Implementation of an Enhanced Dynamically Adapted Students' Admission System

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Abstract

The design and implementation of computerized dynamic students' admission system is aimed at realizing an efficient and accurate computation of students' results. It saves the school the embarrassment caused by students complaints at the end of working day. These complaints arise from the problems discovered in the manual registration system which not only include inefficiency, inaccuracy, time consumption and inconveniency but labourious and sluggish. These problems are as result of lack of fund and expertise being faced by most private and indigenous universities in some developing parts of the world, ill-management policy to reduce cost and frequent ethno-religious challenges within the Kwararafa University environment as a case study. These problems occasioned the dynamic computerization of the manual system which was achieved in this research in order to solve these problems associated with it owing to the uniqueness of the university as the case study. Adaptation of enhanced RC6 cryptosystem also help to fight against insecurity been faced in so many automated admission systems that exist in other higher institutions. Rapid Application Development (RAD) methodology was used which helped not only in carrying the client along with its concept of Joint Application Development (JAD), but also in delivering a solution that meet the uniqueness of the university requirements within a reasonable time frame. The basic technological tools and features introduced to automate this dynamically enhance admission processing system is the designed problems solving algorithm using Visual C# Programming language on Microsoft .net platform. The result achieved showed a significant improvement over admission processing accuracy, efficiency, reduced administrative cost and timeliness, aims at alleviating the incidences of academic admission lapses which is the bases of socio-economic progress in the history of so many universities in the world which may be facing the same challenges as Kwararafa University, Wukari.

Keywords: *Computerization, Admission, Data, Cryptosystem, Database*

INTRODUCTION

Education system in Nigeria was fundamentally divided into three as of 1990 such as the indigenous system, Quranic schools, and formal European-style education institutions. The missionaries introduced the Western-style education in Nigeria in the mid-nineteenth century. An education department was founded in 1887 in southern Nigeria, which kicked off the development of curricula requirements and administered grants to the mission societies. There were fifty-nine government and ninety-one mission primary schools in the south; all eleven secondary schools, except for King's College in Lagos, were run by the missions during the amalgamation of north and south into one colony in 1914 (Olu, 1994).

The western-style education system focused strongly on examinations. The first governor of the unified colony, Frederick Lugard in 1916 set up a school inspectorate, discipline, buildings, and device a means of ascertaining the qualities of teaching staff, but the basic measure used then to rank and accredit schools was by population and examination results. These measures of evaluation holds through 1990 for graduating students to be gainfully employed both in government and private establishments (Agi, 2013).

For the fact that results still stands as the most vital information or data in all higher institutions today, there is need to employ sophisticated measures for both processing and storage. These information are available in a variety of formats and media and in a variety of locations, hence, the need to manage these information/data efficiently becomes more and more critical. Staff, students and public users want access to these stored information in a more easy and efficient manner which necessitate the need to build university policy to improve both the efficiency and effectiveness of course registration and result

processing operations and services through the implementation of an integrated automated database System to support adaptable student admission system especially for rural established school (Olu, 1994).

Owing to these facts, this research deemed it fit to move manual admission system to a more secured automated system. Computerized course registration and result processing system is usually implemented with a computer to attain the best proficiency and anticipated goals. The existing computerized education systems in higher institutions include these modules; course registration module, result processing module, curriculum module, fresh admission module, fees and other financial processing module, staff and facility management module, students' self-care module, alumni module, library module and other academic modules which when put together forms a university portal Chimezie (2000). University Portal is adapted software that puts the whole education business process together and makes them functional and accessible across the internet, giving access to all university stakeholders such as students, lecturers, administrators and parents (Chimezie, 2000). It also delivers other functionalities such as collaboration tools and advanced reporting engines. In spite of all these advancement; it still faces the greatest challenge of insecurity, hence the adaptation of enhanced RC6 cryptosystem in this research to address this security challenge.

LITERATURE REVIEW

The use of information and communication technology (ICT) in industries and institutions drastically enhanced the information need of organization which is achieved with the existence of system knowledge base. System in context here refers to computer system which is a reliable machine serving in different IT capacities. It is define by Funk (1980), as an electronic device that can perform a sequence of arithmetic and logical operations automatically at a high speed according to instructions given to it inform of a pre-arranged program.

