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Design and Implementation of a Result Processing System with Mobile Course Advising

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ABSTRACT
This research is motivated by the desire to make result processing student friendly. Over the years, on graduation, students have related the experiences of missing results on some courses. Additionally, students do not realize their performance until late into graduation year because they hardly access all their results as at when due. Compilation of results tales place only after graduation. The project, "Design and implementation of a mobile based model for graduate academic advisor and result processing" is proposed to guide students each step of their way up. The project is a mobile application that compiles students results real-time, makes the result available to the students through mobile phone and further advises them based on the performance perceived. Object Oriented Hypermedia Design Methodology was used in this research. Hybrid mobile application development tools were used such as Cordova, HTML5, CSS3, JQuery, CodeIgniterphp web framework. MySQL was used at the back end. Additionally, the mobile application features a CGPA calculator and an intelligent academic advisor. The result of this research is a fully functional android application that is used to process and publish students' results. Workload of large computation of result is thus removed from examination officers. The mobile application calculates the CGPA of the available result(s) and show the current CGPA at any point in time. After showing the CGPA, the system advises the students on further steps to take so as to graduate with a certain class of degree. It also shows areas and courses to improve on. The application can also be accessed via a web browser for other operating systems other than android.
Keywords: Result Processing, Mobile Advising, Android, Result Processing, CGPA

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I. INTRODUCTION

1.1 Background of the Study

Result processing in tertiary institutions involves continuous process of converting data (scores, grade points credit units etc.) into definite meaningful information (statement of result, transcript etc.). These results are used to check the performance of each student in various courses. These results when processed manually, lead to many problems such as delay in publishing of result, errors during computation, untidy results after changes must have effected, work load on exam officers etc. However, computerizing the result processing with academic advisor will reduce these problems to their barest minimum. Every tertiary institution need computer for 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 institution, 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. It is unfortunate that all educational institutions in the developing world, such as the Universities, Colleges of Education and polytechnics in Nigeria, still operate under the manual method of record keeping and computation of GGPA. Chukwuemeka Odumegwu Ojukwu University (COOU), for example, still operates on this manual method which is highly prone to errors. Department of Computer Science COOU, since its inception have student's enrolment every year and since then students result and CGPA has not been electronically accessible. The manual system employed is not very efficient, in that a lot of paper work has to be done which takes a reasonable length of time to prepare. Due to the increasing number of students, computation of the student's CGPA has been a very difficult task. Therefore, because of this problems and errors arising from

such method of operation, a software-computerized result processing system and academic advisor becomes inevitable. This research will ensure that result processing is improved in such a way that more value is delivered to students with little efforts from staff. Hence, stress on exam officers is reduced. Results inform the management about the performance of each student in various courses. These results obtained are used to check the student's level of understanding in the entire subject taught. In the course of this research, an intensive investigation was carried out on how result processing is done in tertiary institutions. After the investigation, it was found that the current method adopted needs improvement. Introduction of computer in the system will go a long way in changing how results are handled.

It is an established fact that after every assessment examination or research work, a result must be obtained. In any academic environment, there is need to have results that will tell the students' performance and to generate transcripts whenever the need arises. Other activities that are related to result processing are: registration of courses and students' personal data, data entering of examination scores, computation of result, transcript generation, records updating and so on. However, without automating these processes, delays in publishing of results occur because of the workload on the lecturers and exam officers. In some schools, information board is used for pasting of result. Hence, student check the notice board regularly. Student CGPAs are not easily accessed by students unless transcript was demanded. The effort expended in the process of registration of students and computation of their examination results is huge. 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 examination 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 process that will effectively and efficiently capture all the important data associated with result processing, CGPA calculation and academic advisory is imminent.

1.2 Statement of the Problem

A thorough investigation was made of the existing method of result processing and problems was found which motivated the development of a new system. The problems found are:

a. Students do not currently have access to their whole results or CGPA real-time. Additionally, the current method of publishing processed result is not student friendly.
b. Course advisers do not have a real-time CGPA of each student and hence, do not have needed facts to render help to students.
c. There is delay in result processing because of the tediousness of manual result processing and transcript generation. Number of students is far greater than that of the officers that are processing the results.
d. Retrieval of processed results can be time consuming and strenuous since large heap of files must be searched.
e. Absence of free distribute database for storing of result. Loss of processed result can occur since such result are kept in physical locations.
f. Since results are stored in a physical location, students cannot remotely access their results. Students must be in school to access their results.
g. Error in result processing may occur because of human error. Wrong formulae, fatigue and ignorance may lead to wrong outputs.
h. Correction or updating of results is complicating since the method is not automated.

1.3 Aims and Objectives of the Study

The aim of this research is to design and implement a mobile based model for graduate academic advisor and result processing. The specific objectives are:

a. To create an application that will prioritize student's satisfaction in result processing. Student can access a suggestion of what they need to do to graduate with a certain class of degree. Suggestions are based on the calculated CGPA for each student.
b. To create a user friendly mobile application that will enable student to access their CGPA real-time
c. To create a system that will furnish course advisers with a complete information need to discharge their duties as course adviser.
d. To automate result processing so that delay and tediousness of manual result processing will be eliminated.
e. To implement a system that will ensure faster retrieval of student's results.
f. To create a database for storage of results using a free distributed database engine, MySQL.
g. To develop a system that will enable remote accessing of results and eventually eliminate geographical factor.
h. To create a highly automated system that will remove error in compilation of result caused by human operation.
i. To develop a system that can store results in a way that correction and updating can be carried out neatly.

1.4 Significance of Study

This work is of great significant to tertiary institutions because it will change the way result processing is carried out. A mobile application that is tailored to the most popular mobile operating system used by students have been developed. Provision has been made for students who do not use android to access the application through a browser. Processed results are accessed by students through the mobile instead of physical notice board. There will not be loss of results or result files because the results will be converted to digital files. Redundancy will be removed from result processing. Wrong outputs that come from human error in calculation of CGPA has been eliminated because the new system automatically compiles and outputs the CGPA of each student. Academic advice can be obtained on the go since the system will display recommended steps to be followed by the student to attain a particular CGPA. Omitted results are easily seen as the system will show that a result was omitted. Duplicate entries of result are eliminated because the system will allow duplicate entry of the same file. Course advisers has never been equipped to discharge their duty. It is now easy for course advisers to see a student's result history so that they will be equipped to plan ahead to know how to advice. This research has greatly reduced the time and pressure involved in doing a work a work that is hard for exam officers before.

II. REVIEW OF RELATED WORKS

2.1 Behavioural and Psychological Aspects of Cell Phone Usage Among University Students.

Aoki and Downes (2004) focused on the behavioural and psychological aspects of mobile phone usage among college students. They tried to find the reasons behind why a technology is adopted in a particular way. They identified several attitudinal factors based on the exploratory study including, necessity in modern times, cost efficiency when compared to landline phone, safety or security, and dependency. The study also endeavoured to look at the motivational and behavioural characteristics of mobile phone usage. The authors tried to combine their results and the result of previous research to find the trends in usage by the youth, "why college students in Nigeria use the mobile phone, what they think of the technology, and how they use it". The motivational themes identified by the study include personal safety, financial incentive, information access, social interaction, parental contacts, time management/coordination, dependency, image, and privacy management. The results of the focus group interviews indicated five distinct user groups in terms of their attitudes toward their mobile phone usage and in terms of the levels of integrating mobile phones into their lives. Aoki and Downes (2002) enumerate the groups as the cost-conscious group, safety/security conscious, dependent, sophisticated, and practical users. The cost-conscious users believe that a mobile phone helps them save money. The safety/security conscious users are cognizant of their own security and having a mobile phone gives them a feeling of security. The dependent user is a person who is reliant on his/her phone and feels disconnected to the world without one. The sophisticated users have had their phones for the longest time and feel it is absolutely a necessity for functioning in the world. The practical user believes a mobile phone gives cost saving, safety benefits, and time efficiency. This study serves as a valuable guideline on how questionnaires focusing on mobile phone use may be designed by using focus interviews.

