1.10

Table 1.10: Student Pin Activation Table Database

S/N	ATTRIBUTE	DATATYPE	SIZE
1	MAT NO	INTEGER	10
2	PHONE NUMBER	INTEGER	12
3	PASSWORD	INTEGER	30

Input and Output Designs

Input Design :

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Generally, inputs to the target system will be handled as electronic transcription of existing forms, which are presently being used for Students' result analytical processing. However, some added design considerations for the various input interface include the following in the diagrams below:

figure1.2 Add New Session

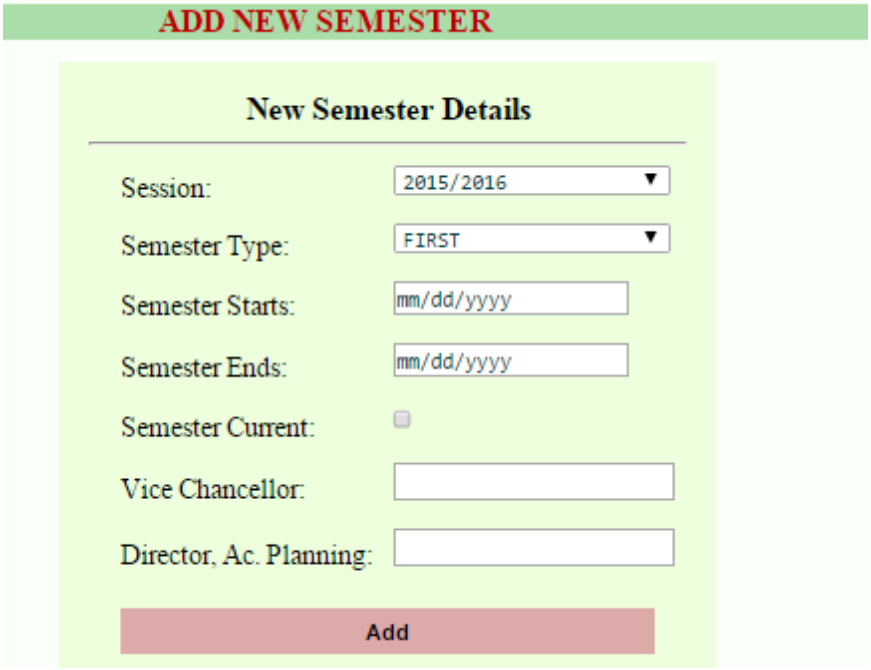

Figure 1.3 Add New Semester

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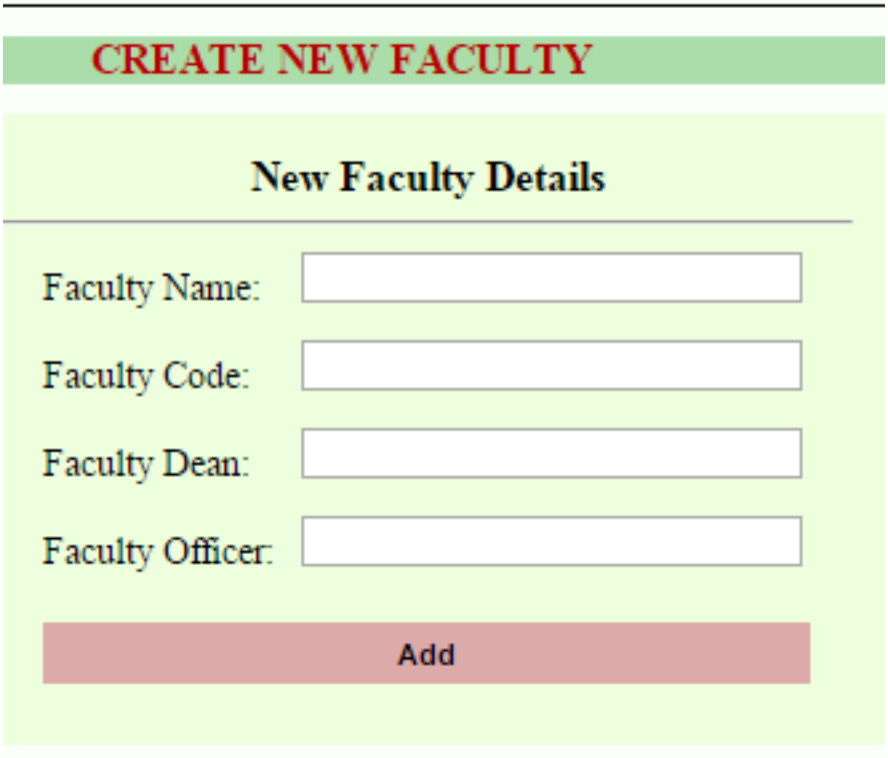