Anigbogu (2000) in his own definition states that it is an electronic device that accepts data and instructions, process the data based on the instructions given to it and generate results in a more intelligent manner than any other mechanical machine known to mankind. Many fields or areas of endeavour such as clerical, technical, business, banking, medicine, education now adopt computers as useful tools. Hence, it is the life-wire of any information system and education system is not an exception and cannot survive without good management information system (MIS).

Clifton (1983) carried out an extensive research on the need and use of computer database system for computerization course registration system. Dimorji (2003) also in a research stated that the center of any information system is a database, as a collection of related information/data of particular entity. Dimorji also stated that database can also be seen as the ways in which information is catalogued, analyzed, stored and used manually. Clifton equally has the view that it is only computer system as a machine that can effectively handle candidates' records in tertiary institutions due its population. He stated that the Oxford University has more than ninety- six thousand student's records, which will be very difficult to handle the details of these records manually. The computer is the most possible application to retain an unlimited number of records with the utmost current updating possibilities. Eloba (1998), in his own ascertained this fact, the research states that when a department has over a thousand candidates, during admission period, and among all that 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.

Ukem and Onoyom (2011), in their research totally discredits the use of manual admission system and strongly recommend the automation of university admission system by carefully examining past and present experiences of the existing manual system. They state that knowing fully well how the university program is being run (manually), studying the past and present experiences energizes the idea of computerization of the board or the program.

Kling and Suzanne (1988) also 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. Among all these literatures reviewed lacks adequate security measures. Also, among all existing automated admission system reviewed, most of them are using weak password and none is using a sophisticated security measure considering the rate at which cybercrime is increasing.

RESEARCH METHODOLOGY

Rapid Application Development (RAD) methodology which is an internationally acceptable software engineering methodology was used which helped not only in carrying the client along with its concept of Joint Application Development (JAD), it is also exceptional in terms of analysis and design of information systems. RAD method involves the application of a sequence of analysis, documentation and design tasks concerned with analysis of the current system, logical data design, logical process design etc;

Data Collection

A detailed examination of manual system in kwararafa university was carried out which provided an insight to the existing data. A feasibility study was also carried out to look at the functional requirement of the present system and a cost-benefit analysis was equally carried out to ascertain whether the benefits of the new system achieved worth the cost. In the investigation proper, several methods of data collection were employed which includes interviewing of office representatives such as lecturers, heads of departments and faculty officers, existing course registration and other manual forms were inspected and evaluated, direct observation of the entire manual system were made. These methods were embraced to certify the soundness of data obtained and significance of the result after processing the data. The vital need for interview is to have direct data/information from source and on time. The interactive nature of an interview creates an opportunity to ask ambiguous questions and obtain detailed data/information. The volume of work carried out manually, the manual course registration processing and the school filling system were carefully observed.

Analysis of the Current System

A student undergoes some compulsory registration processes once admitted including course registration which is a manual system. This makes the system so tedious and time consuming. For a student to finish registration process, he/she must visit all the registration offices in order to sign his or her registration form which is the means to prove that the student has been registered. This process takes some months to be completed and the process is stressful to both staff and students.

File cabinet are used to keep registration forms and required a tedious manual file search operation to find a particular student detail or file each time it is needed. The results are processed and entered into the student's file for each semester examination which is also tedious.

The outcome of the analysis of the current manual system based on data/information acquired revealed the following:

- Students openly or secretly register more than stipulated credits units
- Delay in release of students' results which negatively affect students in term of courses to register next semester and carry-overs.
- Mode of course registration is not standardized.
- Manual filling of documents may lead to loss of important files.
- Insecurity due to unauthorized access to manual filling system by fraudulent staff.
- File processing and retrieval takes a lot of time.

SYSTEM SPECIFICATION AND DESIGN

The stage of system design and specification is very significant in software development as it create the opportunity to consider every technical factor in the system design. The system design must be in a way in which input and output specifications will have a close relationship and the general system design format must be acceptable to the end users.

Input Specification and Design

The input design is the link between the information system and the user. It includes development of specifications and procedures for data preparation and those steps that are necessary to put transaction data into a usable form for processing data entry. The activity of putting data into the computer for

processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling errors, avoiding delay, avoiding extra steps and keeping the process simple.

The system needs the data regarding the asset items, depreciation rates, asset transfer, physical verification for various validation, checking, calculation and report generation. The error raising method is also included in the software, which helps to raise error message while wrong entry of input is done. So in input design the following things are considered.

- What data should be given as input?
- How the data should be arranged or coded?
- Methods for preparing input validations and steps to follow when error occur

Student's registration form, course registration form, and examination score sheet are used to generate input to the new system. These forms contain relevant information concerning student personal and academic records. The inputs are processed to obtain the desired outputs.

