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Design and Implementation of Multidimensional Students Result Analytical Processing for Tertiary Institutions

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Abstract
Online Analytical Processing (OLAP) is playing a vital role in today's business work as well as in other domain. It gives the users an analytical view of data resulting in effective decision making. Many domains are applying Online Analytical Processing (OLAP) for different kinds of analysis due to its excellent performance and wide adaptability, such as analysis of network traffic and remote sensing images. The objective of this work therefore is to develop a web result portal that will enable lecturers post and compare students' results for quick assessment. I was motivated in order to reduce stress, workload and discomfort always encountered by the lecturers and school examination body during computation, compilation and reconciliation of students' results. Object-Oriented Analysis (OOADM) will be adopted as the methodology while Java will be used as the programming language. The expected result is web-based software for students result processing that will eliminate the problems of manual database system used in tertiary institutions.

Keywords: Online Analytical Processing, Result, Database, decision – making, Portal

1.0 Introduction

Students' enrollments in tertiary institutions are 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 in Imo state University. Processing of students academic record represents very significant challenge as it tends to require a great deal of human involvement thereby increasing the cost and delay associated with it. Students' records can be described in terms of their contents such as student bio-data which includes surname, first and middle name, registration number, gender, state of origin, and local government area.

Results processing can be seen as a continuous process of converting data (scores, grade points, credit units etc) into a definite and meaningful information such as statement of result, transcripts etc. These results are used to check the performance of each student in various courses. A result is an official school report on the academic record of student, listing courses offered and grades received. Student's result is a critical component of admission, transfer credit unit processing, and graduation processing. A student's result is the criteria for the measurement of the student's capability in terms of academic work in school. It is also used to measure a student's capability in various courses offered by the student. Without an adequate results processing system, the aim for which results are produced may not be achieved, a mistake made during the process might lead to a very big problem. It is observed that when the results are processed manually, it may lead to problems such as error during computation, insecurity of results, untidy results after changes must have been effected and work load on the examination officers etc. For these reasons an effective, efficient and error free results processing system is required for proper result processing.
Since the manual database is time consuming and error prone, however, becomes easier and more accurate when carried out with a computer running a suitable software application. The software application is

intended to bring relieve by providing for timely and accurate processing of students' results using the processing power of the computer.
Valentine (2012) 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 which was pointed out in the research work titled "Student Examination Result Processing System" Charles (2012), stated that the effort expended in the process of registration of students and computation of their examination results is enormous.
Thomson (2011) noted that there are a lot of problems associated with manual course system management which 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 method.
Bay (2009) 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. Result is therefore seen as an official school report on the academic record of student, listing courses offered and grades received.
According to Amanze and Etim (2016), student's result is a critical component of admission, transfer credit unit processing, and graduation processing. It is the criteria for the measurement of the student's capability in terms of academic work in school. It is also used to measure a student's capability in various courses offered by the student. Without an adequate results processing system, the aim for which results are produced may not be achieved, a mistake made during the process might lead to a very big problem. It is observed that when the results are processed manually, it may lead to problems such as error during computation, insecurity of results, untidy results after changes must have been effected and work load on the examination officers etc. For these reasons an effective, efficient and error free results processing system is required for proper result processing.
Since the manual database is time consuming and error prone, however, it becomes easier and more accurate when carried out with a computer running a suitable software application. The software application is intended to bring relieve by providing for timely and accurate processing of students' results using the processing power of the computer.

Online Analytical Processing (OLAP) is a category of software that allows users to analyze information from multiple database systems at the same time. It is a technology that enables analysts to extract and view business data from different points of view.

Analysts frequently need to group, aggregate and join data. These operations in relational databases are resource intensive. With OLAP data can be pre-calculated and pre-aggregated, making analysis faster.

Online Analytical Processing (OLAP) is computer processing that enables the user to easily and selectively extract and view data from different points of view or different angles which they are unable to view with their natural abilities, Amanze and Amaefula (2016). It provides the manipulation of data where knowledge is easily and efficiently visible to the users. It is also general activity of querying, presenting text and number data from data warehouse for analytical purposes.
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). These data are stored in multidimensional database. OLAP data is multidimensional, meaning that, the information can be compared in many different ways while a relational database is two-dimensional. It is used for data mining.

Online Analytical Processing is used to answer the complex queries posted on data warehouse. In order to solve the queries of nature 'who?' and 'what?' we can use the simple tools but to answer the advanced queries like 'what if?' and 'why?', we require special tool that can support online analytical processing (OLAP).

Online analytical processing (OLAP) is defined as "The dynamic synthesis, analysis, and consolidation large volumes of multi-dimensional data."

OLAP is a term that describes a technology that uses a multi-dimensional view of aggregate data to provide quick access to strategic information for the purposes of advanced analysis. OLAP enables users to gain a deeper understanding and knowledge about various aspects of their corporate data through fast, consistent, interactive access to a wide variety of possible views of the data.

OLAP enables decision-making about future actions. Atypical OLAP calculation can be more complex than simply aggregating data, for example, 'What would be the effect on property sales in the different regions of Punjab if legal costs went up by 3.5% and Government taxes went down by 1.5% for properties.

Analytical Queries per Minute (AQM) is used as a standard benchmark for comparison of performances of different OLAP tools. OLAP systems should as much possible hide users from the syntax of complex queries and provide consistent response times for all queries no matter how complex.

- **OLAP application**: OLAP is mainly for the use of 'knowledge workers', such as managers and executives, who will require information for theirdecision-making. OLTP is more operational in its application, with employees and staff (for example, an IT professional) being the main users.

  - **OLAP outlook**. OLAP takes a strategic stance, thinking long-term and historical instead of just a few weeks or months, which is the horizon that OLTP is looking at. Operational information is not seen to have enough of an impact after, say, 10 or even 5 years from the time the transaction took place. Therefore, OLAP looks at the underlying information of these operational data to identify or establish trends over 5, 10, or more years.