Figure1.4 Add New Faculty

Figure 1.5 Add Department

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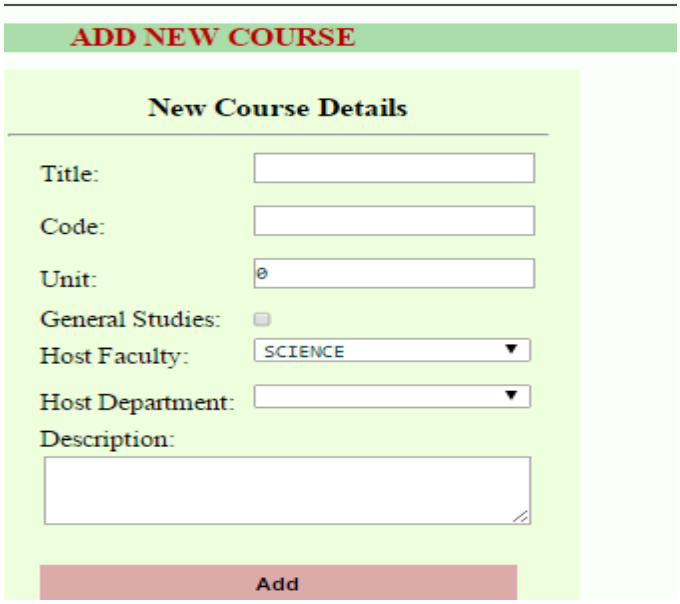