Login System

Admin user will be the authorized user to modify, update and make selection of qualify applicant by viewing the lists of applicant that had registered for admission. He is the sole user to open and close the registration of applicant in the stipulated time given. The user will publish the successful applicants for admission in order for applicant to check and view the list.

Application System

The application process will be as straightforward as possible, using an intuitive form layout, with the necessary information being completed in stages. The system will monitor this and not allow a user to apply to a single Programme more than once.

Output Specification and Design

Computer output is the most important and direct information source to the user. Output design is a process that involves designing necessary outputs in the form of reports that should be given to the users according to the requirements. Efficient, intelligible output design should improve the system's relationship with the user and help in decision making. Since the reports are directly referred by the management for taking decisions and to draw conclusions, they must be designed with utmost care and the details in the reports must be simple, descriptive and clear to the user. So while designing output the following things are to be considered.

- Determine what information to present
- Arrange the presentation of information in an acceptable format
- Decide how to distribute the output to intended receipts.

Depending on the nature and future use of output required, they can be displayed on the monitor for immediate need or kept for later usage.

The inputs to system determine what will be generated as the output. The expected output must generate a meaningful report to the management which may be as softcopy or hardcopy. The following reports are generated:

- Students semester result
- Students session result
- Transcript
- Score Sheet
- General Register
- Students personal record

Database Design of the System

The overall objectives in the development of database technology has been to treat data as an organizational resource and as an integrated whole. Database Management System (DBMS) allow data to

be protected and organized separately from other resources. Database is an integrated collection of data. The most significant form of data as seen by the programmers is data as stored on the direct access storage devices. This is the difference between logical and physical data.
Database files are the key source of information into the system. It is the process of designing database files, which are the key source of information to the system. The files should be properly designed and planned for collection, accumulation, editing and retrieving the required information.
The organization of data in database aims to achieve three major objectives: -

- Data integration.
- Data integrity.
- Data independence.

The proposed system stores the information relevant for processing in the MYSQL SERVER database.

This database contains tables, where each table corresponds to one particular type of information. Each piece of information in table is called a field or column. A table also contains records, which is a set of fields. All records in a table have the same set of fields with different information. There are primary key fields that uniquely identify a record in a table. There are also fields that contain primary key from another table called foreign keys.

Table 1: Applicant details sample table (personal information)

FIELDNAME	DATATYPE	Field Properties (Size)
S/No	Integer	6
Jamb reg_no	Text	10
Jamb score	Integer	3
Surname	Text	15
First name	Text	15
Middle name	Text	15
State of Origin	Text	15
Gender	Text	6
Phone number	Integer	15
e-mail	Text	20
Faculty	Text	30
Department	Text	20
Programme	Text	15

Table 2: Administrator login table

FIELDNAME	DATATYPE	Field Properties (size)
Username	Text	10
Password	Text	8

Table 3: Change of an account sample table

FIELDNAME	DATATYPE	Field Properties (size)
Username	Text	10
Re-enter Username	Text	10
Password	Text	8
Re-enter Password	Text	8

IMPLEMENTATION OF THE SYSTEM

The new system was implemented using Visual C# programming language on Microsoft .net platform. The choice of this programming language and its development platform is due to its code portability, easy development with GUI support, flexibility and modularity.