  - **OLAP storage**. OLAP data is stored in a multidimensional database, which makes sense, really, considering how users will be approaching the same data from different directions, with different objectives for their analyses. The "dimension" we are referring to in a multidimensional database is the data attribute. Users may look at the same data set, but will focus on different data attributes, depending on their objectives. For example, data on the annual sales of an automobile manufacturing company may be accessed by User A to analyze the sales trend within the 12-month period. User B is more regional in his approach, since his objective is to compare sales levels for the year in the different geographical locations or regions and recognize the best-performing country or region. User C, on the other hand, may want to use the data as basis for forecasting sales in units for the next five to ten years.

  - **OLAP emphasis**. The emphasis of OLAP is on retrieval of information, which will be used in strategic decision-making. In contrast with operational or transactional decision-making, strategic decision-making is not something that is performed frequently, so as to require information in a snap. Thus, OLAP may be refreshed daily, weekly, or any frequency or timing for collecting and cleaning data for analysis later on. This will also allow for better indexing of information that can be easily retrieved even several years into the horizon. This is clearly not the case with OLTP, which puts emphasis on updating instantly and automatically.

OLAP databases are divided into one or more cubes. The cubes are designed in such a way that creating and viewing reports become easy.It provides the manipulation of data where knowledge is easily and efficiently visible to the users. It is also general activity of querying, presenting text and number data from data warehouse for analytical purposes.

Online Analytical processing (OLAP) has been well recognized as an essential data analysis service and can provide critical insight into huge archives of application data. It allows the users to analyze database information from multiple database systems at one time and its data is stored in multidimensional database. OLAP data is multidimensional, meaning that, the information can be compared in many different ways while a relational database is two- dimensional. It is used for data mining. OLAP and data warehouses are two different things. However, OLAP can be used to transform the data from a data warehouse into strategic information.

A data warehouse stores and manages data, typically in relational databases. These could be extremely large databases with enormous amounts of data.

OLAP data, on the other hand, is stored in a multidimensional database. In a multidimensional database, each data attribute (such as product, region, time period, etc) is considered a separate "dimension". OLAP tools can be used to extract data from the intersections of such dimensions

1.1 Motivation

Due to difficulties on manual database of students' record keeping and result processing that has been going on in many tertiary institutions today, I was motivated to reduce the stress, time usage, inaccuracy and discomfort always encountered by the lecturers, school examination and record department during computation, compilation and reconciliation of students' results.

1.2 Statement of Problem

In the existing system, there have been problems associated with manual database system in Imo State University Owerri on students' result processing. These problem include; inability to sort students' heap of files, time consumption, insecurity of results, loss of results when files are being carried around the University, inaccuracy in data entry, wrong calculations during computation due to human error in creating, using and maintaining data, omission of result and cost of duplication of results by the head of department.

1.3 Aim and Objectives

The aim of this study is to develop a web-based multi-dimensional result analytical processing system.
The objective is,
To design a web-based result portal that will enable lecturers post their results, help course advisers perform composite results, as well as enable a sessional grade checking system.

2.0 Theoretical Framework

In order to throw more light on this study, some review will be made.
According to Amadin and Ukaoha (2003), Student's Examination result is one of the most important elements in schools. These data must be processed under critical management, while requiring simple operations for processing the examination results.
The need for student to have access to their result on time and accurately cannot be overemphasized. Scores from examination taken by student need to be returned to these student to enable them know their performance in the various courses written. Also, students need to know what courses they failed in order to retake the examination. Staff in charge of students result processing is burdened with a lot of other academic works like lecturing, research, marking of exam scripts and attending to other administrative task. These other duties tend to affect the timely, efficient and accurate processing of results.
Kespas (1995) stated that, the effort expanded in the process of registration of students and computation of their results is awesome. Quite worrisome is the fact that these processes are carried out every academic session, putting the operators in a continuous and ever demanding cycle. The computation of results and registration of students is obviously an object-centered activity, the student being the dominant object in this case. Hence the need to evolve a computerized and online process that will effectively and efficiently capture all the important data associated with the registration and examination result processing within the University and the interactions among the objects. Students' Examination result is the summary of each of the semester for four years.
There have been several studies on Online Result Processing which are reviewed.

Dada (2017), designed an Online Result processing system that will increase through put and reduce the response time involved in processing students result immediately after they graduate from the institution. The system enables students register courses and in turn, enable lecturers upload students results every semester.

Thomsen (1997), examined the inadequacies involved in the manual method of calculating Students CGPA (cumulative grade point average) and proposes a solution by developed a software Application to facilitate the automated processing of the results. The software was developed using PHP (Hypertext processor) scripting language and employing MYSQL Relational Database Management System in designing the database. The developed software was tested and work as expected. 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.

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 analysis. 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.

The term OLAP was created as a slight modification of the traditional database term online transaction processing (OLTP). The first product that performed OLAP queries was Express, which was released in 1970 (and acquired by Oracle in 1995 from Information Resources). However, the term did not appear until 1993 when it was coined by Edgar F. Codd, who has been described as "the father of the relational database". Codd's paper resulted from a short consulting assignment which Codd undertook for former Arbor Software (later Hyperion Solutions, and in 2007 acquired by Oracle), as a sort of marketing coup. The company had released its own OLAP product, Essbase, a year earlier. As a result, Codd's "twelve laws of online analytical processing" were explicit in their reference to Essbase. There was some ensuing controversy and when Computerworld learned that Codd was paid by Arbor, it retracted the article. OLAP market experienced strong growth in late 1990s with dozens of commercial products going into market. In 1998, Microsoft released its first OLAP Server – Microsoft Analysis Services, which drove wide adoption of OLAP technology and moved it into mainstream.

