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ANALYSIS AND DESIGN OF E-MANAGEMENT SYSTEM IN NIGERIAN AVIATION WITH OBJECT ORIENTED METHODOLOGY.

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ABSTRACT

E-management system for Nigerian Civil Aviation Authority is a thesis designed to enable electronic information system that will aid Nigerian Civil Aviation Authority and flight customers to obtain firsthand information on flight schedule, turn-around maintenance and customers comments on their experience why flying with the airline. The existing document management in the Nigerian Civil Aviation Authority is partially automated and is faced with a lot of challenges which includes non-availability of airline maintenance schedule information electronically. Majority of the airlines operating in Nigeria has a website where customers can view flight schedule and probably book tickets online. They do not have provision to allow customers view flight maintenance records, customer's experiences and the purchase date of the plane. This keeps customers out of the required information that will allow them make decision on the airline to use.This paperaimed at designing and developing an e-management system for Nigerian aviation.To deal with this problem, a computerized system is needed. Methods used in analyzing and designing of the credit card fraud is Object Oriented Analysis (OOA) with unified modeling language (UML).

KEYWORDS: Customer, Object Oriented Methodology, UML, Aviation Information

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INTRODUCTION

The mission of the Nigerian Civil Aviation Authority (NCAA) is; to provide aviation safety and economic regulatory services in the most efficient, effective, quality and technology – driven manner, to the satisfaction and benefit of all stakeholders, consistent with the highest international standards and the sustainable development of the industry and national economy.

With E-registration and e-management system, organization information could easily be managed while also providing added bonuses, with a main goal being to ease the transfer of information. The management system requires a tremendous amount of data and documentation, and this e-registration solution allows institutions to focus less on processing paperwork and more on what matters most meeting the information needs of their clients by having a cost-efficient, secure registration process that allows for easy access to files.

Review of related works

[1] Proposed an implementation of a general Airline Ticketing website like Orbitz, which helps the customers to search the availability and prices of various airline tickets, along with the different packages available with the reservations. This project also covers various features like online registration of the users, modifying the details of the website by the management staff or administrator of the website, by adding, deleting or modifying the customer details, flights or packages information. In general, this website would be designed to perform like any other airline ticketing website available online. The Airline Reservation System project uses the .NET framework 1.1 and is completely independent. The project itself is a bigger product and does not need to be introduced into a larger system. The application runs on a Windows XP/2000 Operating system. The Airline Reservation System has the following features: One is the customer or the end user and the other is the administrator of the website. Some of the major functions of the product can be categorized under two different categories that are for the administrator and the user [1]. As can be seen in this study, the Airline Reservation System is related to our thesis but they implemented the system specifically for airline reservation while our thesis will cover both airline reservation and aviation information management.

Online Airline Ticketing System

The research describes the evolution and working of airline reservation system. Various aspects related to online flight booking are explained in the thesis. The main focus of the thesis was developing a working application. A basic application similar to the models used by airlines companies today was developed with the use of

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various software and programs. In the application developed, the users can easily purchase an e-ticket by going to the ticket sale website, searching and selecting the destination, entering the details such as name, way of travel, luggage information and dates and finally making the payment via bank cards, bank transfer or through online payment companies. The e-ticket is then emailed or texted on the telephone of the customer. While previously travel agents and airlines assisted customers in making ticket purchases, today with the improved internet system, it is getting easier and easier to book the flights on your own. After the customer makes the purchase, the electronic record and the details of the ticket are saved into airline's database. The database is integrated with the passenger service system, which is then connected to the airports, airlines, travel agencies for sharing real time information [2].

The web-based ticket system uses client/server architecture. In client/server computing model, a server hosts, provides and manages the resources and services made for the client. This kind of model usually has more than one client computers connected to central server over internet connection. All requests and services are delivered over the network in this model and the system shares resources. The internet itself is also based on this architecture [3].

In online ticket booking model, a client can use a web browser to access the website and book online tickets. It is very easy to make the booking as the system is user-friendly. The user does not have to worry about the operating system either as the web page is supported in all popular browsers on all platforms. For the server, Django server is used in the application. Most of the code is written in Python as Django platform is used. At the flight search query, when the user searches preferred choices, the web server searches the database for similarities and returns the result in user-readable form. After the customer books the selection and the payment is verified, the data of client is saved to the company's database. Depending on the selection, users are sent an e-ticket or SMS confirmation. In the sample application created for this thesis, users are simply sent the e-ticket to their email address after booking.