The global nature of mobile technologies makes the cross-cultural study of the behavioural characteristics of mobile phone usage a topic of current interest. Venkatesh (1995) noted that consumer behaviours are primarily socio-cultural phenomena that must, therefore, be discussed in sociocultural terms. He emphasized cross-cultural studies should include at least two different cultures as part of the same field study, although it is possible to conduct a comparative study using a single cultural setting and make comparisons with other cultures using textual information rather than field data. He also explained that cross-cultural studies may incorporate cross-national comparisons which studies variables that are objective measures that need no cross-cultural translation. Studies in the realm of mobile phone technologies are only recently starting to appear. Issac, Nickerson, and Tarasewich (2004) studied mobile phone usage in social settings in two developed countries – United States and France. Their research focused on the mobile phones used in social settings, the perception of the acceptable use of mobile phones in social settings. They studied whether the use and attitudes related to the use of mobile phones vary by country. Their survey indicated significant differences between users in United States and France when it came to using phones in public streets or while driving an automobile. French users had a significantly negative view of using mobile phones while driving, this may be attributed to the fact that it is illegal in France to drive and talk on a phone simultaneously. Variances were also observed in the use of and attitudes toward the use of mobile phones for both voice calls and text messaging. French users were more likely to use text messaging in all the scenarios studied except while driving. The researchers explained that, some of the differences may be attributed to cultural and legal differences between these countries, other factors such as age or the length of time that

someone has used a mobile phone may be important.

Carlson, Kahn, and Rowe (1999) studied the organizational behaviour aspect by observing the impact of mobile phones on decision making in sales forces within organizations in United States and France. They compared the differences in sales force behaviour. Correlations were conducted to determine whether the country, length of time the technology has been used, or their interactions were the major effect. Their study showed that new technology adoption was responsible for a shortening of decision making time in both countries. On the other hand, differences in standardization, formalization and decision making time were identified. The results of the study indicated that cultural differences between countries accounted for most of the differences. Hofvenschiold (2003) studied the effect of cultural background and occupational status on the way people interact and perceive technology. She surveyed university students and young professionals from Germany and the United Kingdom to study the attitude to and use of mobile phones. Differences in attitudes were measurable when emotional and motivational aspects of mobile phone use were explored.

Castells et al. (2004) produced a detailed compilation of existing research evidence of the social aspects of wireless communication technologies including mobile phones. They indicated cultural differences in communication style preferences had an impact on the adoption rates of wireless technologies. The researchers intended to elicit general patterns for the social differentiation of wireless diffusion in different societies of Europe, America, and the Asia Pacific regions. They cite numerous studies indicating that text messaging is more prevalent among the youth across countries. Other findings include the high incidence of phone-borrowing in parts of Europe; impact on trip planning in travelers and mobile workers; popularity of mobile Internet in Japan; mobile phone as extension of personal identity in Japan; and usage of phones for communication and as status symbols by migrant workers in China. Castells et al. (2004) extensively looked into the rise of the mobile youth in a cross-cultural perspective. Their stated hypothesis was that "there is a youth culture that finds in mobile communication an adequate form of expression and reinforcement." They indicate that much of the research into this youth culture has focused on Europe. The researchers cite evidence for the emergence of collective identity resulting from peer-grouping based on networked sociability. They examine evidence in the United States where owning a mobile phone for a teenager has become a rite of passage. This compilation brings up a wide variety of unique culture attributes for each of the countries or regions studied. However, there is little by the way of direct cross-cultural comparison for specific demographic segments. The literature review shows that the usage of mobile phone technology has a significant societal influence. The ubiquitous and always-connected nature of the technology is shaping attitudinal changes regarding public and private space of mobile phone users. The importance of this area and the study of the behavioural characteristics involved are being just realized. However relatively few studies are available which look at this issue from a cross-cultural perspective, especially the youth segment of the mobile phone user market.

2.2 Review of Related Works

2.2.1 Processing systems

Admission processing system, result processing system, course registration system is typical information processing system or organizational information system on candidates' admission and performances. World Net describes an information system (IS) as "a system consisting of the network of all communication channels used within an organization, and includes software and hardware". It may also be defined as "a system that collects and processes data (information) and provides it to mangers at all levels that use it for decision making, planning, program implementation and control.

The aim of information system to admission, registration and result processing in universities is improving the quality and accuracy of information provided to all involved as well as assisting universities in compiling and reporting information. The information system (IS) has common data set on admission, admittance regulations of different universities and admission procedures.

Computerization is a social process for providing access to and support for computer equipment to be used in activities such as teaching, accounting, writing, designing, circuits, file processing etc. Computerization entails social choices about the levels of appropriate investment and control over equipment and expertise, as well as choices of equipment.

Dunlop and Kling (1991), by the early 1990s, computing and telecommunications accounted for half of the capital investments made by private firms. However, paper (1980) Feigenbaum and McCorduck (1983) and Yourdon (1986) stated that the most fervent advocates of computerization have argued that the actual pace of computerization in schools, factories and homes is too slow.

Taylor (1980), classified computer-based education includes both computer-assisted

instruction programs that interact with students in a dialogue and a broader array of educational computer applications such as simulations or instruction in computer programming. There is major national push for extended application of computer-based education at educational levels. For example, in the mid-1980s private several colleges and Universities required all their freshmen students to buy a specific kind of Micro-computers and others invested heavily in visions of "wired Campus".

Kling (1983) avers that computer-based education has been promoted with two different underlying ideologies in all levels of education. Some educators argue that computer- based instructional approaches can help fulfil the traditional values of progressive education: the simulation of intellectual curiosity, initiative, and democratic experiences. For examples, (1984) has argued that computerized universities are qualitatively different than traditional universities: College students with micro computers in their dorm rooms will be more stimulated to learn because they will have easy access to instructional materials and more interesting problems to solve.

Papert (1979), argues that in a new computer – based school cultivate, students will no longer simply be taught mathematics. These visions portray an enchanted social order transformed by advanced computing technologies. Other advocates are a bit less romantic, but not less enthusiastic.

For example, Cole (1972), states because of the insatiable desire of students for more and more information at a higher level of complexity and more sophisticated level of utilization, more effective means of communication must be used Computers can provide a unique vehicle for this transmission".Hence, it is important to note that computer- based education goes a long way in helping the students as well as the staff to effectively make use of the computerized course registration system. It also helps in convincing the stakeholders of the importance and need for adopting the computerized admission, registration and result processing system as it provides effective and accurate handling of student's files.

Therefore, a computerized course registration system is usually a system, which is implemented with a computer to achieve the utmost efficiency and desired goals. In well developed countries, where education systems are computerized; course registration system should be and/or is one of the modules contained in the college portal. A "College Portal" therefore is personalized software that captures the entire education business process and makes all operations accessible via the web, thus allowing schools to effectively serve all stakeholders, students, lecturers, administrators and parents. It provides many functionalities including Admissions, Registration, Financial Services (transactions- processing), Exams & Records, Grading, Staff Management, Facility Management, Student self-care (My school), Alumni Records, Library and College shop, etc and supports workflow and Messaging and provides other collaboration tools and advanced reporting engines.

Russell, M. (1987), dealt extensively on the need for the use of computers on such database system like computerized course registration system. In the words of Dimorji (2003), at the center of any information system is a database, which is any collection of related information grouped together as a simple item. The term can also apply to the ways in which information is catalog used, analyzed, stored and used manually.

Russell was also of the view that without a computer, effective handling of Candidates' records cannot be achieved effectively. According to him, "The oxford University has more than ninety- six thousand student's records. No person would precisely remember the details of these records". The computer is the most possible application to retain an unlimited number of records with the utmost current updating possibilities. This is true as can be seen as posited by Eloba (1992), Computer in school record keeping, Technical Education Today, Vol. 3 No 182. "That at a department with over a thousand candidates, with the use of computer, all qualified for admission only 100 candidates need to be chosen. With the ranking of the scores or grades of the candidates, the management is in position to choose best candidates with the best results with ease and on time" with the use of computer. Again, many computerized systems have become more than tools-they are environments that people sometimes find hard to change and so on.