OLAP tools enable users to analyze multidimensional data interactively from multiple perspectives. OLAP consists of three basic analytical operations: consolidation (roll-up), drill-down, and slicing and dicing. Consolidation involves the aggregation of data that can be accumulated and computed in one or more dimensions. For example, all sales offices are rolled up to the sales department or sales division to anticipate sales trends. By contrast, the drill-down is a technique that allows users to navigate through the details. For instance, users can view the sales by individual products that make up a region's sales. Slicing and dicing is a feature whereby users can take out (slicing) a specific set of data of the OLAP cube and view (dicing) the slices from different viewpoints. These viewpoints are sometimes called dimensions (such as looking at the same sales by salesperson, or by date, or by customer, or by product, or by region, etc.)

Databases configured for OLAP use a multidimensional data model, allowing for complex analytical and ad hoc queries with a rapid execution time.They borrow aspects of navigational databases, hierarchical databases and relational databases.

OLAP is typically contrasted to OLTP (online transaction processing), which is generally characterized by much less complex queries, in a larger volume, to process transactions rather than for the purpose of business intelligence or reporting. Whereas OLAP systems are mostly optimized for read, OLTP has to process all kinds of queries.

2.1 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 exerciseprone 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.

Data Warehouse Concept

The word "Data Warehouse" was first coined by Bill Inmon in 1990.He said that Data warehouse is subject Oriented, included, Time- Variant and nonvolatile collection of data. This data helps in supporting decision making process by analyst in an organization The operational database undergoes the per day transactions which causes the frequent changes to the data on daily basis. But if in future the business executive wants to analyse the previousfeedback on any data such as product, supplier, or the consumer data. In this case the analyst will be having no data available to analyse because the previous data is updated due to transactions.
The Data Warehouses provide us generalized and consolidated data in multidimensional view. Along with take a broad view and consolidated view of data the Data Warehouses also provide us Online Analytical Processing (OLAP) tools. These tools help us in interactive and effective analysis of data in multidimensional space. This analysis results in data generalization and data mining. The data mining functions like association, clustering, classification, prediction can be integrated with OLAP operations to enhance
Interactive mining of knowledge at multiple level of abstraction. That's why data warehouse has now become important platform for data analysis and online analytical processing.

2.1.1 Understanding Data Warehouse

- The Data Warehouse is that database which is kept separatefrom the organization's operational database.
- There is no frequent updating done in data warehouse.
- The Data warehouse possesses consolidated historical data which help the organization to analyze its business.
- The Data warehouse helps the executives to organize, understand and use their data to take strategic decision.

- The Data warehouse systems available which helps in integration of diversity of application systems.
- The Data warehouse system allows analysis of consolidated historical data analysis.

The Data warehouse is Subject Oriented, Integrated, Time-Variant and Nonvolatile collection of data that support management's decision making process.

2.1.2 Data Warehouse Separated from Operational Databases

The following are the reasons why Data Warehouse is kept separate from operational databases are following.

- The operational database is constructed for well-known tasksand workload such as searching particular records, indexingetc. but the data warehouse queries are often complex and itpresents the general form of data.
- An operational database supports the concurrent processingof multiple transactions. Concurrency control and recovery mechanism are required for operational databases to ensure robustness and consistency of database.
- An operational database query allow reading, modifyingoperations while the OLAP query need only read only accessof stored data.
- An operational database maintains the current data on theother hand data warehouse maintain the historical data.

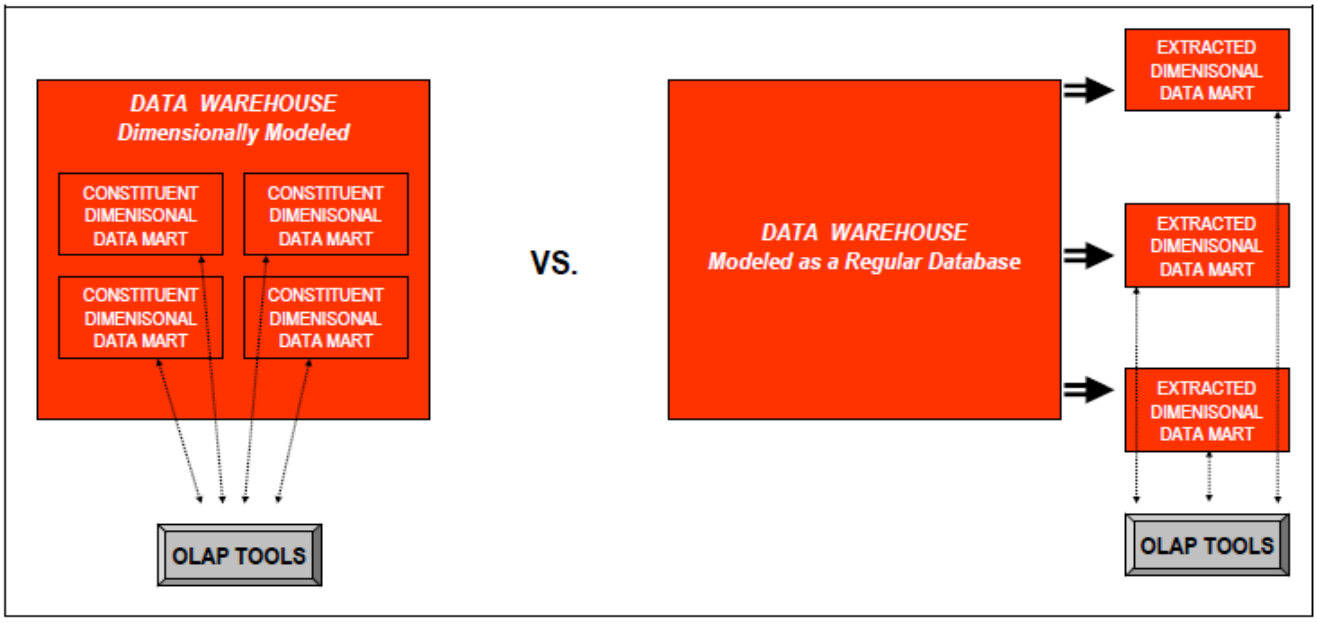

Figure 1: OLAP Tool as an Interface to Two Different Data Warehouse Architectures

Source: *Nenad, Boris, and Mary (2008)*

One option, shown on the left side of Figure 1, is a data warehouse as a composition of various intra-connected dimensionally modeled data marts (Kimball, 1998). In that case, OLAP tools can be connected directly to the data warehouse. Another option, shown on the right side of Figure 1, models a data warehouse as a regular relational database with the dimensional data marts extracting data from the data warehouse (Inmon, 2002). The data marts present data to the users in the OLAP-friendly dimensional way.

