

Designing and Implementation of An Advanced Information Management System at Information and Communication University- Zambia

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ABSTRACT

Student Information Management Systems have become an important factor in modern educational institutions. These systems help learning institutions to manage student records and easily streamline administrative tasks and provide real-time access to data. This research focuses on the design and implementation of an Advanced Information Management System (AIMS). The AIMS system is an online web-based system that will be used as a student information management system and as an E-learning platform by the students at Information and Communication University Zambia (ICU Zambia). The students at ICU Zambia will use the system to view their student records such as Personal Information, Semester Exam Results, Payment history etc. Furthermore, the students will be using the AIMS system to access their study materials, answer Online quiz question, register for semester exams, make online payments, submit assignments etc. Additionally, the AIMS system will allow ICU Zambia Staff members to access student's academic progress and modify student records according to the access levels given to them. ICU Zambia staff members are able to enter end of semester exam results, enter student assignment marks, enter quiz questions, approve or reject submitted payments etc. The system utilizes user authentication mechanism, displaying only information necessary for an individual's duties. The system features a complex logging system to track all users' activities in the system. The AIMS system allows the University to easily manage and deliver its students records in a timely manner and in an efficient way.

KEYWORDS:

Advanced Information Management System, Information and Communication University Zambia, Online Server, Web-Based.

1. INTRODUCTION

The main objective of the study is to design and implement an advanced information management system at information and communication university Zambia. The advanced information management system will be a new way of record management and transaction processing that will help achieve efficiency in processing student information, capture student payments, allocate semester study materials to students, enter end of semester examination results etc. It will be a great help to the administrative personnel, academic personnel, accounts personnel, examinations personnel and students in updating, retrieving and generating student data.

The design and implementation of a comprehensive student information management system is to replace the current systems being used at the Information and Communication University. The university is still using a semi- automated system and paper- based student information management system. These systems do not fully automate the process of storing student information, capturing student payments, allocating semester study materials to students, entering end of semester examination results etc. The staff at the university have to manually perform these processes for each student. The staff find it very tedious and laborious in performing these tasks due to repetition of the processes. As main goal of the university is “to become the global ICT Leader” the current system is inconsistent with the asserted university’s main goal.

University Staff will be able to directly access all aspects of a student’s academic progress through a secure, online interface embedded in the university’s website. The system utilizes user authentication, displaying only information necessary for an individual’s duties. Additionally, each sub-system has authentication mechanism that will allow only authorized users to create or update information in that subsystem. All data is thoroughly reviewed and validated on the Server side before actual record alteration occurs. In addition to a staff user interface, the system has student user interface, allowing users to access information and submit requests online thus reducing processing time. All data is stored securely on SQL servers managed by the university administrator and ensures highest possible level of security.

This system provides a simple interface for the maintenance of student information. It can be used by educational institutes or universities to maintain the records of students easily, enter end of semester examination results, easily approve or reject student payments and easily allocate student study materials for each semester. Achieving this objective is difficult using the system that is currently being used at university. The current system does not automate most of the processes at the university. All these problems are solved using the Advanced Information Management System (AIMS). The system focuses on presenting information in an easy and intelligible manner which provides facilities like online

application, online exam registration, online payments, uploading exam results and profile creation of student's thus reducing paper work and automating the record generation process at the university.

The system features a complex logging system to track all users that access the system. The system is expected to increase the efficiency of the universities' record management thereby decreasing the work hours needed to access and deliver student records to users.

2. LITERATURE REVIEW

Educational systems form the backbone of every nation. And hence it is important to provide a strong educational foundation to the young generation to ensure the development of open-minded global citizens. Advanced technology available today can play a crucial role in streamlining educational-related processes to promote solidarity among students, teachers, parents and the school staff.

Information handling is one of the major challenges that most organizations face. Many organizations still use the old methods of handling information that come into the organization or that circulates within. These organizations still use files and paper to handle information. Although using files and papers is one of the most fundamental way of handling information, it poses a challenge when there is a huge amount of information flowing in and out, and needs to be managed every day. When it comes to analyzing huge amounts of information from paper tends to be tedious and full of errors. It is because of this fact that institutions like Universities and Colleges have embarked on developing systems that can aid them with handling information regarding the institution. More and more Universities and Colleges have started developing applications that help them handle information about their students.

Systems that are used to handle student information are called Student Information Management System (SIMS). These systems are able to handle information from the grades of the student to accounting information of the student.