Kling and Suzanne (1988), argue that we have much to learn about future uses and consequences of computerization by carefully examining past and present experiences. Knowing fully well how the University program is being run (manually), studying the past and present experiences energize the idea of computerization of the board or the program.

Also, Kling, (1994) illustrates that systems being computerized offers exciting possibilities of manipulating large amount of information rapidly with little effort to enhance control, to create insights, to search for information, and to facilitate cooperative work between people.

2.2.2 Relevance of Computer System in Data Processing

Computer Data Processing: This is any process that uses a computer program to enter data and summarize, analyze or otherwise convert data into

usable information. The process may be automated and run on a computer. It involves recording, analyzing, sorting, summarizing, calculating, disseminating and storing data. Because data is most useful when well-presented and actually informative, data-processing systems are often referred to as information systems. Nevertheless, the terms are roughly synonymous, performing similar conversions; data-processing systems typically manipulate raw data into information, and likewise information systems typically take raw data as input to produce information as output. Data processing may or may not be distinguished from data conversion, when the process is merely to convert data to another format, and does not involve any data manipulation.

Data Analysis: When the domain from which the data are harvested is a science or an engineering field, data processing and information systems are considered terms that are too broad and the more specialized term data analysis is typically used. This is a focus on the highly-specialized and highly-accurate algorithmic derivations and statistical calculations that are less often observed in the typical general business environment. In these contexts data analyses packages like DAP, or PSPP are often used. This divergence of culture is exhibited in the typical numerical representations used in data processing versus numerical; data processing's measurements are typically represented by integers or by fixed-point or binary-coded decimal representations of numbers whereas the majority of data analysis's measurements are often represented by floating-point representation of rational numbers (Anigbogu, 2002).

Processing: Practically all naturally occurring processes can be viewed as examples of data processing systems where "observable" information in the form of pressure, light, etc. are converted by human observers into electrical signals in the nervous system as the senses we recognize as touch, sound, and vision. Even the interaction of non-living systems may be viewed in this way as rudimentary information processing systems. Conventional usage of the terms data processing and information systems restricts their use to refer to the algorithmic derivations, logical deductions, and statistical calculations that recur perennially in general business environments, rather than in the more expansive sense of all conversions of real-world measurements into real-world information in, say, an organic biological system.

The importance of high-speed data processing and communication to modern society and economy can scarcely be exaggerated. Thomas Friedman, in The World is Flat (Farrar,2005) argues that they have wrought a more profound revolution change in communication and trade than did the Gutenberg printing press and have changed the world permanently in far less time. The proliferation of PCs, PDAs and cellular communications, the ubiquity of the internet and the accelerating development of software that allows all of these technologies to interact on a common communication framework have "flattened" our world, in Friedman's parlance, by literally erasing the significance of geography and national boundaries in the conduct of commerce and trade. Together with the emergence of the leadership and management practices to take advantages of these "flatteners", and the collapse of political and economic barriers that accompanied the end of the cold war, what Friedman calls the "triple convergence" has literally "changed everything". Friedman's observations are supported by the words of the CEO of Hewlett Packard, that the world is entering "an era in which technology will literally transform every aspect of business, every aspect of life and every aspect of society.

2.2.3 Formats of Result

Resultmust be communicated to the person who wishes to use it. It can be communicated in a number of ways for example:

a) By word of mouth (e.g. telephone) by sight (e.g. witnessing or observing something) even by touch, smell or taste
b) On paper
i. as a report
ii. as a set of figures
iii. as a diagram or chart
iv. as a photography or picture
c) In a form that is not human sensible that in a form that humans cannot use without the help of a computer or special equipment. Microfilm and microfiche are examples of this and computer files of magnetic disks, or magnetic tapes are others. The communication of the information would, in these cases, be communications between machines and humans would then have to use a machine such as a computer or microfilm reader to obtain access to the information they want. Information and organization are unified. Information is communicated so that decisions can be taken.

2.2.4 Features of Result Processing

Processing results can be said to have the following features for manual as well as electronic.

a. **Collecting Data in the First Place**: There must be data to process and this may arise in the course of operations. There has to be a system or procedure for ensuring that all the data needed for processing is collected and made available for processing.
b. **Up-Dating Files to Incorporate the ProcessedData**: Updating the personal ledger

and the debtors control account are the updating activities to keep the sales ledger records up to date. Updating files means bringing them up to date.

c. **The Routine Dissemination of Information to Users**: This includes routine management control of information and comparing the actual results and budgeted for the month. Providing non-routine information to users on request.

2.2.5 Computer Systems and Result Processing

Computers are key features of the electronic office, and it is important aware of the reasons why they process information better than a manual system. The functions of computers in information or data or result processing include:

1. To process information or result more quickly
2. To handle bigger volumes of processing
3. To undertake complex processing
4. To process information more reliably i.e. with less chance of error mistakes
5. To process information at less cost than a manual system.
6. To improve the scope and quality of management information

2.2.6 Types of Result Processing

Basically there are two types of result processing: the conventional result (manual) processing and electronic method of result processing. Result can be processed manually or with the aid of primitive tools such as tabs or calculators, which take heavy tools in manual input. The processing of result by machines in general in such a way as to reduce to a minimum the need for manual processing is referred to as automatic data processing (ADP). When result processing is mainly done by computers we refer to this as electronic data processing (EDP)

Generally, the result processing methods are:

a. Manually Method: This involves operations performed by a clerk assisted if desired by specific aids such as a pocket calculator or adding machine etc. this method processing is only suitable in cases where the volume of result to be processed small and there is not too much emphasis on the specific period of time the work must be completed. The processing is simple and in most cases, the employment of more hands will solve the problem of time constraint. Example is the updating of handwritten result records.

b. Mechanical Method: This involves operations that are performed by machine consisting of a keyboard but which are actuated by depressing appropriate key by an operator. The results of this type of processing are printed on documents in specific columns. Example is the posting of lodgements and withdrawal on the personal customers' ledger using an accounting machine.

c. Electronic Method: This is more or less like the mechanical method except that in this case the machine being used is electronic and may have optional peripheral devices that are attached to it. It can be can be used for many accounting procedures including payroll, stock schedules and ledger updating. These days' computers are being used. Result for input are entered through the keyboard, card reader, optical character/mark reader, tape reader, while processed result are printed or stored on auxiliary storage. Its processing speed is high and can therefore handle quite a large amount of result. Very suitable for processing tasks that are repetitive in nature.

2.2.7 Factors Determining the Methods of Result Processing

Common factors determining the methods of result processing can be under the following headings:

a. Size and Type of Results: with each of the examples given, the method of producing the result will largely depend on the size and type of result. In a very small school a single person may be able to have the time to produce all the result required, but as the volume of result increases, more people and aids, in form of calculators and small computers, may be employed. Large volumes of result will require the use of large computers. In small schools the payroll will be a matter of simply paying a member of staff the same amount each month, whilst in others a complex payment by results system will have to be coped with. Similarly, invoicing may be simply a matter of virtually coping from the customer's order, or it may require complex discount calculation. Simple situations indicate the need for fewer people and aid to produce the information and complex situations indicate the need for more people and aids (French, 1992).

b. Timing Aspects: Some results requirements are less time critical that others. For example, the results for a semester may only be produced once in three months. The timing requirement for information will have considerable bearing on the methods and equipment needed to provide it.

2.2.8 Result Processing Stages

Whatever method, or combination of methods, is used it will be seen that result will pass through the same basic stages in the processing cycles.