Regardless of which architectural option is used, OLAP tools are used as a way to interface with the data warehouse.

Data Warehouses and Data Marts

A typical organization maintains and utilizes a number of operational data sources. These operational data sources include the databases and other data repositories which are used to support the organization's day-to-day operations. A data warehouse is created within an organization as a separate data store whose primary purpose is data analysis for the support of management's decision making processes (Inmon, 2002). Often, the same fact can have both operational and analytical purposes. For example, data describing that customer X bought product Y in store Z can be stored in an operational data store for business-process support purposes, such as inventory monitoring or financial transaction record keeping. That same fact can also be stored in a data warehouse where, combined with vast numbers of similar facts accumulated over a time period, it is used to analyze important trends, such as sales patterns or customer behaviour.

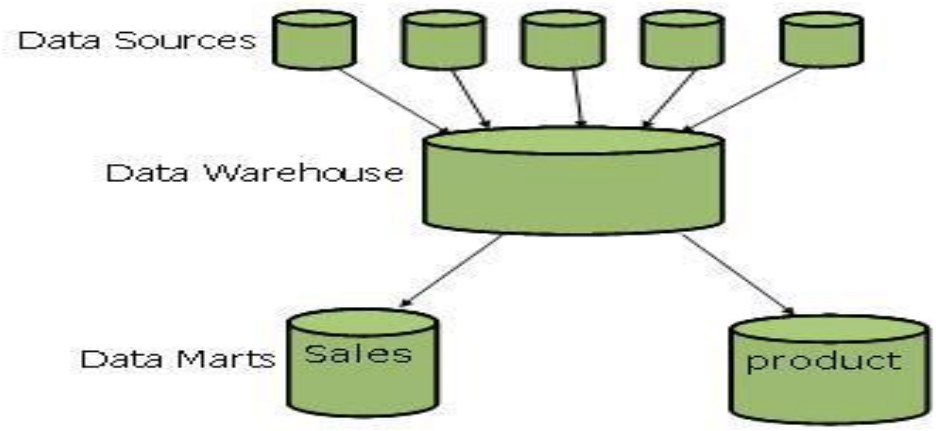

Figure2: Showing Graphical Representation of data mart
SOURCE: http://shodhganga.inflibnet.ac.in/

Why store any fact in two places? There are two main reasons that necessitate the creation of a data warehouses as a *separate* analytical data store. The first reason is the performance (speed) of queries. Operational queries are mostly short and fast, while analytical queries are complex and consume significant amount of time. The performance of operational queries can be severely diminished if they have to compete for computing resources with analytical queries. The second reason lies in the fact that, even if performance is not an issue, it is often impossible to structure a database which can be used (queried) in a straightforward manner for both operational and analytical purposes. Therefore, a data warehouse is created as a separate data store, designed for accommodating analytical queries. A typical data warehouse periodically retrieves selected analytically-useful data from the operational data sources. For any data warehouse, the infrastructure that facilitates the retrieval of the data from the operational databases into the data warehouses is known as ETL, which stands for Extraction, Transformation and Load. Figure 1 illustrates this process.

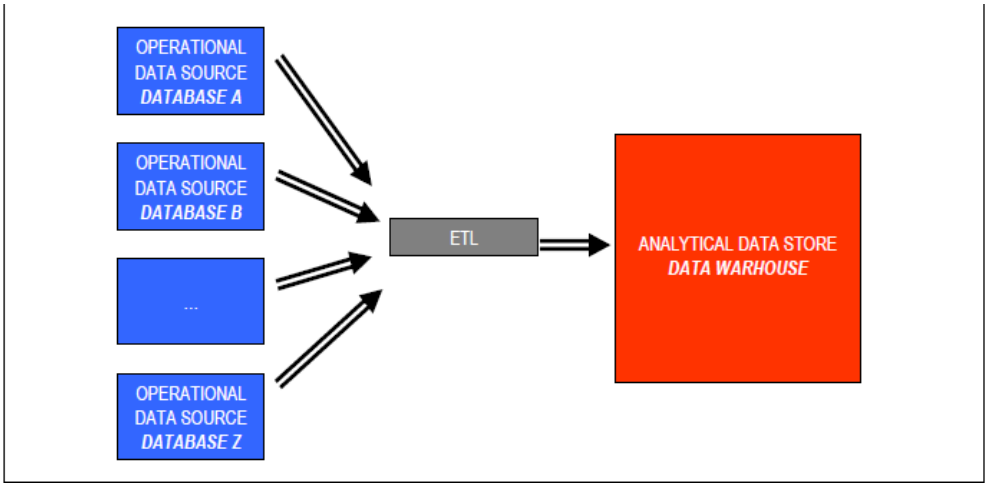

Figure 3: Data Warehouse - a Separate Analytical RepositorySource: *Nenad, Boris, and Mary(2008)*

A data mart is a data store based on the same principles as a data warehouse, but with a more limited scope. Whereas a data warehouse combines data from operational databases across an entire enterprise, a data mart is usually smaller and focuses on a particular department or subject. Dimensional modeling (Kimball, 1998) is a principal data mart modeling technique (which can also be used as a data warehouse modeling technique). It uses two types of tables: facts and dimensions. A fact table contains one or more measures (usually numerical) of a subject that is being modeled for analysis. Dimension tables contain various descriptive attributes (usually textual) that are related to the subject depicted by the fact table. The intent of the dimensional model is to represent relevant questions whose answers enable appropriate decision-making in a specific business area (Chenoweth, 2003).