System Flowchart

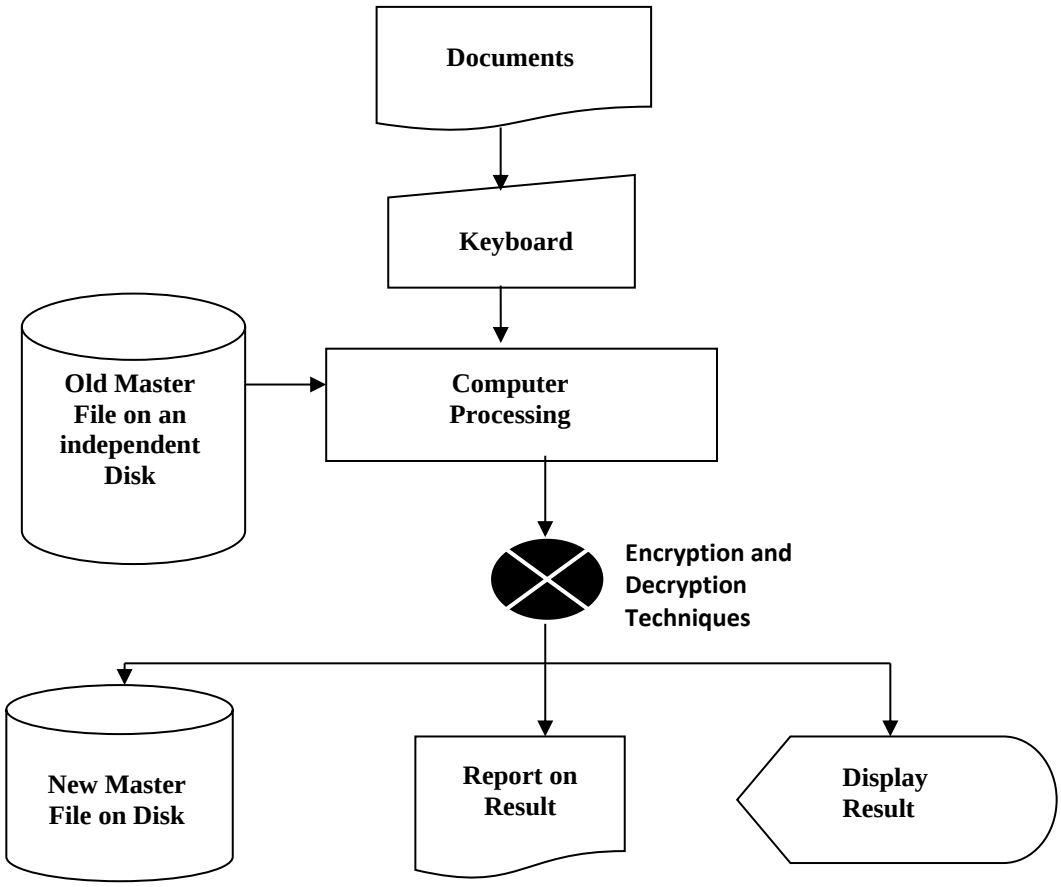

Fig 1: System Flowchart

The logical view of the flow chart in figure 1 indicates that all the data acquired from existing file on independent disk, new student registration, course registration and score entries are encrypted using into cypher text using the embedded cryptosystem and stored in database for further use. These encrypted data are retrieved and decrypted each time there is need for it using the encryption key such as during result computation, display or printing. The encryption and decryption windows are shown as figure2 and figure 3 respectively.