The result processing stages are:

a. Result collection
b. Arrangement of results
c. Result entering into computer systems
d. Application of computing formulas
e. Production of digital contents and files

2.3 Academic Advising

2.3.1 The Link between Academic Advising and Retention

"Academic advising is the very core of successful institutional efforts to educate and retain students. For this reason, academic advising … should be viewed as the 'hub of the wheel' and not just one of the various isolated services provided for students…academic advisors offer students the personal connection to the institution that the research indicates is vital to student retention and student success" (Nutt, 2003).

The retention literature has long recognized academic advising as one of the three most effective strategies, along with academic support and orientation programs, for improving student success. Although there has not been a direct, causal relationship established between advising practices and retention, good advising promotes many outcomes that are also associated with a high rate of retention, such as student satisfaction, effective academic and career planning, goal setting, familiarity with and use of campus resources and support services, and student/faculty interaction outside the classroom.

Joe Cuseo presents a strong argument for the connection between advising and retention in his manuscript, "Academic Advisement and Student Retention: Empirical Connections and Systemic Interventions," first published on the First Year Assessment listserv in 2003. In this document, Cuseo points out that numerous studies have shown that a student's level of satisfaction with his or her experience in a particular college or university is linked to that student's likelihood of staying at that institution, and students also report that good advising and contact with their academic advisor is of high value "relative to other student services". Thus it is reasonable to expect that a student who is dissatisfied with the academic advising he or she is receiving may be more likely to leave. In fact, Cuseo reports that a study conducted in 1989 involving a large number of first year students revealed that students who experienced what they reported as "good quality" advising withdrew at much lower rates than those who experienced poor advising or no advising (Metzner, 1989).

In addition to student satisfaction, academic and career planning, as well as goal-setting in general, are expected outcomes of good quality advising. These activities also impact a student's likelihood of staying in college. Research shows that most students, in fact about 75%, enter college without having made final decisions about majors and careers, because even those who declare a major right away are likely to change that major during their college experience. So most students are making these decisions while they are in college, and this exploration can and should be part of the academic advising experience. Since prolonged indecision about a major is associated with a higher rate of student attrition (Astin, 1977), it stands to reason that advising which includes effective academic and career planning can have a positive impact on retention.

Although studies have been conducted to determine the most effective advising model, there is still no clear conclusion. Effectiveness of any given model will vary depending on institutional context. Assessment results will also vary from the student to the administrative perspective – students have been known to rate a model as very satisfactory while administrators believe that same model is not meeting their needs (Pardee, 2000). Some researchers have claimed that there is an ideal model based on institutional type, but the recommendations vary. Many institutions find that the best model is one that combines the strengths of several different models, uniquely fitted to their own institutional climate, needs, and context.

2.3.2 Fitting Advising Model to Institution

"From an institutional perspective, academic advising programs and services are second only to the instructional mission in most colleges and universities in their pervasive reach to all students throughout their time at the institution" (Creamer et. al., 2003). There are many variables that factor into the question of which advising model is best for a particular institution. Institutional characteristics such as type (two year or four year), governance (public or private), and size are factors (Pardee, 2000). For example, two-year schools are more likely to find centralized systems work best for their populations, while four-year schools usually favour a split or decentralized model. Larger institutions might benefit from satellite models, and very small schools might be able to meet student needs with a faculty only advising system. Other factors such as institutional mission (research or teaching institution), programs (technical, liberal arts, professional), and admission requirements (liberal, traditional, selective) affect the determination of which advising model is best suited for a particular institution. Another important determinant is the amount of resources that a college or university is willing and able to dedicate to academic advising.

Student and faculty characteristics are also factors. The diversity of the student body and whether or not there are significant numbers of non-traditional students, part-time students, and/or distance learners are factors. For example, a faculty only model might work best for a school with a large number of distance learners, or a centralized model that includes an advising centre with hours beyond the traditional school day might work best

for a school with a large population of part-time or non-traditional students. If students are primarily residential, that may work well for a satellite model with centres based in the residence halls. Schools with a large number of undeclared students may find a split model, with professional advisors advising undeclared students, is their best fit.

Historically, academic advising was centred on the activity of helping students select and register for classes. However, beginning in the 1970's, the theories of student development were linked to academic advising, and developmental advising became the preferred advising method (Frost, 1991). In a developmental advising framework, advising is considered a form of teaching, advising is seen as an opportunity for helping students to develop and grow, and the responsibility for advising is shared between the student and the advisor.

Related to this movement, definitions of good advising changed. Traditionally, advising was prescriptive; it involved students asking questions and advisors supplying the answers. In a prescriptive advising relationship, the advisor is responsible for providing the correct advice to the student; once the advice has been administered, the student is responsible for carrying it out. The emphasis of the advising is curricular, and the goal is to enable students to complete the requirements and earn a degree. With developmental advising, the responsibility is gradually shifted from advisor to advisee, and students are prepared for this shift by the advisor. The goal of developmental advising is to prepare students to plan, set goals, and make decisions, and the emphasis is both curricular and extra-curricular (Appleby, 2001).

Cuseo (2003) suggests that good advising is systematic and ongoing, involving a close student-advisor relationship and frequent interactions between the student and the advisor. Good advising involves assisting students in setting and achieving their goals, and should be separated from the registration process – educational planning is the focus, not just scheduling courses, according to Cuseo. He proposes three key advisor roles or functions: 1) Advisor as humanizing agent, whose interaction with students occurs outside the classroom and in an informal setting, so that the student feels comfortable in seeking the advisor out, 2) Advisor as counselor or mentor, who helps guide students through academic policy and procedure, offers advice and listens, and refers them to support when needed, and 3) Advisor as educator or instructor, who teaches students strategies for success and helps them understand the curriculum, the purpose of their academic program, and encourages problem solving, critical thinking, and decision making.

These three roles are closely related to Creamer and Scott's (2000) characteristics of effective advising, which are availability, knowledge, and helpfulness. Students most often cite these three characteristics are what they value most in an advisor. Effective advisors must be available and accessible, which may mean the advisor takes the initiative in meeting with the student; they must be knowledgeable enough to help students not just with curriculum and degree requirements but also with broader educational and career planning and personal growth; and they must be helpful and demonstrate an interest in and a concern for their advisees.

2.4 Knowledge gap

From the review, it was discovered that mobile phones are used by students as necessity. They see it a sense of security. Now when it comes to the use of mobile phones in academics, no one has really applied it effectively in processing of results and course advising. In some universities and other tertiary institution, lectures are delivered over mobile phones. In this way geographical barrier is eliminated. According to the review, mobile phones are also used for checking of admission status on the internet through a browser installed on the phone. But in this new research, an application is actually developed and installed on the phone. The user does not need to use browser to access a particular webpage. The application is now resident on the phone. Additionally, the new system calculates the grade point average of each student real-time. This means that the grade point average can be calculated even when all the results are not yet complete. The system like no other existing system then advises the student based on the performance of the student on each area of the course of study. Grade point average is also used as a criterion for recommendations.

III. THE PROPOSED SYSTEM

3.1 Introduction

This chapter reveals the investigation and analysis made into the existing system after which it was necessary to develop a new system. A systematic, theoretical analysis of the methods applied to the development of the new system was shown. this comprises the theoretical analysis of the body of methods and principles associated with the methods adopted in this research. Further, a detailed analysis of the new system is made to show how the advantages of the new system outweighs the strengths of the new system. The weaknesses found in the existing system were taken note of so as to create a new system that will correct the weaknesses. An overview of the new system was presented such that the architecture that

was used for developing a software product was explained.