Figure 1.6 Add New Course

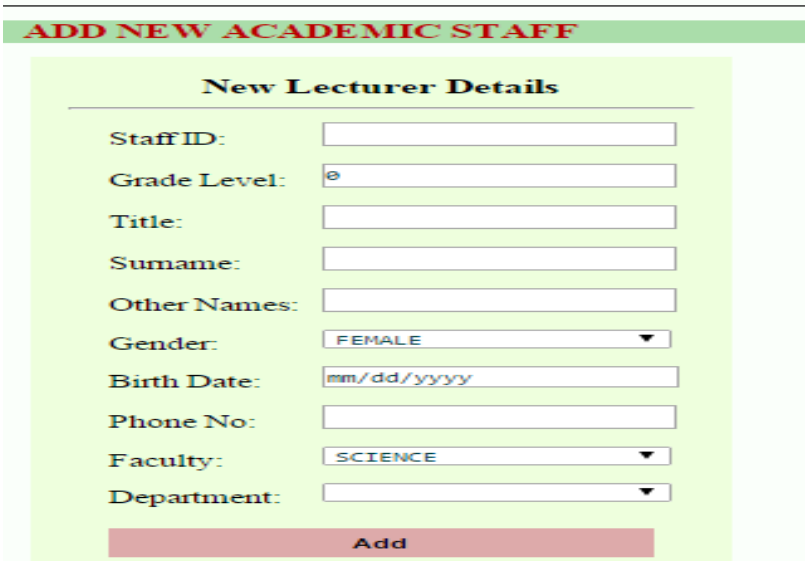

Figure 1.7 Add Lecturer

DOI: 10.18535/ijecs/v5i8.52

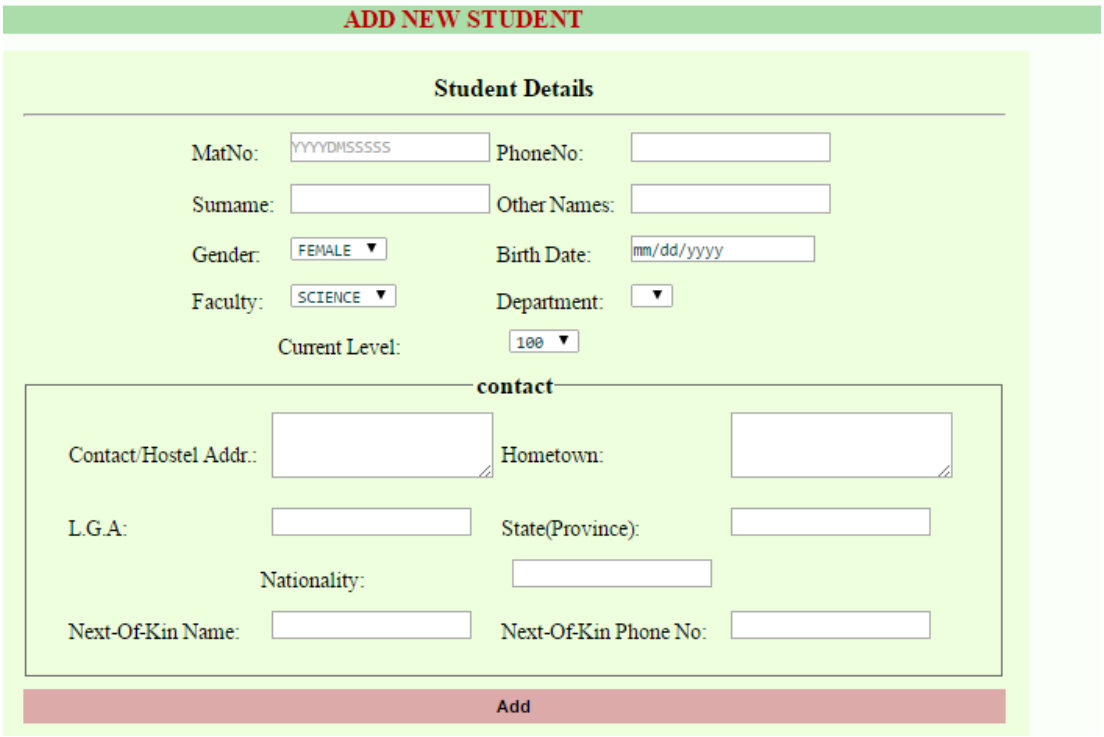

Figure 1.8 Add Student

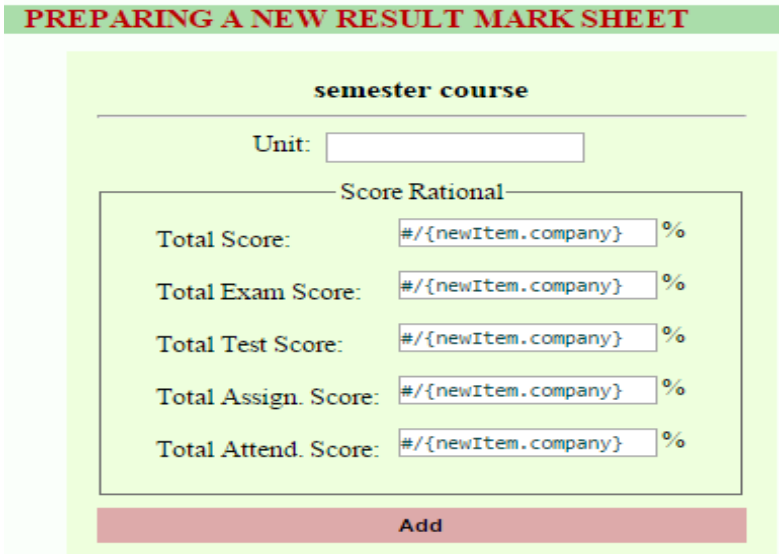

Figure1.9 Create Result Mark Sheet.