Before the Advanced Information Management System was developed at the Information and Communication University, the university was using two systems to manage the university processes and activities. The first system is called the e-school and it is used to manage student information such as student academic details and biological information. The other system is called the e-learning. The e-learning platform is used to manage and assign study materials to students. Although these two systems have been able to deliver their expected functions to the university, they have not been able to handle the fast-growing parse of the university and the dynamism of the university. The university has expanded and grown at a very fast parse and this has posed a challenge to the current systems. This is mainly due to the fact that the two systems are not fully automated and depend upon the university staff to manually enter the student's information into the system.

The e-school is a platform that enables the university to easily manage student information such as payment history, exam results, student's current semester, student's program of study etc. The system has been able deliver all the expected functionalities, however most of these tasks require a university staff to manually perform the tasks for each student. For instance, in order to capture information for a prospective student, a staff member has to manually enter the information into the system. The staff has to repeat the process for each and every person that wants to become a student at the university. This process is time consuming and very tedious for the staff. Furthermore, when it comes to capturing the payments for the student, the system requires a student to either physically bring in or email their deposit slip to the university and a staff has to manually enter the payment information into the system so that the payment status can reflect in the student's portal. This process has to be repeated for each student that sends their deposit slip. This posed a very big challenge to the university especially that the number of students at the university has grown at a tremendous parse and performing such a process for each student can be time consuming and tedious for the staff.

The e-learning is a platform that enables the students at the university to have access to study materials for each semester. In order for a student to have access to the study materials, an account has to be created for them by a staff member and the login details sent to the student. This means for each and every student at the university. In addition, the study materials have to be assigned to each and every student at the university every new semester. This process is time consuming and tedious for the staff.

The objective of Advanced Information Management System is to try and overcome some or all the challenges that the current systems have. The new system will allow the administrator, academic personnel, exams personnel, lecturers to easily manage academic details of a student by automating most of the processes that the university performs. The students will be able to keep up to date on exams, materials, payments and other university activities easily. The new system will require a prospective student to fill out an online application form in order for them to be considered for a place at the university. Once the online application form is filled out and submitted, the system will capture the information and the only thing that the university staff will do is either accept and reject the submitted application. This makes the work of the university staff fast and easy. Unlike the current system that requires the staff member to enter the prospective student information into the system. The new system will also facilitate for students to easily submit their payments through the online registration system which will capture the payments made by student. Once a student does online registration, the university staff will either accept or reject the submitted payment by the click of a button. Once the payment is accepted, the payment will immediately reflect in the student's portal. This lessens the amount of work that the staff have to do and improves the efficiency of the university in delivering quality education. Additionally, the new system will require each student to register for the exam before they can enter the exam room to write. This makes the work of the examinations department much easier and fast when it comes to entering the examinations results. With this new system, the examinations department will be able to generate excel sheets that has the list of students that registered for a particular course. The

people marking the exams will use the generated excel sheets to enter the grades obtained by each student in each course. The only thing that the examinations department does is upload the excel sheets that have grades on them into the system and the system will capture all the results on the excel sheet. Unlike the current system which requires the examinations department to enter the results for each student in each course.

3. METHODOLOGY

3.0 Research Methodology

A university faces many challenges in the operation of its daily activities. In order to solve these problems, we need to make a strong decision as to the methods and steps to be taken in solving these problems. For us to know which direction to take, we need to conduct a research. Research is considered as the process of arriving at a dependable solution to a given problem through a system collection, analysis and interpretation of data.

3.1 Methods of Data Collection

There are a number of approaches to data collection depending on the nature of research being conducted. In this project, the methods adopted include the following: Interview, World Wide Web, references to published and unpublished data. The data collected for this research can be broadly classified into two types, namely: primary and secondary

3.1.1 Primary Data

Primary data can be defined as data collected directly from respondent sources relevant to the subject under investigation. The primary data used in this case is interview method. According to Collis, B. (2002) says that primary source data is source from firsthand where information can be obtained. The tools for gathering the primary source of data include; interview, observation and questionnaire etc.

3.1.1.1 The Interview Approach

The researcher employed a combination of both oral interviews, questionnaires and observational method consulting of staff, students and downloading information from the Internet to investigate the system. The oral interviews and questionnaires were distributed within the university premises and people from different departments of the university were considered. People under the examinations department were considered in order to understand how the university and the system handles the

exams. Furthermore, people under the accounts department were also considered in order to understand how the university and system handles the payments of students.

3.1.2 Secondary Data

These are source of data collection in which an already made data are being obtained i.e. information that is already in printed form. Sources of secondary data include, textbooks, magazines, journals etc. in the case of this project, most of the data are published documents and references.