3.2 Methodology

The methodology adopted in this work is OOHDM (Object Oriented Hypermedia Design Method). The Object-Oriented Hypermedia Design Method is a mature approach for building hypermedia and web applications by describing different design models which are then mapped onto a running application. This method is suitable for this research since android mobile application is a hypermedia application. Object Oriented Hypermedia Design Method consists of five activities namely requirements gathering, conceptual design, navigational design, abstract interface design and implementation. The sequence of steps to develop a mobile/web application according to OOHDM are described and evaluated:

Requirements gathering: at this stage, the functional requirements of the mobile application are captured and specified. Roles and their tasks are also obtained. Next, the possible application scenarios are described. Scenarios are narrative descriptions of how the application may be used to allow actors to perform each task. Scenarios must be grouped in functional units defined in Unified Modelling Language such as Use Cases. Because a set of related scenarios have been defined for different actors, the use case for this set must identify the actors it belongs to. Hence, a Unified Modelling Language such as the Use Case Diagram was used to depict the requirements of the android mobile application. The Use Case Diagram is shown in figure 3.1.

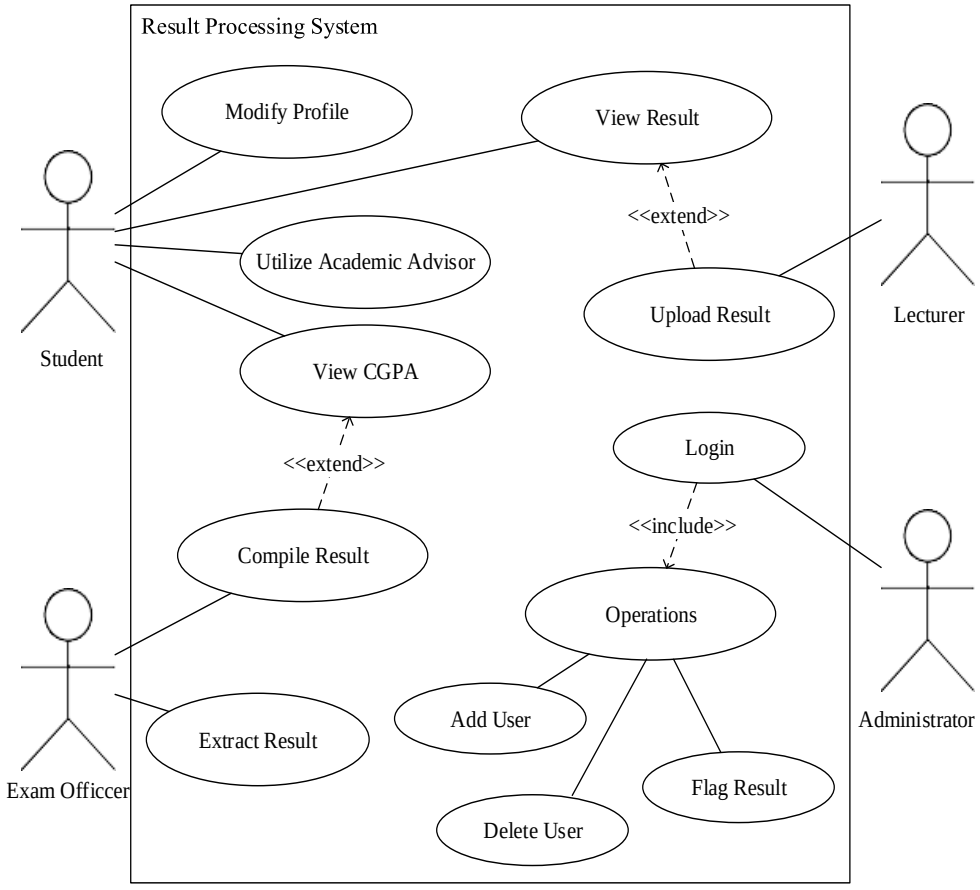

Figure 3.1: Use case of the proposed system

Conceptual Design: The starting point of the design process is the specification of a conceptual model. The target of this model is to enumerate the object classes of the domain, their attributes and their relationships. The output of this stage is the Conceptual Class Schema, a diagram of classes with the notation specified in Unified Modelling Language. The Conceptual Class Schema shows the underlying structure of the information that is going to be presented to the users, independently of the presentation form. This schema has more relationship to the way the data will be stored than to the way it will be presented. The Conceptual Class Schema portrayed as class diagram of the new system is shown in figure 3.2.

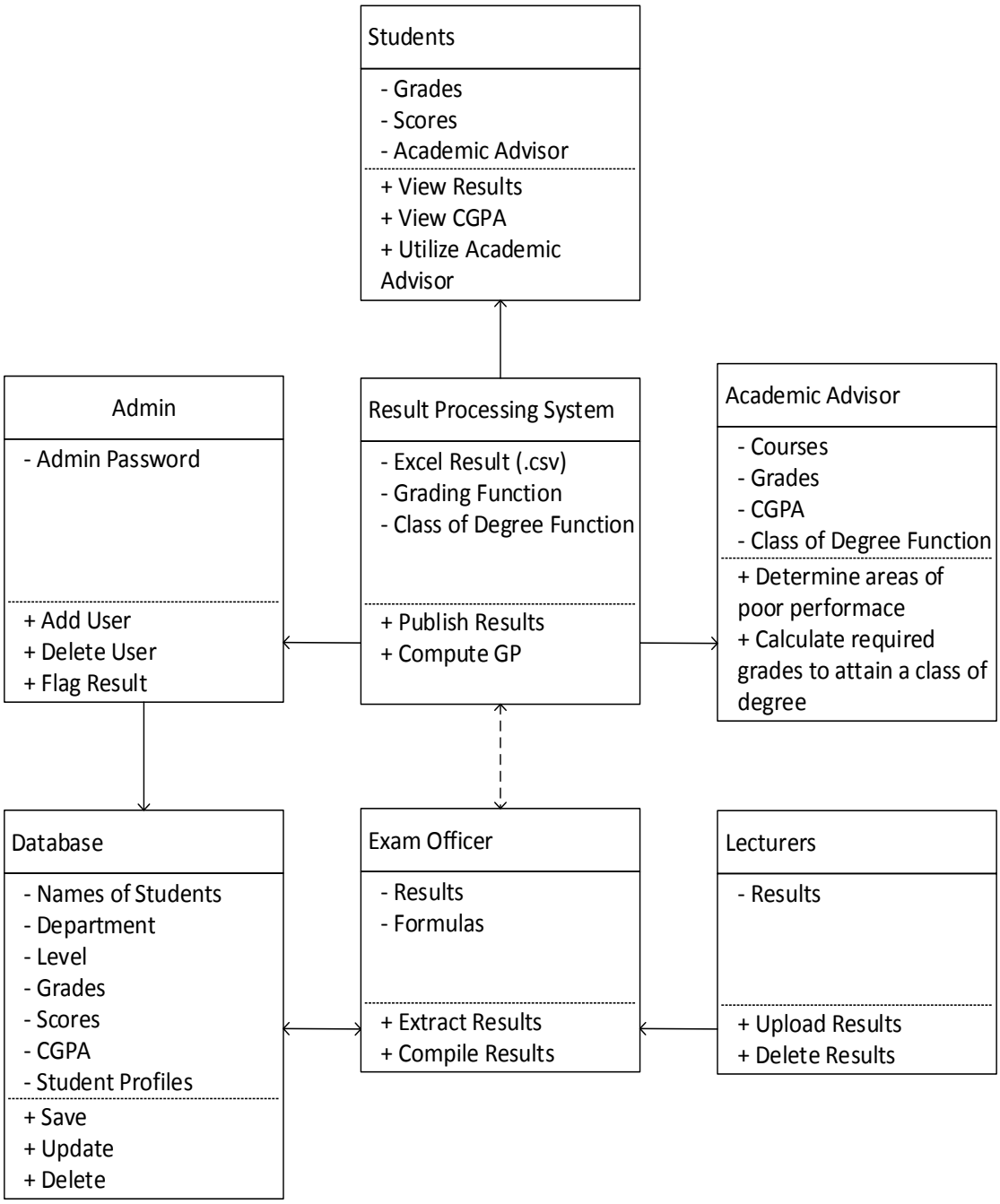

Figure 3.2: Class diagram of the proposed system

Navigational Design: previous phases have produced, for each task, several scenarios, a use case and a class diagram. Next, OOHDM describes a method to derive the navigational topology of an application that supports each task. The main output of this stage is a navigational model that is built over the conceptual model. This stage allows the creation of different models, according to different user profiles. Each navigational model provides a subjective view of the conceptual model. The output of this stage are nodes, links, access structures, navigational contexts and navigational transformations.