3.0 Methodology

Outlining objectives of the solution to a problem, planning methods of solution and obtaining the solution are all System investigation processes in a scientific means and approaches of identifying problems of an existing system.

To achieve the above, certain tools must be needed such as flowcharts, dataflow diagrams, structured charts etc. To create clarity on defining the problem requiring solution, provide clean sequence of logic flow, and enhance error corrections amending and improving modularity of coding. The method used in the investigation of the findings was discussed, processes adopted by the current institution in processing students result wear critically analyzed, and the weaknesses are also printed out.

3.0 Methodology

Osuagwu (2009) Software Engineering Methodology (SWEM) stated that the body of methods, rules, postulates, procedures and processes that are used to manage a software engineering are classified into various categories namely:

i. The pragmatic Structural system analysis and design methodology (SSADM).
ii. Object oriented analysis and design methodology (OOADM)
iii. Prototype Methodology
iv. Expert System

Structured System Analysis and Design Methodology (SSADM)

This project work is developed with this methodology (SSADM). The pragmatic system analysis and design methodology consist of investigation of the present system, definition of the new system, establishment of constraints and system analysis documentation which should provide the following.

1. Cost/ Benefit/Schedule report for each suitable system
2. Database requirement
3. Physical requirement of hardware and personnel
4. Conversion requirement

This methodology (SSADM) involves: developments such as system flow chart, Job steps, Program narratives which enhances organization for computer execution

i. Prototype Methodology
ii. Object Oriented Analysis and Design

Pragmatic System Analysis and Design Methodology

3.2.1 Overall Data Flow Diagram of the Present Manual System

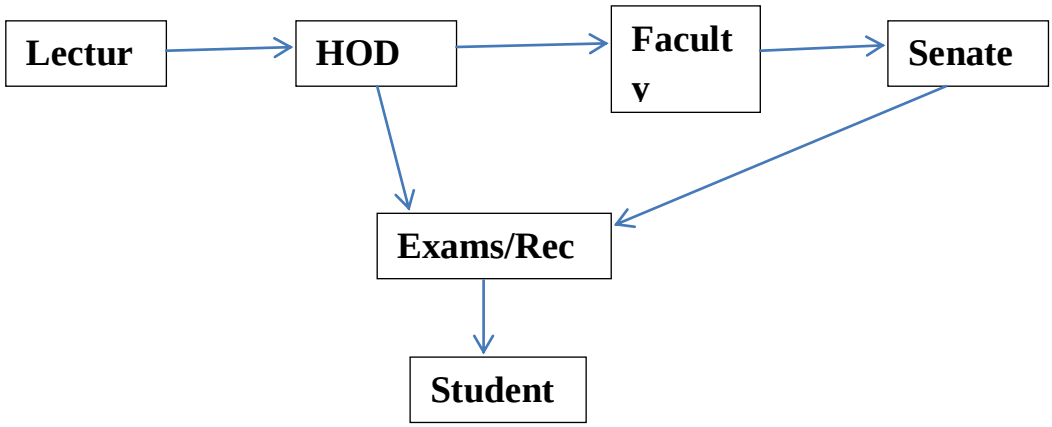

Figure 3.1 Manual Result Processing Flow

3.2.2 Choice/Adopted Methodology for This Study

Object-oriented analysis and design (OOAD) was adopted for this design. It is a popular technical approach for analyzing and designing an application, system, or business by applying object-oriented programming, as well as using visual modeling throughout the development life cycles to foster better stakeholder communication and product quality. Web based school portal management information system was designed following the OOADM stages /approach.

1. Object-Oriented Analysis
2. Object-Oriented Design
3. Object-Oriented Implementation

In this chapter, only OOADM first phase will be discussed while phase two and phase three will be done in chapter four.

Phase 1: Object-Oriented Analysis

In this stage, the problem is formulated, user requirements are identified, and then a model is built based upon real–world objects. The analysis produces models on how the desired system should function and how it must be developed.

Students User Requirement Module

Students from various locations could login with their details to perform some task with the outlined functions below:

- Create Account.
- Check Semester result

The requirement analysis for Students Requirement module can be transformed into the following use case diagram as shown Figure 3.2.