The required data including department details, course details, program details, student personal details, semester details, payment details, exam details etc. were collected. The data collected would help identify attributes, relationships, classes, entities/objects that describe, relate and interact with the system.

3.2 System Investigation

This is an in-depth and comprehensive study carried out on the existing system in order to arrive at vital and relevant facts that will help/assist in the design and implementation of the improved/new system or change which will be brought by the proposed system. The main objective of system investigation is to find out or learn how the current system is operating so as to understand and come out with relevant data. The case university will be properly studied based upon its operational mode. Books and records kept and approaches to decision were considered. Data were collected from the workers and students which will form the basis for data analysis as below

3.3 Results of Data Collected and Interpretation

From the data collected, the following results were made:

- (a), the university is making use of both manual and automated approach of handling student information and performing its daily activities. They have a database system that keeps academic records, examination results, student study materials, staff records etc. they also use some paper, file work where the database cannot be applied.
- (b), It was discovered that the university is using two separate systems to handle student information and study materials. One system is used just to handle information like payment history, exam results, current semester etc. only, while the other system is used to handle the study materials for students.
- (c). It was also discovered that staff and students who knew about the new system where of the view that the anticipated benefits derivable from the new system would improve the operations of the university.

3.4 system analysis and design

This deals with data flow diagram, detailed flow graph, requirement analysis, and the design process of the front and back end design of the student information management system.

3.4.1 System Data flow diagram

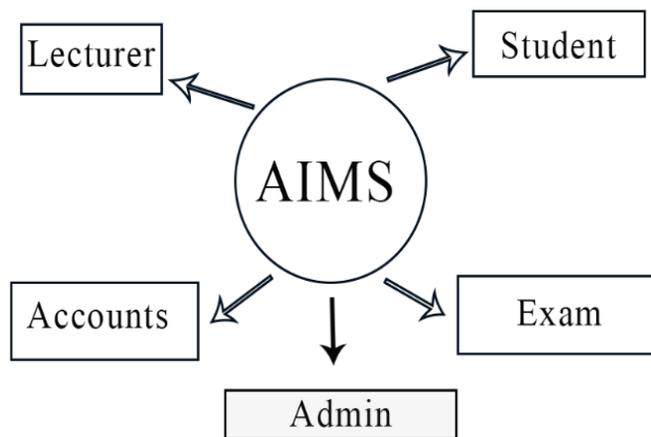


Figure 1: System Data Flow Diagram

A Data Flow Diagram (DFD) is a graphical representation of the “flow” of Student Information System. A data flow diagram can also be used for the visualization of how Data is processed in the system. Figure 1 above illustrates how the advanced information management system processes information from different users that access the system.

3.4.2 Accessing the System

The Advanced information management system is embedded in the university website. In order for students access the system they need to go to the university website (<http://www.icuzambia.net>) and click on a link (AIMS) that takes them to a page that will request them to enter their login credentials. Students need to have login credentials in order to access the system (AIMS). The login credentials are sent to them through text message and email when their student accounts are created. The login system on AIMS is not only used by students but by every other user that tries to access the system. The system uses one login form in order to grant access to the different users of the system. This means that the administrators, lecturers, accountants, exams department and students all use the same login form in order to access the system. Figure 2 below shows the login page that is used for authenticating users that want to access the AIMS system.