Output Design: All the output is made visible to user and they are mainly viewed either through monitor or the printer facility depending on the action performed by the user.

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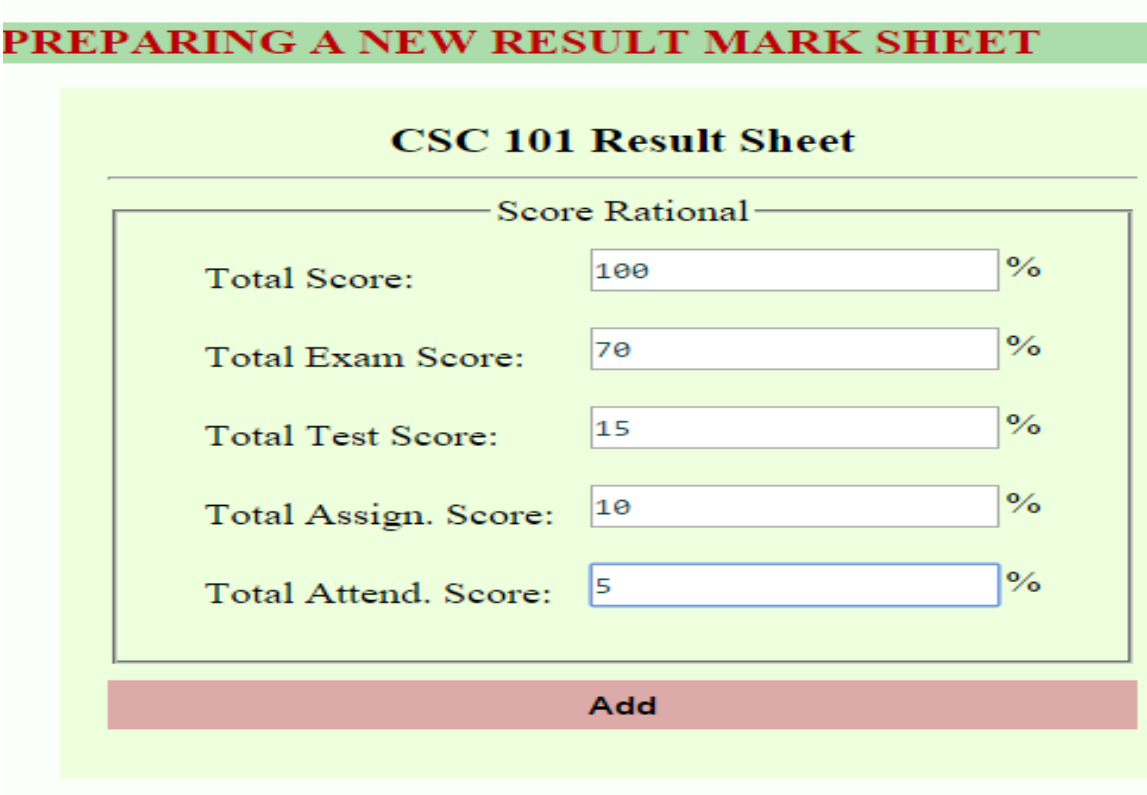