Abstract Interface Design: In the Abstract Interface Design activity, the interface objects the user will perceive is specified. It should be recognized that there is a distinction between navigation operations and interface operations; not everything that happens in the interface is navigation related. Furthermore, it is useful to design interfaces at an abstract level, to achieve, among other things, independence of implementation environment. The Abstract Interface Specification includes the way in which different navigational objects will look like, which interface objects will activate navigation, the way in which multimedia interface objects will be

synchronized and which interface transformations will take place.

Implementation: In this phase, the designer will actually implement the design. Up to now, all models were deliberately constructed in such a way as to be independent of the implementation platform; in this phase the particular runtime environment is taken into account. When the implementation phase is reached, the designer has already defined the information items that are part of the problem domain. He also has identified how these items should be organized according to the user's profile and tasks; he has decided what the interface will look like, and how it will behave. In order to implement all of this in the mobile environment, the designer has to decide how the information items (both conceptual and navigation objects) will be stored. He must also decide how the interface appearance and behaviour will be realized using HTML and possibly use some extensions. At this stage, the actual appearance was defined by a graphics design software, Photoshop.

3.3 Investigation and Analysis of the Present System

The current manual procedure of result entering and compilation represents the present system. Currently, results are submitted singly according to a particular course, department and level. On submission, the results are kept in the department for use in the department. The head of department, departmental exam officer and the secretary among others have responsibility of keeping and maintaining the results. On receipt, photocopies of results are either pasted on the information board or kept in the department for general consumption. During compilation, results are entered on individual result sheet of each student by the exam officer. The individual result sheet is used to record grades, credit units and grade points of courses studied by a student throughout the course of study in the institution. Thereafter, the total grade points are divided with the total credit units to get the cumulative grade point average. The class of degree is determined by the result of this process. Reconciled result are forwarded to the exams unit head where statement of results and certificates are prepared. Meanwhile, before compilation, students whose results were not pasted are ignorant of a complete picture of what their performance is. As a result, a student is kept in the dark till after final year. The implication of this situation is that a student may not know areas of the course of study to work on while in school and while there is still opportunity for the student to make effort. Additionally, students who failed a course whose result was not published on time or on the notice board run a high risk of staying extra years in the institution when they finally realize their predicament. This present system of result processing has strengths and weaknesses that will be isolated in the sections that follow.

3.4 Strengths of the Present System

The new system has a valuable quality which is referred to as strengths and they are:

a. The manual result processing system is flexible unlike the automated which has to take the predefined course without external interference.
b. High capital expenditure is not incurred in investing for an automated result processing system.
c. Computer practical skill and knowledge is not necessary to process result in the current system.
d. There is no procurement of hardwares to facilitate electronic processing.
e. The manual procedure does not replace staff, hence maintain the staff and their work stations.

3.5 Weaknesses of the Present System

The present system has the following weaknesses:

a. The present system does not provide results real-time to students through a medium that is not geographically limited.
b. The present system does not provide advice or recommendations based on the semester results and CGPA.
c. The response speed of the present result processing system is slow compared to the automated system and hence processing and information retrieval is slow.
d. The present system is redundant. There is also inconsistency in data entry, room for errors, wrong entering of information.
e. Manual result processing is a labour-intensive process and it is dependent on good exam officers.
f. There is lack of security to result and individual composite sheet. Storage of result files takes lot of space.
g. Manual processing introduces the possibility of human error; workers that do not have close attention to detail or that are suffering from a lack of concentration or fatigue may make more errors.

3.6 Analysis of the Proposed System

The proposed system is a mobile application that is based on android. The application is also extended to non-android platforms through a web browser. The application is used by students, lecturers, exam officers and an administrator. Results are uploaded by the lectures according to a predefined format. A model Microsoft Excel worksheet is provided in csv format to enable lecturers prepare the result. The

model Microsoft Excel worksheet is constructed as eleven (11) specific columns consisting of names of students, registration numbers, continuous assessment, examination score, total score, grade, course code, session, level and semester. These results are uploaded on the webserver and inserted into the result database. These results can be view by students through their mobile phones. During compilations, the exam officer will extract all the results from the uploads made earlier by the lecturers. A feature is provided on the website that will enable the exam officer to do the extraction. Basically, it is this same feature that makes it possible for a student to see only his results and not that of others. Subsequently, the exam officer compiles the results for each student using the application. Grades and credit units are converted to grade points, total grade points for each semester is divided by total credit units for each semester to get grade point average for each semester. Then, all the grade points summed together is divided by all the credit units summed together to get Cumulative Grade Point Average (CGPA). These procedures are carried out automatically by the proposed system. After compilation, the proposed system analyses the overall performance of the results, one student at a time. This analysis is made to determine the area of the course of study where the student's performance is distressingly low. Some category of courses is greater in number than others. For example, for a computer science student, CIS courses are greater in number than GSS courses and MTH courses. So, each category is analysed based on the ratio of the total courses in each category to the number of courses failed in each category. If no courses were failed, the analysis is made on courses whose scores are low. Based on the analysis, recommendations are saved for each student. When the advisor is module is launched from the mobile application, an advice or recommendation is made from the previous analysis. In this way, each student is assisted each step of the way. The proposed system compiles the results real-time. This means that the proposed result processing system processes and updates results as soon as it is received from some external source such as result upload from lecturers in the institution.

3.7 Description of Input and Output Documents

As noted earlier in the analysis of the existing system, the proposed result processing system must use data to produce cumulative grade point average and recommendations as output. The input to the system is a result prepared as Microsoft Excel worksheet which has eleven (11) specific columns consisting of names of students, registration numbers, continuous assessment, examination score, total score, grade, course code, session, level and semester. The format of the result is depicted in figure 3.3.

SN	NAMES	REG NO	QUIZ	EXAM	TOTAL	GRADE	COURSE	SESSION	LEVEL	SEMESTER
1	OKEKE OLIVER C.	2015 224 001	26	17	43	F	CIS 192	2017/2018	100	SECOND
2	AMEKE PETER BELUCHUKWU	2015 224 002	28	42	70	A	CIS 192	2017/2018	100	SECOND
3	OBIKA VICTOR CHIGOZIE	2015 224 003	20	13	33	F	CIS 192	2017/2018	100	SECOND
4	NDIFE UCHENNA S.	2015 224 004	26	29	55	C	CIS 192	2017/2018	100	SECOND
5	NWAFOR OLUCHI ABIGAIL	2015 224 005	25	35	60	B	CIS 192	2017/2018	100	SECOND
6	ONOCHIE THOEDORE	2015 224 006	5	13	18	F	CIS 192	2017/2018	100	SECOND
7	NWABUNWANNE EMMANUEL C.	2015 224 007	27	24	51	C	CIS 192	2017/2018	100	SECOND
8	EZEIMO NNENNA S.	2015 224 008	7	10	17	F	CIS 192	2017/2018	100	SECOND
9	ILOKA PASCHAL N.	2015 224 009	27	23	50	C	CIS 192	2017/2018	100	SECOND
10	MUOMA DABERE ANTHONIA	2015 224 010	26	37	63	B	CIS 192	2017/2018	100	SECOND
11	MMADUKWE JOSEPH C.	2015 224 011	21	38	59	C	CIS 192	2017/2018	100	SECOND
12	IWEKAEZE INNOCENT	2015 224 012	29	32	61	B	CIS 192	2017/2018	100	SECOND
13	DIBUA GIBSON OLISA	2015 224 013	26	15	41	F	CIS 192	2017/2018	100	SECOND
14	OKWUOHA MUNACHI PETER	2015 224 014	20	31	51	C	CIS 192	2017/2018	100	SECOND
15	CHUKWUKEZIE NDIDIAMAKA	2015 224 015	25	40	65	B	CIS 192	2017/2018	100	SECOND
16	OGUNDU EBUKA	2015 224 016	22	31	53	C	CIS 192	2017/2018	100	SECOND
17	OKECHUKWU AMAOBI	2015 224 017	27	33	60	B	CIS 192	2017/2018	100	SECOND
18	OKONKWO NZUBE W.	2015 224 018	23	37	60	B	CIS 192	2017/2018	100	SECOND
19	OKEKE MICHAEL	2015 224 019	27	34	61	B	CIS 192	2017/2018	100	SECOND
20	OKOLI CHIBUEZE	2015 224 020	24	32	56	C	CIS 192	2017/2018	100	SECOND