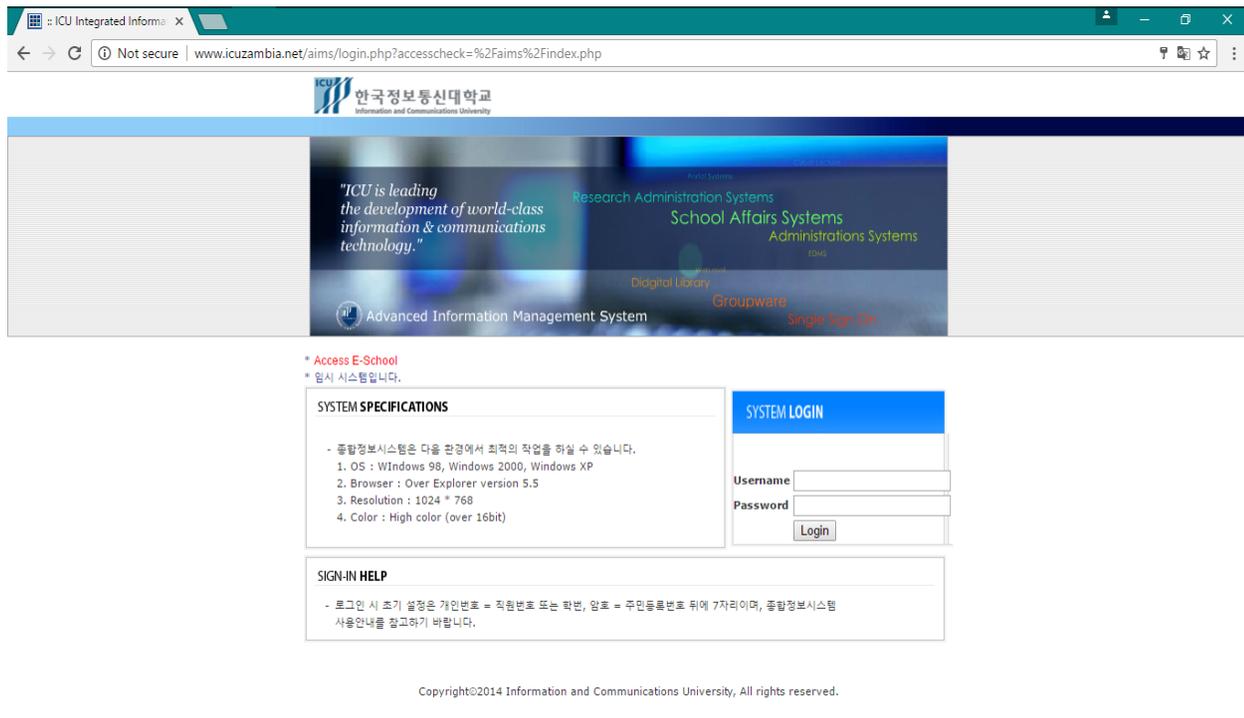


Figure 2: System Login Screen

The system utilizes user authentication mechanism to ensure that only authorized users are given access to the system and able to carry out their assigned duties.

As different users will be accessing the system to perform different kinds of work, it is important that access levels are established to different content so that users can only access the system based on their different duties. The system employees a mechanism that makes sure that only users with authorized access are able to access the system and that they are only able to access part of the system that pertains to the kind of work they are required to do. The accounts department, exams department, lectures and students will only view parts of the system according to their kind of work.

3.5 Project Modules

The system is made up different modules that are accessed by different users. Some of these modules include administrator module, accounts module, examinations module, text message module, search module, lecturer module, student module etc.

3.5.0 Administrator

The administrator is responsible for managing the overall system and making sure that all modules of the system are accessible and working fine. The administrator has the power of approving or rejecting an application done by a prospective student. The administrator can create new users in the system and assign them different access levels to the system, e.g. the administrator is able to create a new lecture user and assign them courses to handle. The administrator is also able to approve or reject payments done by first time students or returning students through the online registration system. Furthermore, the administrator is able to upload new study materials for students and also assign courses to students. The administrator is also able to view the activities that each user did in the system by using the systems log tracking. The administrator has the highest level of power in the student information system. The figure below depicts some of the functions that the administrator can do in the system.