The main functionality of the application lies in the page called ''Flight Search" where the user can make flight bookings. The layout is very simple: user can select the place of origin and place of destination along with the preferred date of departure. There is option to check the box for one way flight or enter the return date for two way flight. The user also has to specify the number of adult tickets and/or child and infant tickets. All the fields except one way checkbox, children and infant ticket are mandatory. Online flight booking system as developed by this research has its own set of limitations as well. Prospective clients in parts of the world where the internet connection speed and availability is poor may find it hard to access the website of flight companies and book tickets. In much of the less developed part of the world, besides internet connectivity, the limited knowledge and access to technology can also hinder the chances of using this service. As a result, many people in the developing world still use the traditional method of purchasing tickets from the offices of travel agents. Machine failures such as lost connection or unresponsive program can sometimes also cause the disappearance of all the flight itinerary. Furthermore, the customer might not be able to get correct or enough information from the website alone as it is not done face to face with a person who knows everything about the connections, offers and company policies. Then there is also the issue of security: it is sometimes possible that somebody can steal your credit card information and use it for online ticket booking. Also the limitation of this system is that it functions as a separate entity for Airline Company and was not integrated for all airline operators while our thesis will maintain an integrated database system for Nigeria civil aviation authority.

Methodology Adopted

Object-oriented analysis and design methodology (OOADM) was adopted in this research, and it is a set of standards for system analysis and application design. It uses a formal methodical approach to the analysis and design of information system. Object-oriented design (OOD) elaborates the analysis models to produce implementation specifications.

The OOADM approach is motivated by the kind of system we desire to develop. We desire to build a usable and evolvable application. The very nature of the proposed system, in which navigation is combined with the inherent difficulties of dealing with multimedia data, needs an OOADM approach. The interface of Web apps is more complex than in traditional software systems, navigation and functionality should be seamlessly integrated and the navigational structure should be decoupled from the domain model of the app, therefore OOADM was chosen for its functionalities, in that it allows object oriented abstractions for analysis and design of information-intensive web applications. Besides the modeling abstractions, it also provides a methodology which guides a developer through different activities in the web application development.

Analysis of the New System

The e-management system for Nigeria Civil Aviation Authority uses client/server architecture. In client/server computing model, a server hosts, provides and manages the resources and services made for the client. This kind of model usually has more than one client computers connected to central server over internet connection. All requests and services are delivered over the network in this model and the system shares resources.

In proposed system, a client can use a web browser to access the website and book online tickets, make complaint and view flight schedules. It is very easy to make the booking as the system is user-friendly. The user does not have to worry about the operating system either as the web page is supported in all popular browsers on all platforms. For the server, apache server is used in the application. Most of the code is written in PHP and java scrip as Dreamweaver platform is used. At the flight search query, when the user searches preferred choices, the web server searches the database for similarities and returns the result in user-readable form.

The new system was divided into a set of modules, each responsible for its own unique function.

The system solution was provided by tightly integrating the modules, providing the following functions: First is communications and database access, including provisions for terminal emulation, system initialization, and recovery. Second is daily plan generation and maintenance. This module controls the startup and initialization of the knowledge base, the parsing of the data into structures, the update mechanism, and the initial generation of the aircraft normal routings and maintenance scheduling. A mechanism was built that allowed a large data source to be retrieved from the host system and maintained on the local machine. Two special transactions were written in the transaction-processing facility that allowed a calling application to request flight-specific or aircraft-specific data from the host transaction-processing system. The new system sends a request to receive the initial flight- and aircraft-specific data downloaded during system initialization. It then periodically sends a request with a time stamp to receive all data that have changed since the last update. The user interface was designed and built to be reliable, interactive, and user friendly. The data displayed on the screen are automatically. The system records airline registration information, airline maintenance scheduling, and flight schedule and customer complaints. The users are presented with the information on overlaying tables that were specifically designed to optimize the amount of data shown but maintain the related tables that are required for simultaneous display. The users can modify several of the tables to obtain information about the fleet in multiple ways, allowing the user maximum utility from the displays. The users can submit feedback to the system on their experience in their flight.