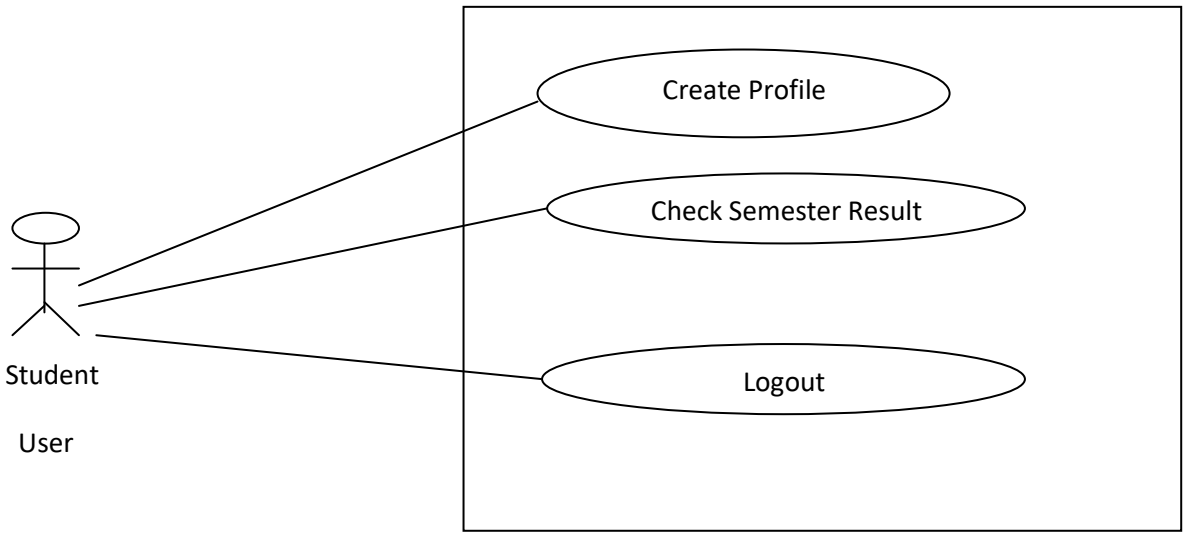

Figure 3.2: Student User Module Use Case Diagram

Lecturer User Requirement Module
The requirement analysis for Lecturers Requirement module can be transformed into the following use case diagram as shown Figure 3.3.

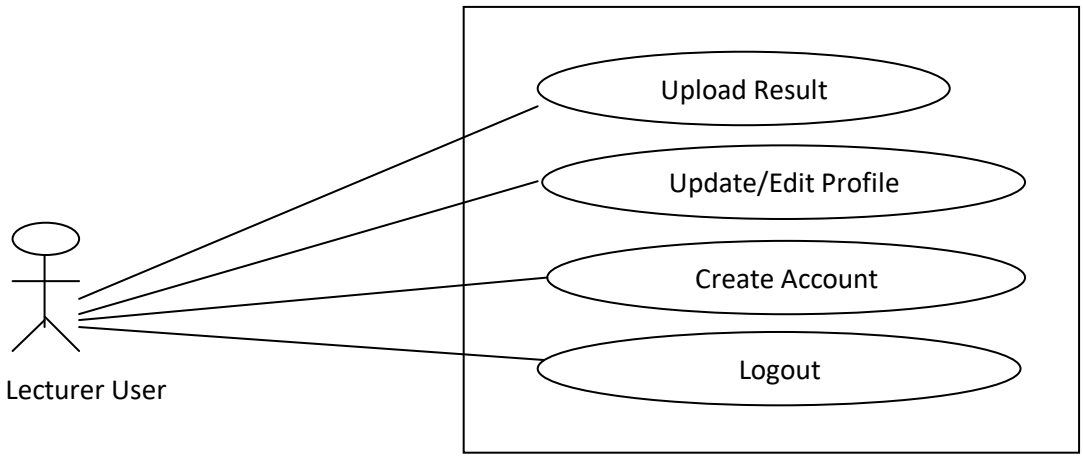

Figure 3.3: Lecturer User Module Use Case Diagram

Parents User Requirement Module
Parents have access to academic performance of their wards, their user requirement analysis module can be transformed into the following use case diagram as shown Figure 3.4.

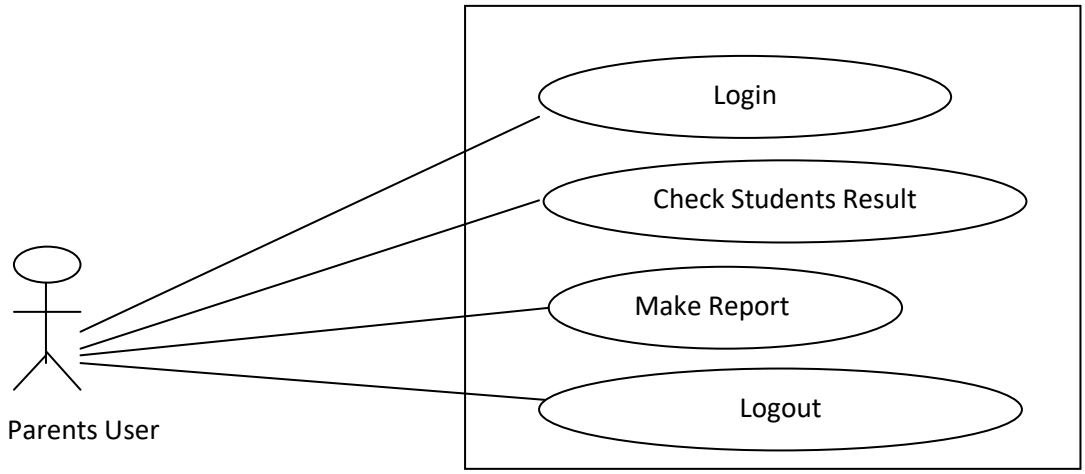

Figure 3.4: Parents User Module Use Case Diagram

Department User Requirement Module
In every institution, head of departments represent each department and hence the entire activities within the department. Therefore this module must be handled by the HOD to perform the outlined task as shown in figure 3.5 of the use case diagram below:

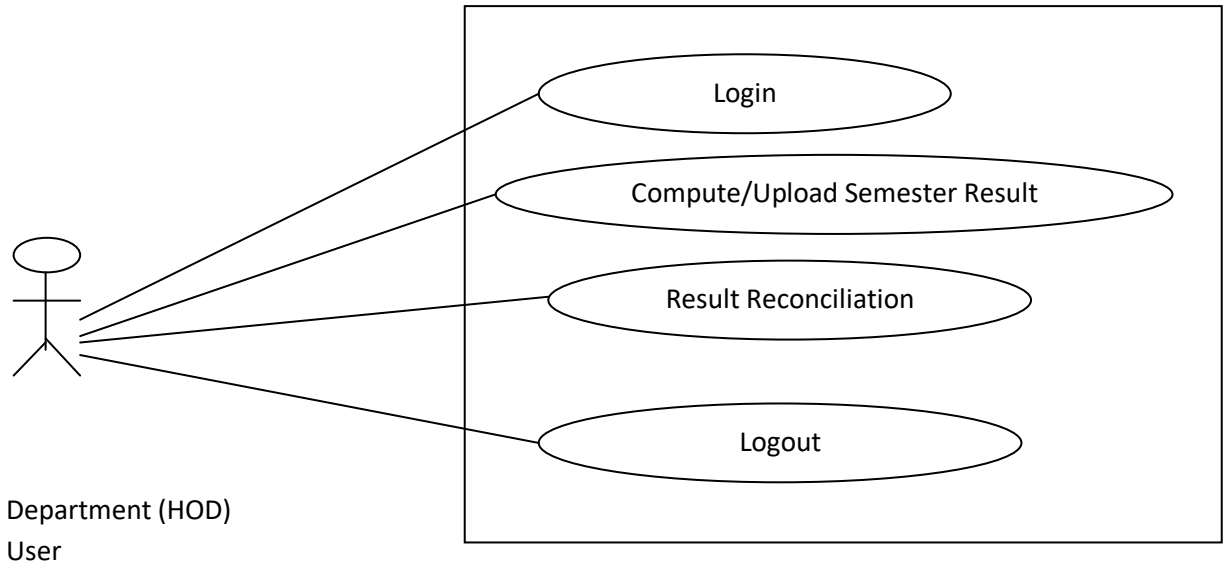

Figure 3.5: Department (HOD) User Module Use Case Diagram

Administrator User Requirement Module

Administrator module is the module that enables administrators to configure and maintain various variables in the system. This module will allow administrators to configure general information and assign user role to other users. The administrator can:

1. Open New Account
2. Upload Result
3. Block or unblock account
4. Trace fraud
5. Grant Privilege to various user

System user with administrator role is the user with super user role to the entire School website. This category of user will have the full administrative access rights to each module in the system. The administrator is the "gatekeeper" of the proposed system who creates user profiles for the system and is responsible for restricting the access to other users. The administrator can add as many users as needed and he is the key person who will assign user to different role of the system. The Administrator Module requirements analysis can be transformed into the use case diagram as shown in figure 3.6.