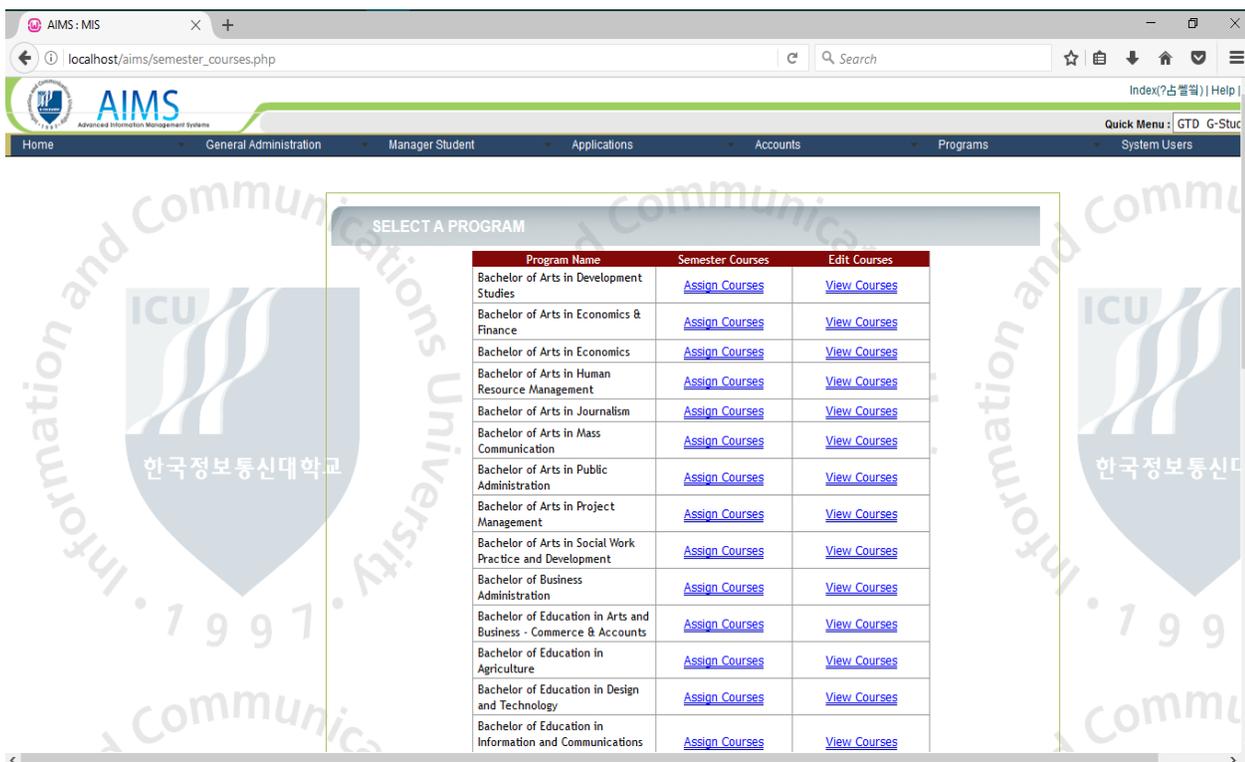


Figure 3: Administrator Assigning Program Semester Course Page

The administrator has the power to send short text messages to different kinds of users in the system. The system has enables the administrator to send short messages to either all users, a single student, all students, all lecturers or single lecturer. The administrator is able to choose to whom he wants to send the short text message to.

3.5.1 Student

The student is of center focus in this system, because in every university student plays the most important role. A student is only able to access part of the AIMS system that pertain to students. Some of the modules that a student is able to have access to include My Course Materials, My Results, My Payments, School Register, General Download and Student Details. My Course Materials module enables students to access their semester study materials. From this module, students are able to download study material, assignments, course outline, projects and answer online quiz questions. Furthermore, using this module, students are able to submit their answered assignments and project to the system. The other module that students are able to access is My Results. This module enables students to easily have access to their exams results online. The My Payments module helps students to easily make online registration. Students can easily submit their deposited slips to the university by simply using this module. The administrator can then accept or reject the submitted slip depending on the requirement. When the payment is accepted, the student can check their payment history using the My Payment module. The School Register is another module that students have access to. This module enables students to register for end of semester exams. This makes it easy for the examinations department to grade and publish results. The General Downloads module gives students access to files and notices that the university wants students to know about e.g. past papers. The Students Details module enables students to view their biological information. Additionally, the system also enables students to view and send messages to different departments and to their fellow students.