Each aircraft within the fleet has requirements for scheduled and unscheduled (routine and non-routine) maintenance and is assigned to fly a particular set of routes. It is the responsibility of the Maintenance Operations Center controller to make certain that all maintenance requirements for each aircraft are met, making changes to the routing of the aircraft if necessary. This task requires the ability to generate aircraft routings in a rapidly changing, dynamic environment. The new system maintains a list of aircraft that need planning for maintenance, which is displayed to the controllers through the user interface. From this list, the controller selects an aircraft to plan.

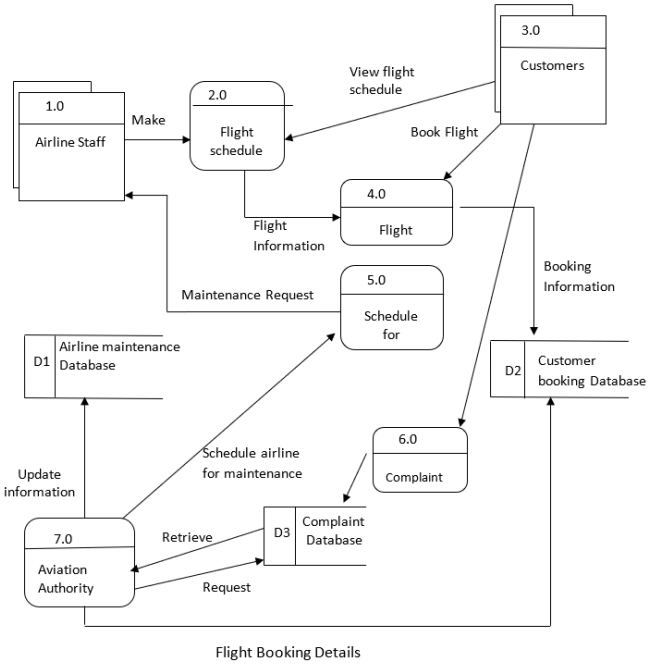

Figure1: Data flow Diagram of the New System

Object Diagram

Sequence Diagram

The sequence diagram in figure 2 shows how objects interact with one another and in what order. It depicts the objects and classes involved in the scenario.

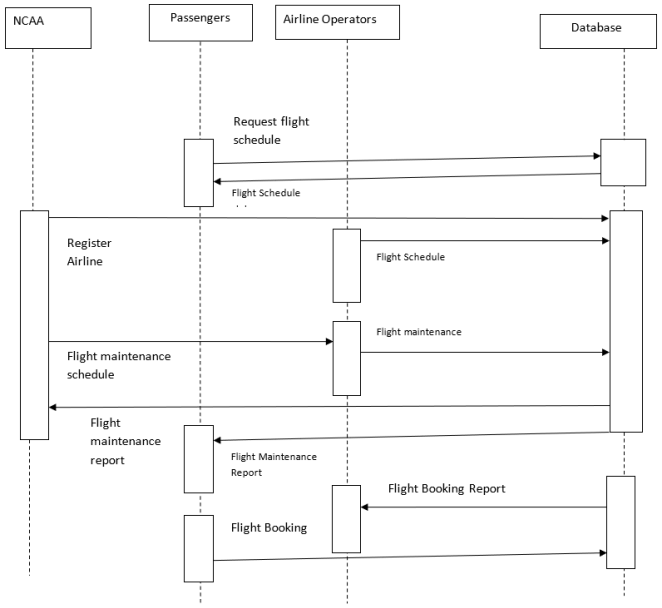

Figure 2: Sequence diagram of the new system

State Diagram

Fig 3 shows the various state that lead to e-management of aviation operations by NCAA.