Figure 3.4: Input document for result upload

These results are uploaded on the webserver were it will be inserted into the result database by the mobile application. These results are then manipulated by the proposed result processing system to give outputs. The name of the file will be save with the course code and session written as one word. For example, CIS 101 for 2017/2018 session would be saved as CIS1011718. The

department and other information will be selected on the interface of the application. Defensive programming was applied in the development of the application such that correction will be automatically be made when a lecturer makes mistake in the upload. This format will enable the mobile application to store the results in such a way that it can easily be retrieved, extracted and compiled for each individual student. The output document is individual result page than contains result compilation. A button is also provided for launching another output document which is the recommendations for the student. The output document that shows a sample compilation of a semester result is shown in figure 3.5.

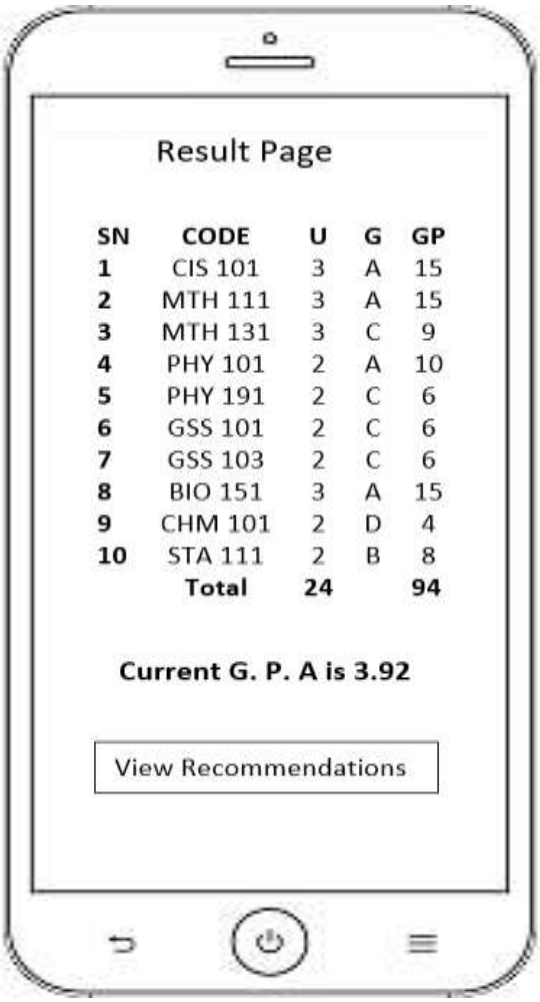

Figure 3.5: Output document of semester result computation.

3.8 Information and product flow diagram

Information and Product flow diagram is a graphical representation of the order by which a sequence of products is created according to Product based planning principles. It is related to the Product breakdown structure. This diagram depicts the flow of result from academic staff through the proposed system to the exam officer and students. The information and product flow diagram of the proposed system is shown in figure 3.6

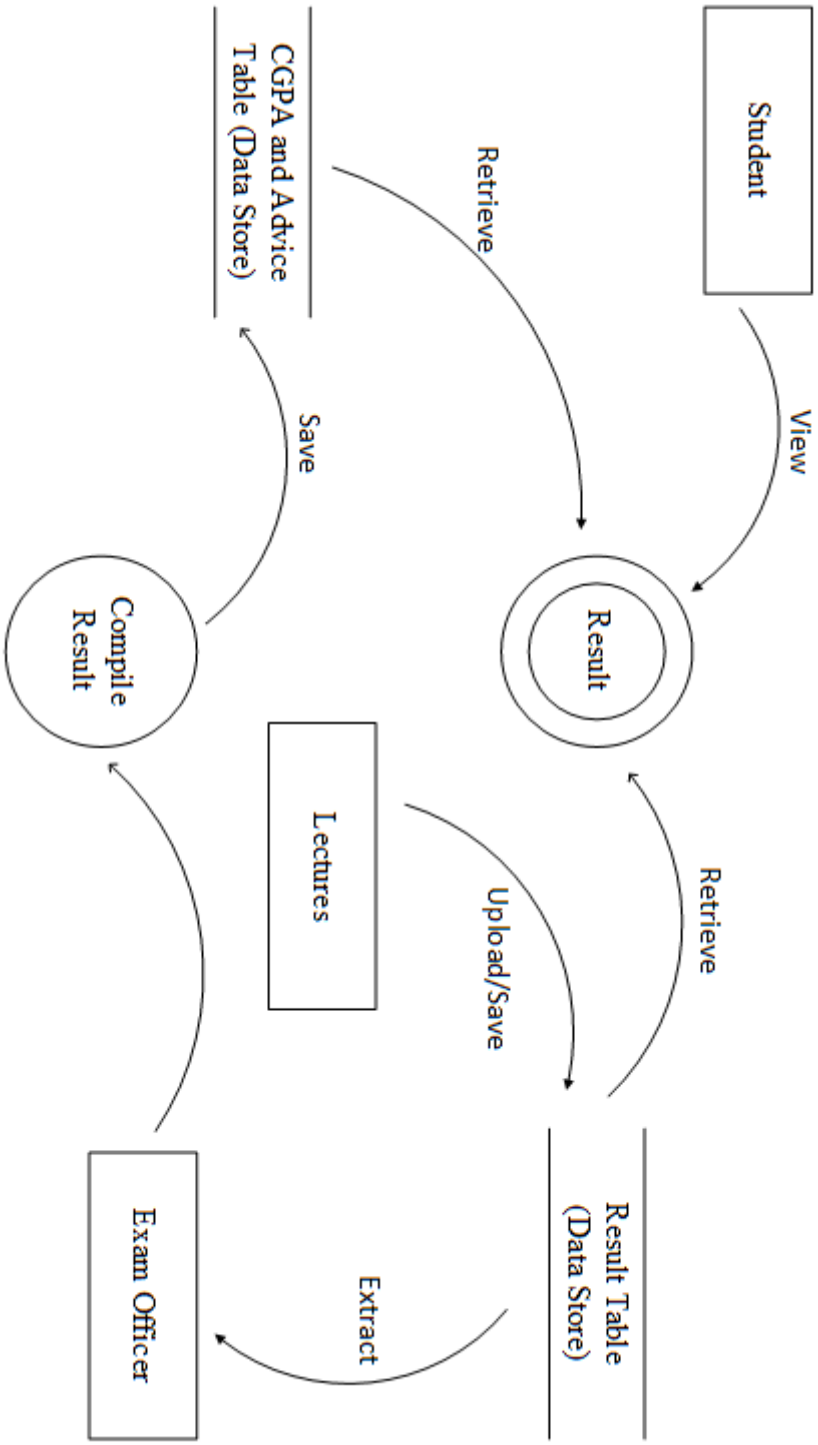

Figure 3.6: information and product flow diagram of the proposed system

3.9 Specification and Design

Mathematical algorithm was developed for the proposed result processing system according to the grading system of the Chukwuemeka Odumegwu Ojukwu University. Methods for result computations which were applied are represented mathematically as:

GCPA = Total Grade Point / Total Credit Unit

Grade point is determined by multiplying the grade value of a course with its credit unit. Grade value has the following standard:

A = 5
B = 4
C = 3
D = 2
F = 0

For instance, say a student got B in a 2 credit unit course:
The grade is B
The grade value of B is 4
The credit unit is 2
The grade point is 8

After summing all the grade points of all the courses under consideration, credit units of those courses are also summed. The sum of the grade points is thus divided by the sum of the credit units to get the grade point average. Class of degree is determined according to the rule shown in table 3.1

Table 3.1 Class of degree grading system

I	II	III	IV	V
Score	Grade	Grade value	Final CGPA	Class of Degree
70 – 100	A	5.00	4.50 – 5.00	First Class Honours
60 – 69	B	4.00	3.50 – 4.49	2nd Class Upper
50 – 59	C	3.00	2.40 – 3.49	2nd Class Lower
45 – 49	D	2.00	1.50 – 2.39	3rd Class
0 – 44	F	0.00	1.00 – 1.49	Pass
			0.00 – 0.99	Fail

3.10 High Level Model of the Proposed System

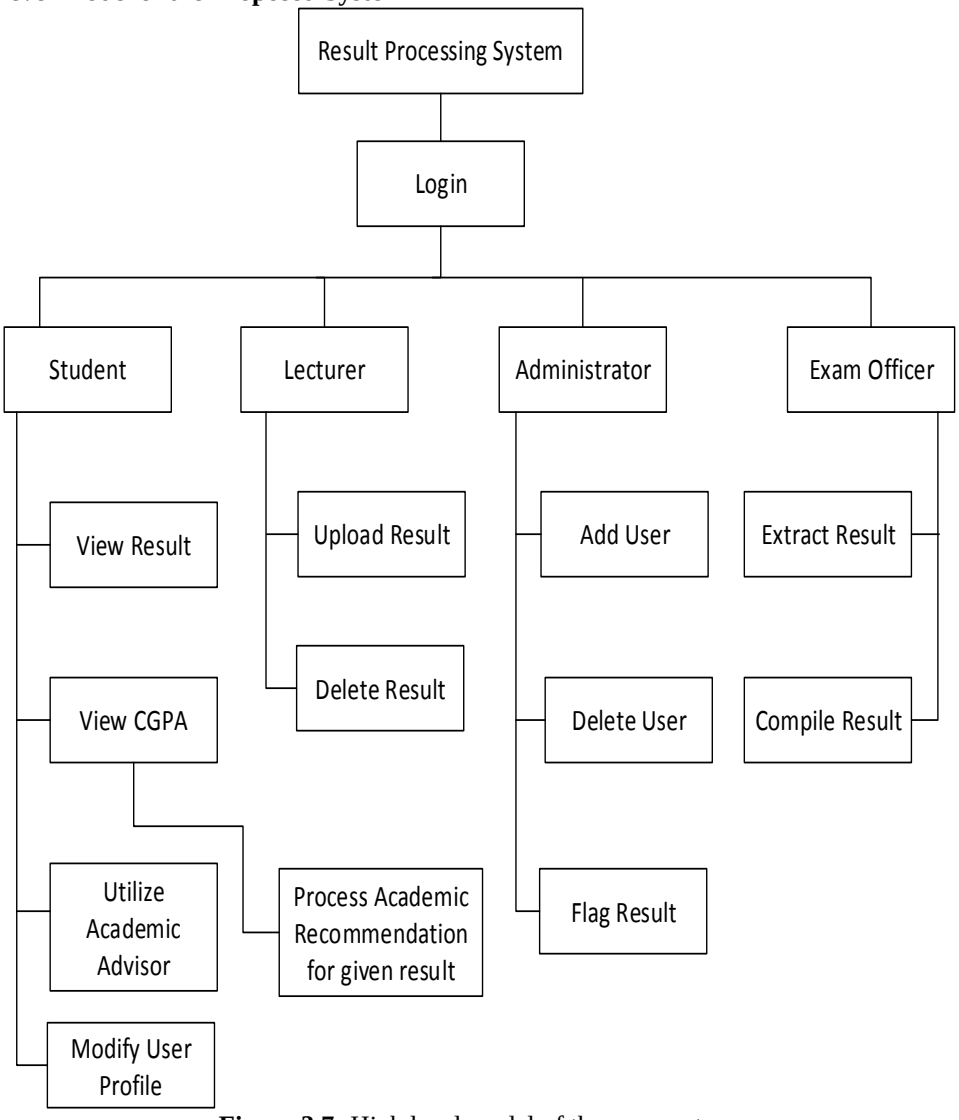

Figure 3.7: High level model of the new system

REFERENCES

[1]. Anigbogu, S.O. (2000). Computer Application and OperationFirst Edition.Awka: Optimum Press (Printers, Publisher andDesigners)

[2]. Appleby, D. "The Teaching-Advising Connection." The Mentor: An Academic Advising Journal, April 1, 2007. [http://www.psu.edu/dus/mentor/appleby1.htm].

[3]. Astin, A.W. Four Critical Years. San Francisco: Jossey-Bass, 1977.

[4]. Blementhal, S.C. (1999). Management Information SystemNew jersey: Hall Inc, Eaglewood:
[5]. Creamer, E.G., and Scott, D.W. "Assessing Individual Advisor Effectiveness." In V.N. Gordon, W.R. Habley, and Associates (eds), Academic Advising: A Comprehensive Handbook. San Francisco: Jossey-Bass, 2000.
[6]. Cuseo, J. "Academic Advisement and Student Retention: Empirical Connections and Systematic Interventions." NACADA Clearinghouse of Academic Advising Resources web site, April 23, 2007. [http:// www.nacada.ksu.edu/ Clearinghouse/AdvisingIssues/Retention.htm]
[7]. Eloba., P.C (1998). Computer in School Record KeepingTechnical Education.Ikeja, Lagos State:Ekon Press.
[8]. French, C.S (1992), Computer Science. Fourth Edition DPAldine Place, London. Webstar Publication, Ltd.
[9]. Frost, S.H. "Academic Advising for Student Success: A System of Shared Responsibility," ASHE-ERIC Higher Education Report no. 3, Washington, D.C., George Washington University, School of Education and Human Development, 1991.
[10]. Metzner, B.S. "Perceived Quality of Academic Advising: The Effect on Freshman Attrition." American Educational Research Journal, 1989, 26(3), 422-442.
[11]. Murdick, D. (1971). Management Theory of Computer.Pg 32.
[12]. Nutt, C.L. "Academic Advising and Student Retention and Persistence." NACADA Clearinghouse of Academic Advising Resources web site, Sept. 1, 2006. [http://www.nacada.ksu.edu/Clearinghouse/AdvisingIssues/Retention.htm]
[13]. Osaula, E.C. (1978). Introduction to Research Methodology.Ikeja, Lagos State: Ekon Press.
[14]. Oxford Advance Learner's Dictionary of Current English.
[15]. Pardee, C.F. "Organizational Models for Academic Advising." In V.N. Gordon, W.R. Habley, and Associates (eds), Academic Advising: A Comprehensive Handbook. San Francisco: Jossey-Bass, 2000.
[16]. Patrick, C. E. (1990). Computer Application. Abia: M. C. Publication Ltd.
[17]. Popoola, R.T. (2004). Timesharing and multiprogramming. Ibadan: J&T Publishers.
[18]. Richard, M. (2000). Creating database using Microsoft access. Mumbai: Krish publication.
[19]. Shimon, M. (1989). How to Use VISUAL BASIC 6.0.FirstEdition. U.S.A, Indianapolis, Indiana 46290. Divisionof Macmillan Computer Publishing.
[20]. Vossen, G. F. (1991). Data Models, Database Languages andDatabase Management Systems.U.S.A: Adison – WesleyPublishing Company.
[21]. Wikipedia, the free Encyclopedia, Structured System Analysisand Design Methodology. Latest update.

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