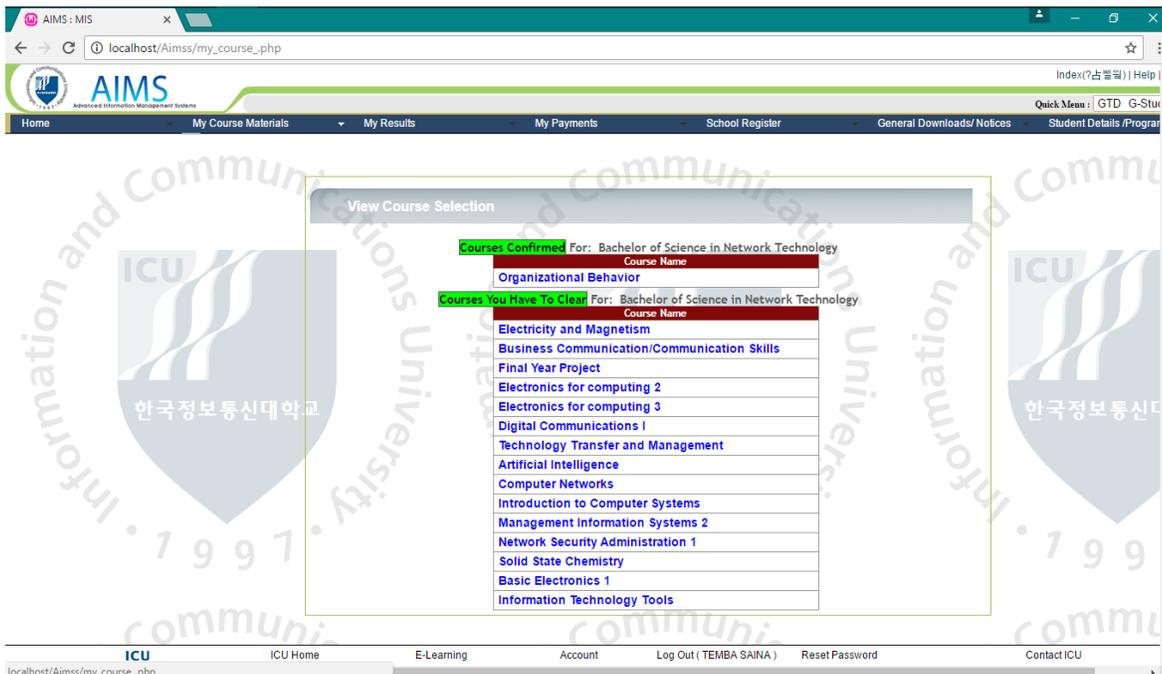


Figure 4: Student Assigned Semester Courses Page

3.5.2 Lecturers

Lecturers are the other kind of users that are able to access the AIMS system. These users are able to view part of the system that only pertain to the kind of work they do. Some of the modules that lecturers are able to access include Upload Material, Notice Board and General Downloads. The Upload Materials module enables lecturers to have access to courses that have been assigned to them. From this module a lecturer is able to upload study materials, course outline, assignment questions, projects questions and quiz questions for students.

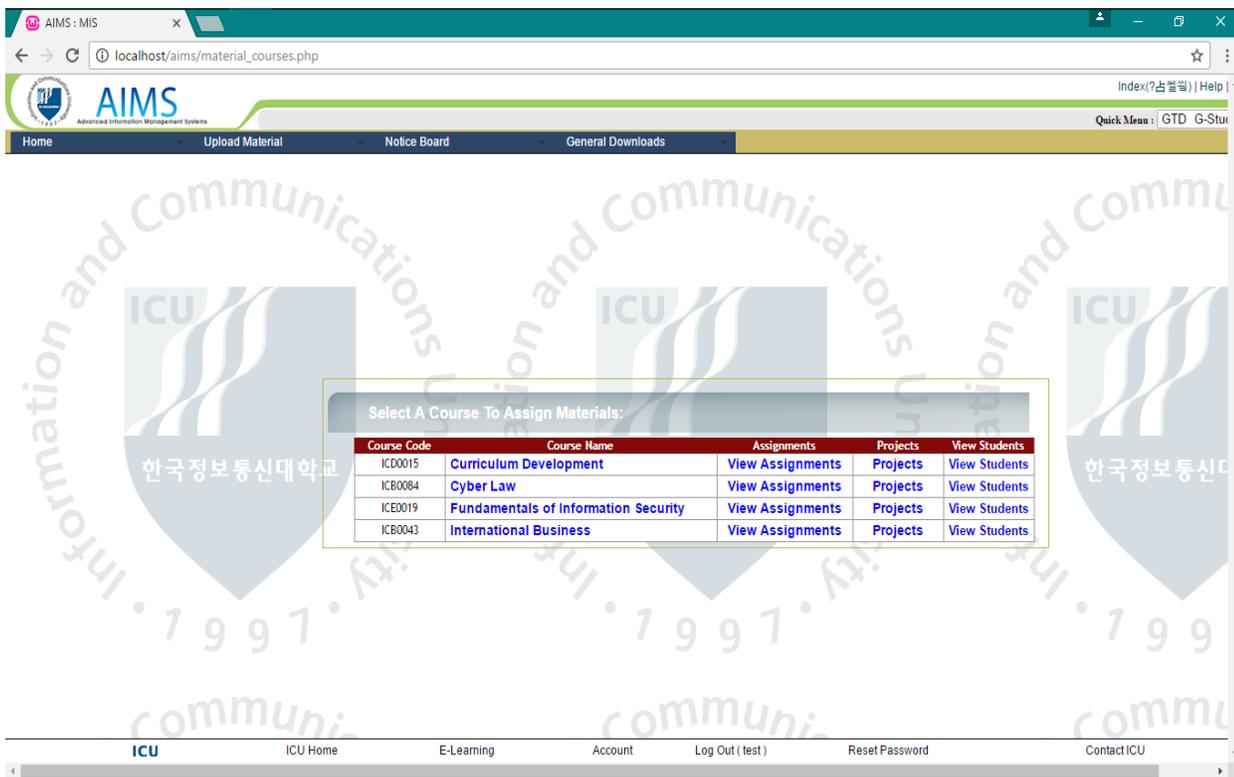


Figure 5: Lecturers Assigned Courses Page

Additionally, a lecturer is able to access assignments and projects that have been submitted by students. A lecturer can just download the submitted assignments or projects and review them then give a grade in the system under the Upload Materials module. The other module that a lecturer is able to access is the Notice Board module that gives notices to the system users. The lecturer is able to send and receive message through their account.