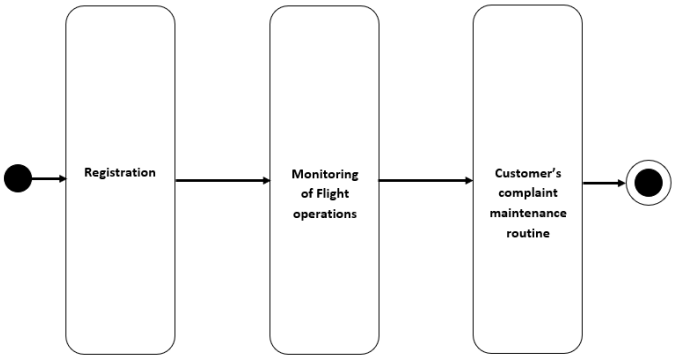

Figure 3: State Diagram

Class Diagram

Figure 4 shows the class diagram of the proposed system. Class diagrams are one of the most useful types of diagrams in UML as they clearly map out the structure of a particular system by modeling its classes, attributes, operations, and relationships between objects. The standard class diagram is composed of three sections:

- **Upper section:** Contains the name of the class. This section is always required, whether you are talking about the classifier or an object.
- **Middle section:** Contains the attributes of the class. Use this section to describe the qualities of the class. This is only required when describing a specific instance of a class.
- Bottom section: Includes class operations (methods). Displayed in list format, each operation takes up its own line. The operations describe how a class interacts with data.

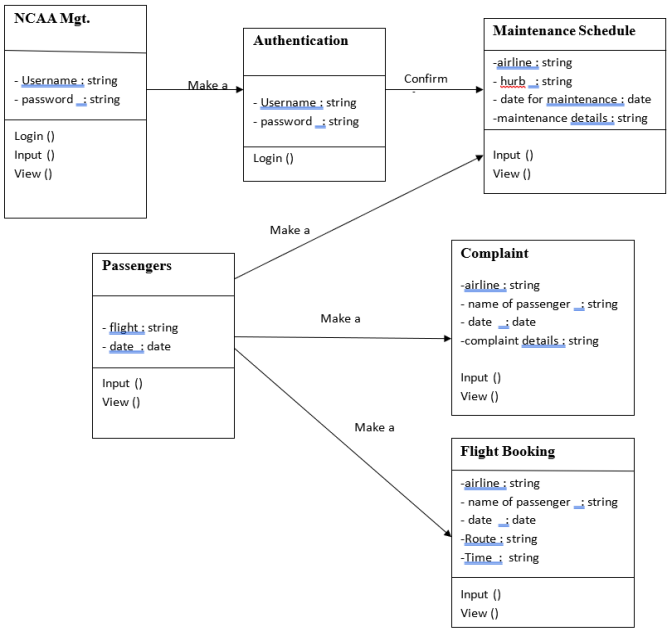

Figure 4: Class diagram of the proposed system

Collaboration Diagram

Figure 5 shows the various information that is needed at each stage of the e-management system for Nigeria Civil Aviation Authority.

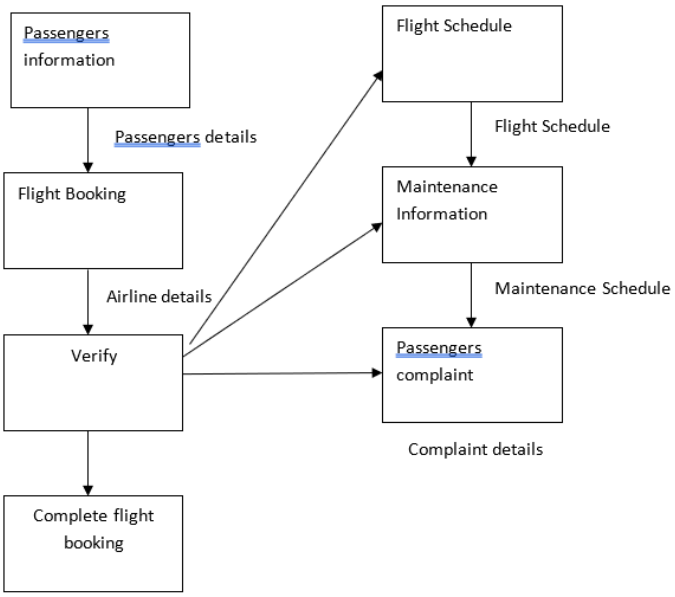

Figure 5: Collaboration Diagram of the proposed system

Activity Diagram

Figure 6 shows the various processes that lead to e-management of aviation operations by NCAA. It starts with airline registration, monitoring of flight operations, customers complaint, maintenance routines, and enable NCAA to decide when to suspend an airline.