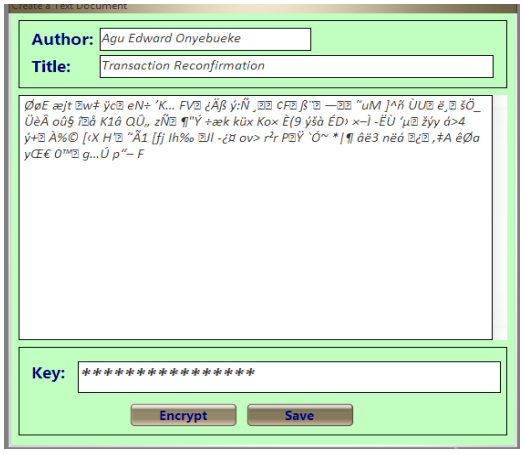

Figure 5: Encryption Window

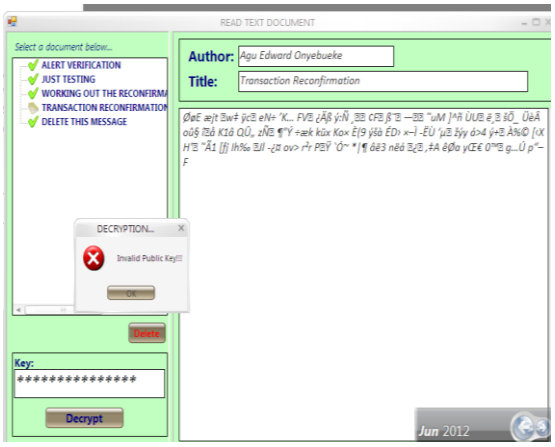

Figure 6: Decryption Window

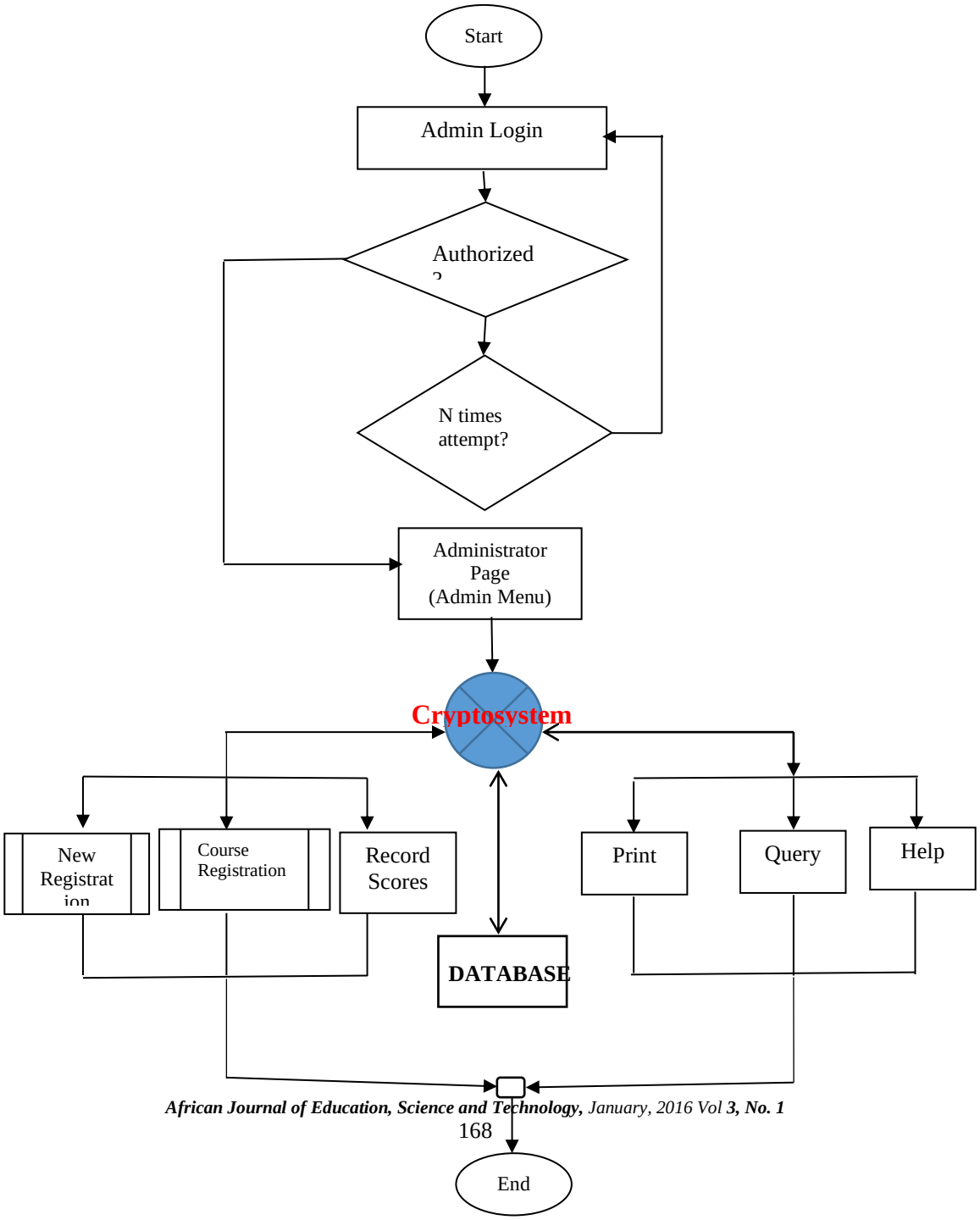

Fig 2: Logical flow chart of the automated system

Procedure Chart

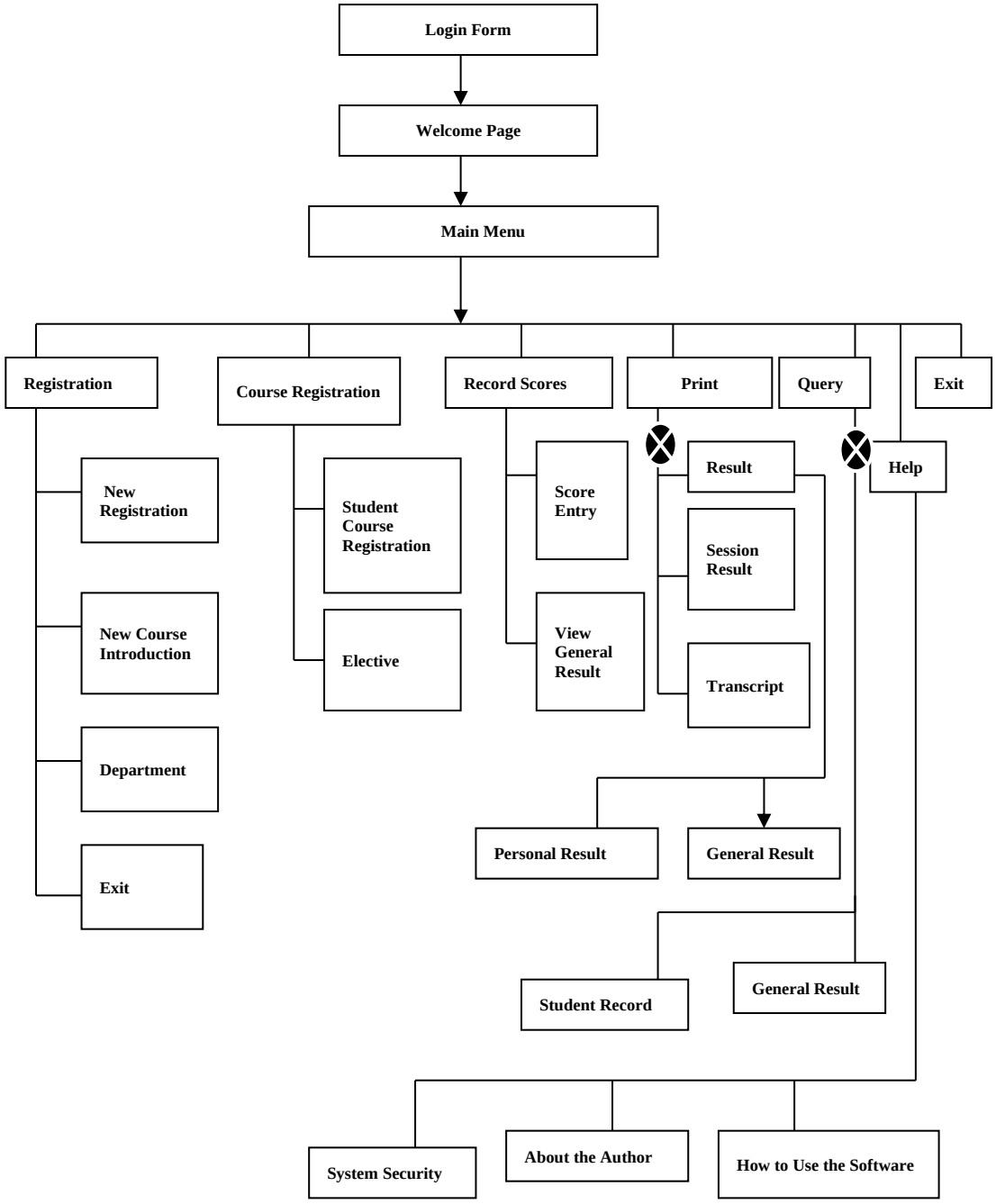

Fig 3: Top down Design of the Result Processing System

The Login

There is a security measure embedded on this login form which enables the user to enter his \ her password. If the password entered is valid, the software will then open the welcome page before showing the program menu. But if the password is not valid the user will be denied access to the program. This is the only security measure obtained in most existing automated admission systems, once bypassed; the system is at the mercy of the criminal.

The Welcome Page

This page presents the welcome information, the developers' information and some other necessary information relating to the software. It is shown as figure 7 in appendix.

The Main Menu

The main menu contains all the available commands and serves as a link to all other modules in the program. Click on the menu icon to access any of the menu command.

The Registration Menu

This menu contains the commands that are used for registering new students, new courses, and new departments. The admission form is shown as figure 8 in appendix.

Course Registration

This module helps students to register their courses and a printout of the courses registered appears on the screen at the end of the registration.

Record Score

This module helps in entering of students' score and computation of students' grade points using the scores.

Print

Print menu contains all the commands for printing results and transcripts; it is further secured with the enhanced encryption and decryption techniques.

Query

This menu is used for search operations; also it is further secured with the enhanced encryption and decryption techniques.

Help

The help menu is used for obtaining guideline on how to use the automated system. Some sensitive information with respect to system security is also encrypted and the admin has access to it.