3.5.3 Examination

The examinations department is able to access the system in order to handle examinations related issues. Users from the examinations department are able to login into the system and modify student's results. Some of the modules that the examinations department is able to access include General Administration, Manage Students, Applications and Programs. The Manage Students module is the one that enables the examinations department to enter new examination results or update old examination results in the system. This module has another level of authentication. It requires anyone trying modify results in the system to have clearance from the head of department. This level of authentication prevents users from changing results in the system anyhow. Under the Applications module, the examinations department is able to view the statistics of the number of people that have registered for the upcoming examinations. These statistics can be used to know the number of students that will be writing and prepare adequately. Furthermore, from the registered students an excel sheet can be generated that can be used to record the results of each student that registered for the exam. This excel sheet can be used to enter the graded results into the system by simply uploading the excel sheet of each course. This makes the uploading of results fast and efficient.

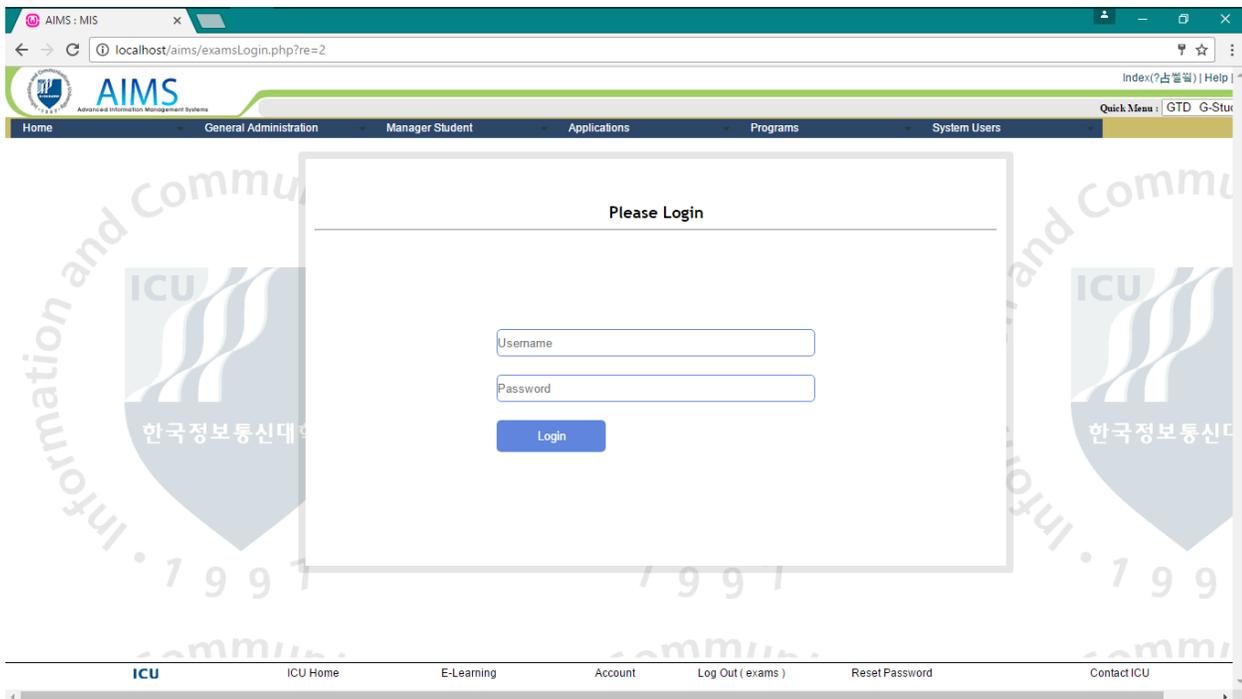


Figure 6: Examination Authentication Page

3.5.4 Accounts (Payments)

The accounts department deals with the payment slips that have been sent by students. The department has to authenticate the deposit slips sent by students. The department can use the system to monitor which students have sent their deposit slip and authenticate the deposit slips. If the deposit slips are genuine, the department will approve the payment and the payment will reflect in the students account immediately. If the payment is not genuine the accounts department will reject the payment and a text message will be sent to the student notifying them of the rejection. There are two main types of payment that the department is able to deal with. There are payments made by those that have not become full students at ICU (otherwise known as first time students) and those that are already full students at ICU (otherwise known as returning students). When a first-time student does online registration, the department will review the payment and either approve or reject the payment. Once the payment is approved, the students account is created and the login details are sent to the student through text message and email. The new students will be able to access his new account and download study materials.