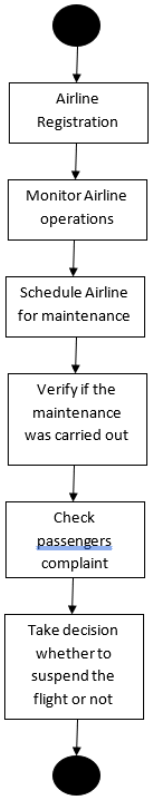

Fig. 6: Activity Diagram of e-management system

Event Package Diagram

The event package diagram as shown in figure 7 shows the various stages of events in the process of e-management for Nigeria Civil Aviation Authority. It starts with entering the password which needs to be verified before completing the processes.

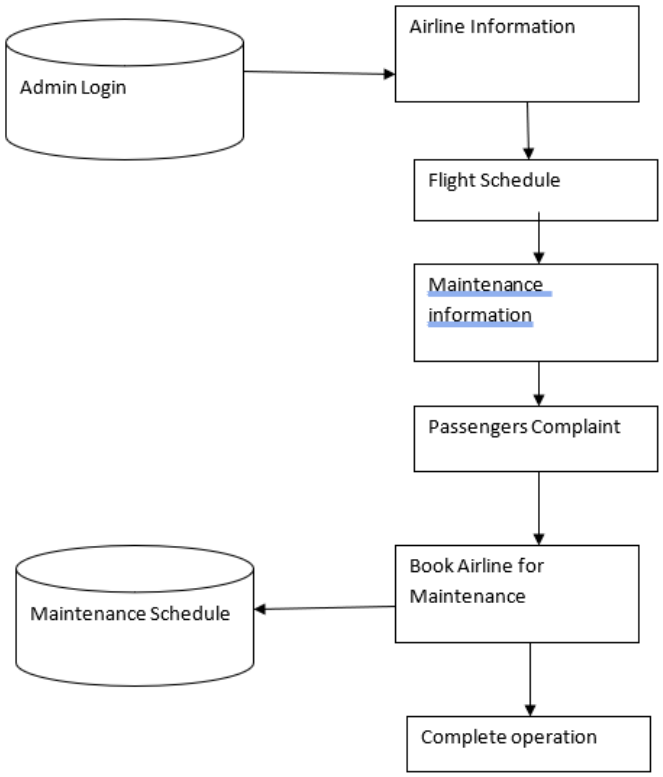

Figure 7: Event Package Diagram

Entity Relationship Diagram

Entity Relationship diagram is a specialized graphics that illustrate the interrelationship between entities in a database. Here diagrams always use symbols to represent different types of information.