ADAPTION OF ENHANCED RC6 CRYPTOSYSTEM

To enhance the security measure for securing the student admission system with respect to result information which is the life-wire of the institution, enhanced RC6 cryptosystem was developed and deployed to encrypt and decrypt all the result and other vital data and processed information to cipher text and back to plain text at both server and client or user side. The cryptosystem uses enhanced RC6 encryption and decryption algorithm together with private key to convert the result and other vital information to cipher text which are random sequence of notations, symbols, numbers, alphabets etc, as the results are sent over the university network to prevent interception by both student and other individuals with biased mind un-authoritatively (Rhee, 2003).

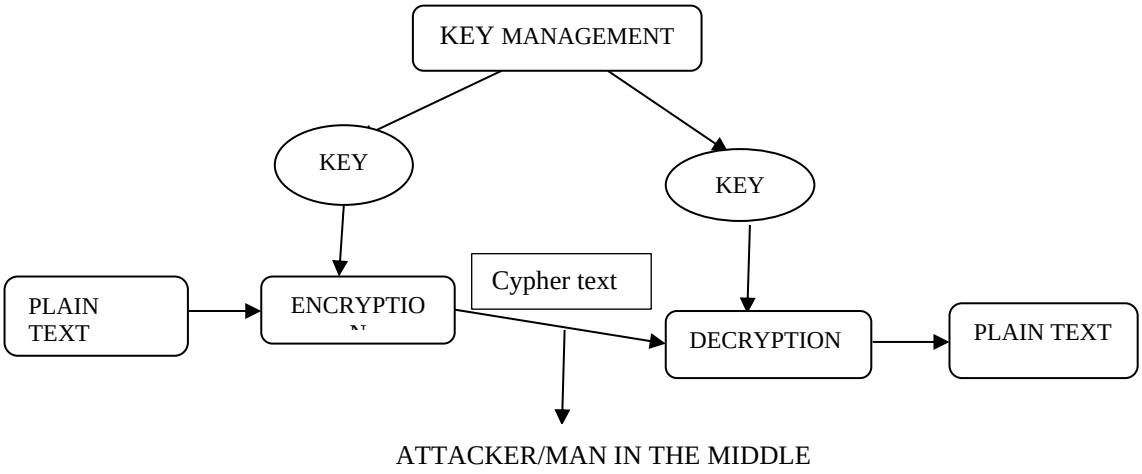

Figure 4: A schematic diagram of RC6 encryption and decryption system

The result is decrypted back to original plain text only by authorized individuals or university official. It is the only legitimate personnel who are in possession of the private key can decrypt the results. Hence, if any unauthorized individual, both student and staff intercepts the results. It will be very difficult for the person to decrypt the result which is in turn useless to him. Again, the transmission of result over the university network is embedded with a time stamp and if there is no response at the end of the duration, the attempt will be logged as illegitimate. The schematic diagram of the cryptosystem is shown in Figure 4.

DISCUSSION AND RESULT

This research work has help in a good number of ways to ease the delay in manual student admission and examination processing. The software developed will help schools management to achieve efficient information management system. Many other advantages achieved by this automated solution include:

- Provision of a reliable solution to result processing that is corruption free.
- Ensure that normal credit load in line with the school is maintained.
- Provision of a software that will generate result that is accurate, timely and error free.
- It saves time during examination processing
- Database for course registration and examination result is maintained
- Easy and fast information access and retrieval.
- Help in reducing the costs such as labour, inventory and stationary.
- Generation of accurate results/information on transactions is sure.

The two encryption and decryption subsystem were tested individually. The result of the unit testing complies to the set result. The two subsystems were integrated to form the main enhanced cryptosystem.

The method of testing used in this research include two major phases which satisfies verification and validation goals (V&V goals); verification certifies that the system obeys its specification which implies that the system should encrypt/decrypt the results as stated by enhanced RC6 algorithm; while validation certifies that the system does what the users expected of the system; that is encrypting the results to cipher text and decrypting it to plaintext or original result without loss of confidence.