Ref No	Names	Notes	Program	Amount	Date Updated	Uploaded Documents	Reject
ICU/6336/2015		APPLICATION FEES REF NO 14581427505607 AND FEES PART PAYMENT REF NO: 14592421179263	Master in Project Planning Management	1050	29 Mar 2016	No File Uploaded	<input type="checkbox"/> Register Student
ICU/9113/2015	reg		Bachelor of Education in Information and Communications Technology	1200	29 Mar 2016	No File Uploaded	<input type="checkbox"/> Register Student
ICU/11446/2016		PAYMENT FOR TUITION, REGISTRATION, RESIDENTIAL ATTENDANCE, EXAMINATION FEE AND EXAMINATION CENTRE FEE	Master of Education	2700	29 Mar 2016	No File Uploaded	<input type="checkbox"/> Register Student
ICU/12206/2016		For Registration, Residential, Examination fee and Tuition fee.	Master of Education	2700	29 Mar 2016	No File Uploaded	<input type="checkbox"/> Register Student
ICU/6968/2015		Registration fee and Examination fee	Bachelor of Science in Information and Communications Technology	700	30 Mar 2016	No File Uploaded	<input type="checkbox"/> Register Student
ICU/12262/2016		REGISTRATION FEES AND EXAMINATION CENTRE	Bachelor of Arts in Human Resource Management	700	30 Mar 2016	No File Uploaded	<input type="checkbox"/> Register Student
ICU/12358/2016		Tuition Fees Residential Fees Exam Fees	Bachelor of Education in Information and Communications Technology	1200	31 Mar 2016	No File Uploaded	<input type="checkbox"/> Register Student
		Registration Fee K500 Residential			31 Mar		

Figure 7: Accounts Pending Payments Page

4. Results and Evaluation

4.1 Results

A web based fully automated advanced information management system intended to track and store student records is the outcome of the project after a critical analysis, design, building and testing of the system. Evaluation was properly done to ensure that the system meets all the requirements and specifications.

4.2 Evaluation

To ensure that the new system produced desired results, the prototype was subjected to functional requirements tests to ensure that the program code executed correctly (unit testing) and also functional testing to ensure that the program produced desired results.

User acceptance test is another part of the evaluation plan. Since the potential users of the system will be both students and staff, evaluation was done from both sides. Their perception of the system is extremely crucial to whether they will use the system or not. Therefore, students, management and lecturers from ICU were chosen to help in evaluating the system requirement and architecture.

All of them are very happy to see the system developed and running. Web-based system interface is very desirable among the students, management and lecturers. Lecturers and management are more interested in the student management module and electronic coursework schedule and submission of assignments. The accounts department are very happy with the system because it makes their job easy by keeping track of the payments made by students. The exams department is also very happy with the system because it helps with the way the department handles and updates students' results.

5. Conclusion

In conclusion, the objectives for this project were achieved and functioned well as the desired target. This system will help the Student Information System database works systematically and will make ease the user in order to manage all the student data in the system. This system will give a better performance in arranging the lecturer and student information without having to do it manually. Furthermore, it will allow the lecturer to focus on other important tasks in the Faculty. As the future recommendation, the project is recommended to be built with the fully functional software that fulfills all the criteria needed and also applied with more complicated algorithm to the system.

Information is an indispensable tool many universities use to advance decision making. Large amount of student's data is generated either manually or electronically on a daily basis. When the population of

students in a school is less than a hundred, the manual system can work perfectly but it is not the best method of managing records of students. The manual and disintegrated electronic systems have numerous disadvantages because these methods of capturing and managing data about students are prone to data inconsistency, data redundancy, difficult to update and maintain, bad security, difficult to impose constraint on various data file and difficult to backup.

An advanced information management system provides prudent solutions to address problems associated with manual systems. In order to assess the performance of the school and students overtime, there is the need to use past records of students without any missing data. The integrated student database system which captures and maintains longitudinal data of students would provide an accurate and reliable data about current and past students.

The system is free of errors and very efficient and less time consuming due to the care taken to develop it. All the phases of software development cycle are employed and it is worthwhile to state that the system is very robust. Provision is made for future development in the system.

Acknowledgement

The successful completion of this work of thinking, researching, writing and coding would not have been possible without the infinite mercies of God Almighty. To Him I give all the glory. I also acknowledge my able supervisor. DR R. Silumbe for his encouragements and advise towards the achievement of this work.

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