Figure 1.10 New Mark sheet Preparation Output

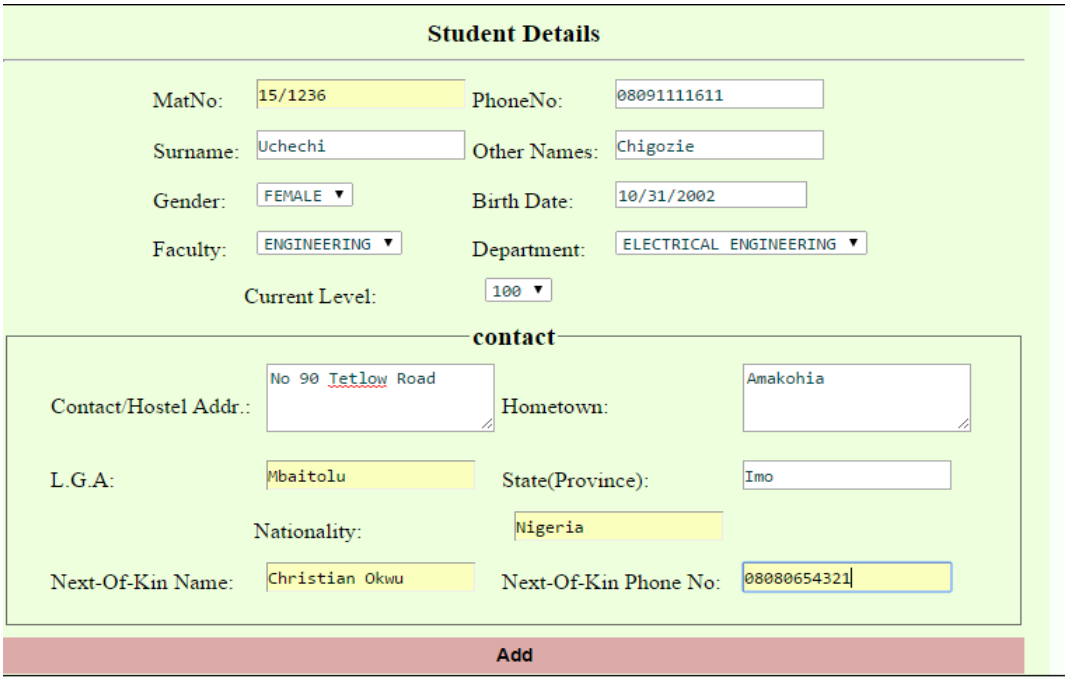

Figure 1.11 Student Registration Output Information

Summary

In this research work, multi-dimensional software model was developed. This marks an addition and elevation of the integrity of software in the software development industry in Nigeria. This research work has achieved some results from finding and analyzing of the present manual system used by the Exams and Records Imo State University Owerri. It has ascertained that the manual system presently used by the Exams and Records is associated with many problems such as wastage of economic space, time consuming and being labour intensive etc. This research work found out that the use of computer in organization has been increasingly accepted based on the concept that computerized systems offers better advantages and services than manual system of operations.

Conclusion

We are living in a global information society with global economy that is increasing dependent on the creation, management and distribution of information resources. This has led to the development of computerized information society. Multi-dimensional analytical software will be developed. This software will search thoroughly into the database and help to provide pattern that will lead to concise and effective decision making. This software will put into consideration all aspect of data mining that is involved. The software will run on window environment and will take up low computer system resource to run. This will be a complete automated approach to the concise evaluation of students result in the institution. This software can be implemented effectively and efficiently assuming all the necessary rules are followed to the later. These rules involve proper staff training, proper supply of necessary data and proper user application of software. The school should have a working WAN for the smooth running of the project. Although the computerized information system may appear to be expensive to set up and install, once set up the computerized system is far more economical to run than a manual system. Therefore establishment, are encouraged to embrace the computerization because it has been ascertained that computerized system perform more efficiently by a feasibility study carried out by the system analyst.

Recommendations

This research work is still open to further research. All the aspects of the work can be further enhanced, improved and expanded. This will be feasible with appropriate manpower, finance and excellent intellectual contributions of course. This research work is worthwhile. We believe that it will scale through any appraisal and stand the taste of time.

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