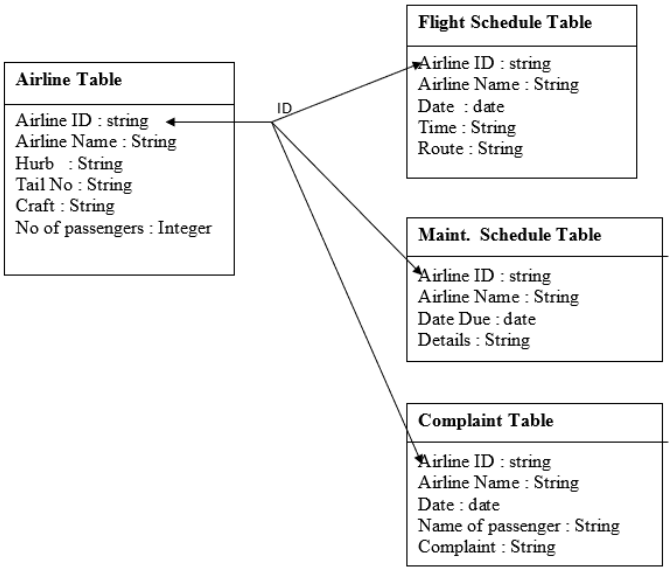

Figure 8: Database Entity Relationship Model

The Structure of the Display

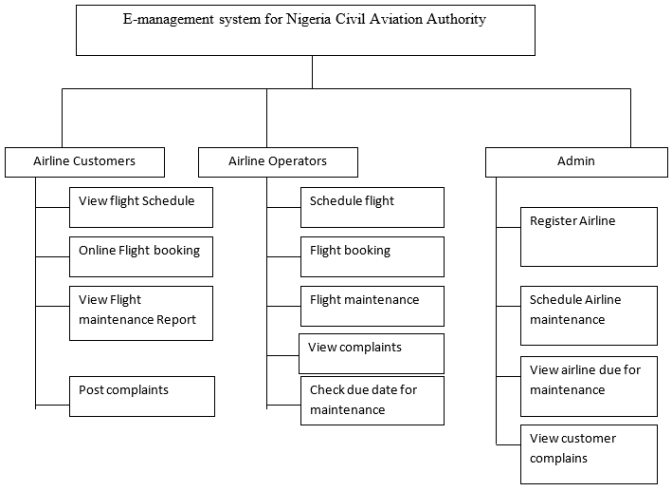

Figure 9: High Model of E-Management System

b. Draft Screen

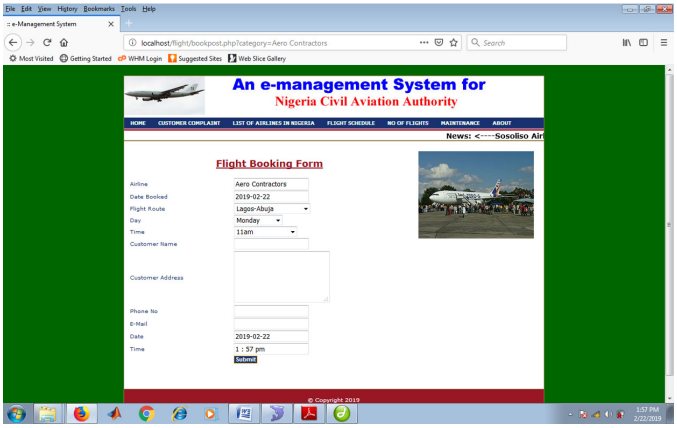

Figure 10 :Flight Booking Form

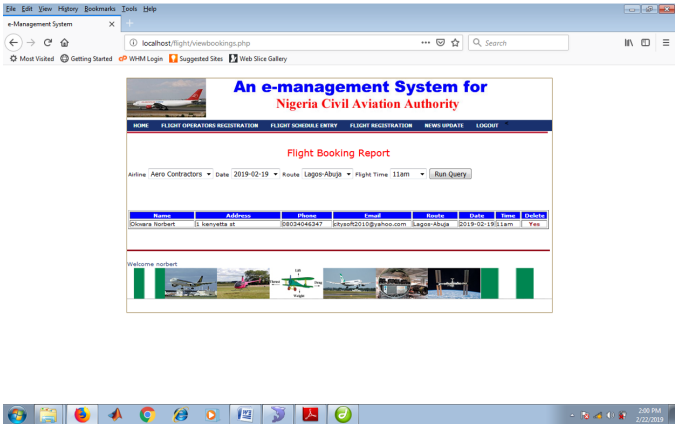

Figure 11: Flight Booking Report

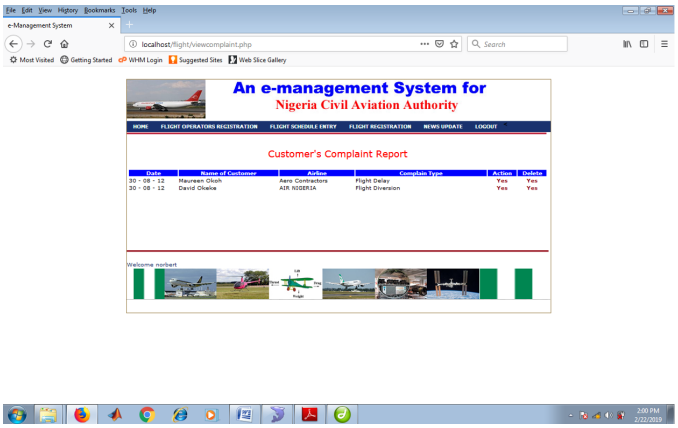

Figure 12 :Complain Report

Recommendations

For proper and effective deployment of the software developed in this research, it is recommended that:

1. There is need to provide hotspots for internet connectivity around the airports so as to enable customers connect to the website and post their comments
2. Proper Training should be conducted for staff of NCAA on Information Technology usage.
3. There is need for re-orientation of the staff on the need to adapt to electronic means of processing data.
4. Government should help and finance the procurement of the needed hardware to enable smooth deployment of the software.
5. A group should be set up to manage the software so as to carry out the maintenance operation when needed.

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