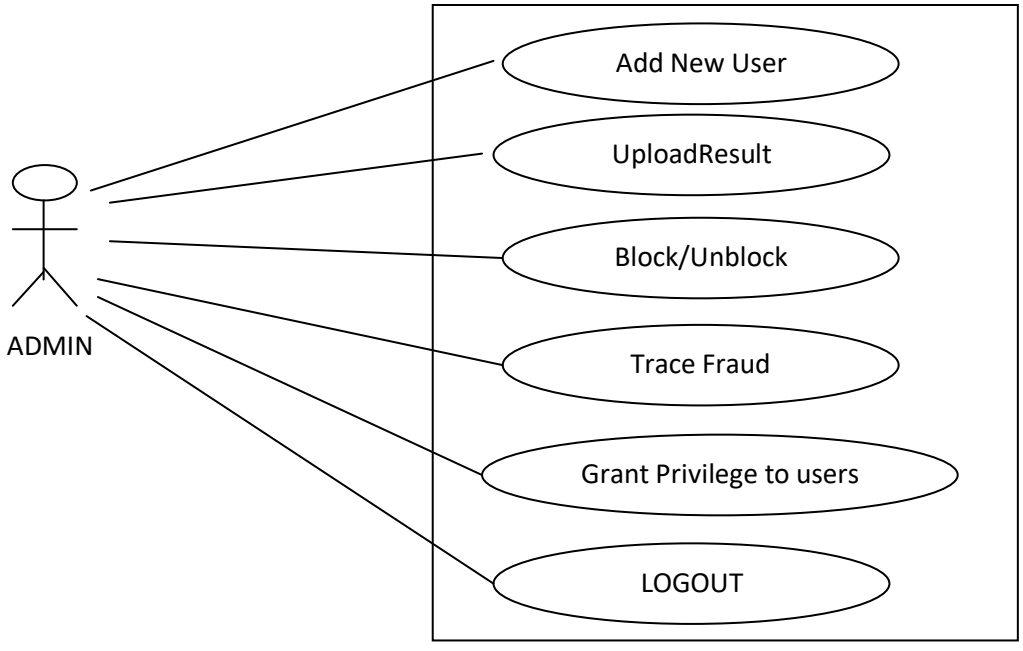

Figure 3.6: Administrator Module Use Case Diagram

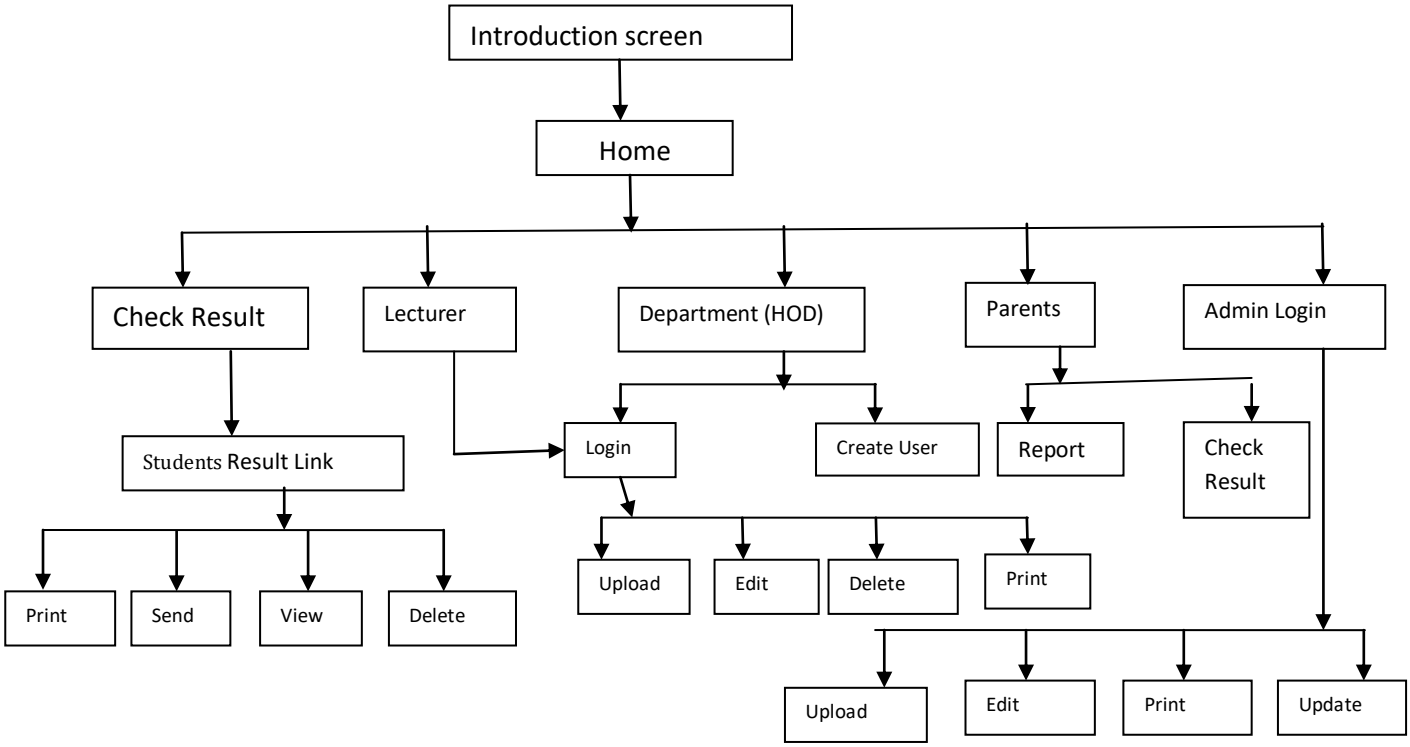

Figure 3.7: High Level Model of Proposed System

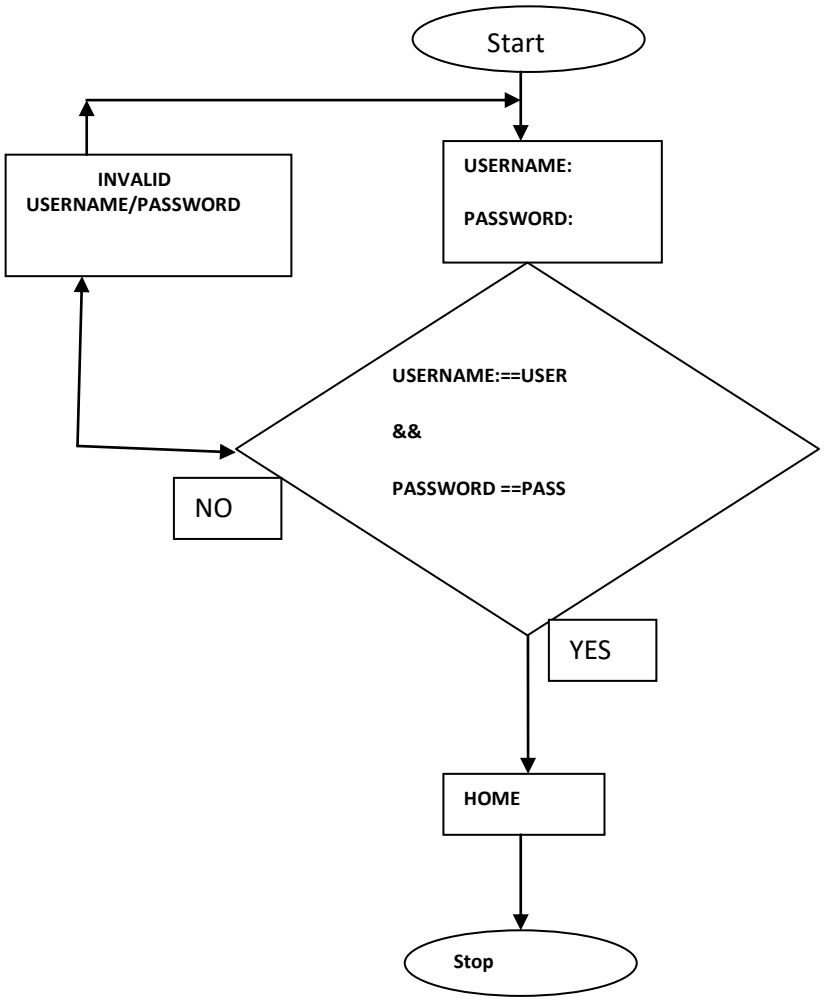

Figure 3.8 Admin Login Flow-chart

Conclusion

Computerization of data and Information Technology has made the world a global economy that is increasing dependent on the creation, management and distribution of information resources. Seeing OLAP as an interactive software that allows users to analyze information from multiple database system at the same time, Multidimensional analytical software will be developed. When this is done, the software will provide a platform and a pattern that will lead to concise and effective decision making. This software will also put into consideration all aspect that involves data mining. It will run on window environment and will take up low computer system resources to run. This will also 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. These rules include, proper training of staff, regular power supply, provision of gadgets, proper data supply and proper user application of software. The school should have a working Wide Area Network (WAN) for the enhancement and smooth running of the project.. Although the system may seem to be expensive to set up and install, but when this is achieved, it will eliminate the associated problems early stipulated in this research work thereby reducing paper base nature of manual database used in most of the higher institutions today.

Recommendation

The 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 of course. This research work is worthwhile and I will recommend that Institutions should try as much as possible to adopt this software because with its usage and application, institution will go a long way to process and release students results on time and will also facilitates decision making by the Management of the Institution. I believe that it will scale through any appraisal.

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