Test Data

Key

"It is just coded"

Plaintext

CSC 201	56	C
CSC 203	72	A
CSC 205	32	F
CSC 207	40	F
GST 301	61	B
PHY 101	47	D

Cipher text

ØøE æjt w‡ ÿc□ eN÷ 'K… FV□ ¿Äß ý:Ñ ¸¢F ß¨—˜uM]^ñÙU□ë¸šÖ_ÜèÂoû§ îå K1â QÛ,, zÑ ¶"Ý ÷æk küx Ko× È(9 ýšà ÉD› ×–Ì -ËÙ 'µ žýy á>4 ý+□ À%© [‹X H' ˜Ã1 [fj Ih‰ Jl -¿¤ ov> r²r PŸ `Ó~ *|¶ âë3 nëá ¿ ,‡A êØa yŒ€ 0™g…Ú p"– F ØøE æjt w‡ ÿc• eN÷ 'K… FV• ¿Äß ý:Ñ ¸¢Fß¨—˜uM ]^ñ ÙU□ ë¸ šÖ_ ÜèÂ oû§ îå K1â QÛ,, zÑ¶"Ý ÷æk küx Ko× È(9 ýšà ÉD› ×–Ì -ËÙ 'µ žýy á>4 ý+□ À%© [‹X H' ˜Ã1 [fj Ih‰Jl -¿¤ ov> r²r PŸ `Ó~ *|¶ âë3 nëá ¿ ,‡A êØa yŒ€ 0™g…Ú p"– F

Comparing the Two Results:

From expected result/test case and actual test result, it was observed that the test data that is fed into the system for processing is the same as the result obtained after the encryption and decryption process, hence validation goal is achieved.

CONCLUSION

This research started with the manual system of operations as regards the problems identified, stating the aims of the new system, stating the various specifications and then implementing the proposed automated system. The work was successufully developed using visual C# on Microsoft .net platform, and the package was tested and improved upon which yields an automated course registration, examination processing and transcript processing system.

The enhancement of this automated admission system which distinguished it from existing admission systems in various well established institutions is the adaptation of enhanced security measure using RC6 cryptosystem. Its benefits cannot be overemphasized. It has led to the improvement in the speed of processing operation, efficiency, accuracy and improved storage of data.

RECOMMENDATIONS

Frauds of deferent kind are on the increase in higher institutions' admission system and need to be controlled with more sophisticated security measures beyond ordinary password. Hence, there is need to research other automated security platform to be deployed.

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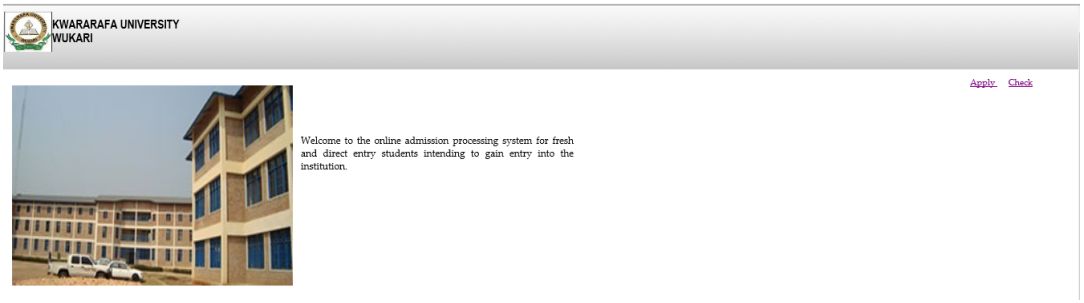

Figure 7: Welcome Page

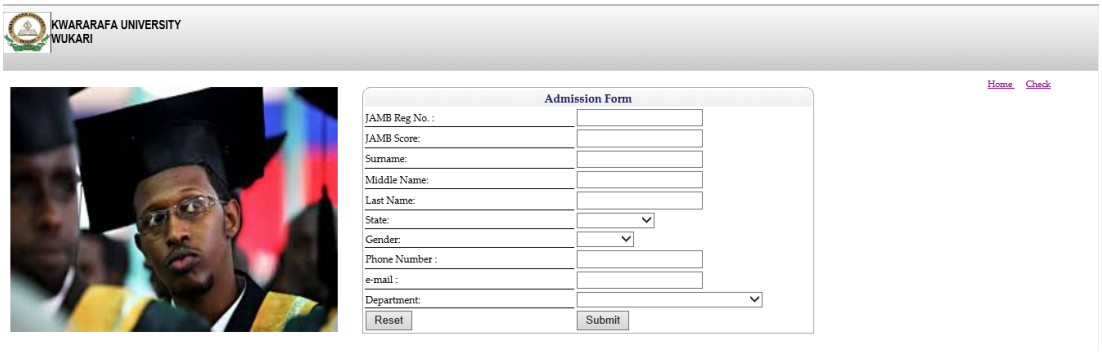

Figure 8: Admission Form