Integrated Health Care System Using Cloud Computing

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Abstract: The Web Based Hospital Management which is a system that automates the retrieval of patients file and also provides a platform for patient to meet the doctor online and communicate with the doctor. The system would ensure the proper keeping of information and the retrieval of patient's information very easy. The project commenced with the investigation of the existing to see the problem on one hand and then propose a solution to the problem. We further carried out a literature review to acquire more knowledge from peoples work, and this helped enhanced the development of the system.

Furthermore, we did the systems analysis and methodology of the system and after we had a clearer picture of the system which made it very easy for us to go into the system design and implementation.
The system is designed for in Nigerian national hospitals but can be used by any hospital. The emergence of this newly developed system will solve the shortcomings of the existing system and also reduce time and resources incurred while using the manual system.

Keywords: Cloud, Computing, Automate, Hospital and Health

1. INTRODUCTION

The way some hospitals in this part of the world manage and carry out some activities especially those that concern patient's, is such that it poses lots of stress and fatigue to both the patient and the staffs in the hospital. In some hospitals, the activities like registration of patient in hospital are done manually. We have experienced situation where a patients has to register twice just because of loss of file in the hospital. We see cases where a patient forgot his hospital number or in ability of patient to talk to the severity of the ailment and the staffs has to go through a lot of stress to be able to retrieve a file and also due to improper keeping of information it has led to the failure of knowing the drugs that the patient in allergic to and administering the drug that is not compatible with body of the patient may worsen the heath of the patients. The worst is that some patients in critical condition have lost

their life due to the long process of manually retrieving health history records (Case files) which would enable the doctor check past record to be able to detect the patients' problem and know the next action to take.

Also patients sometimes end up queuing up to see the doctor for minor cases there by worsening their health situation as a result of stress, wastage of time and fatigue to the patients and doctors. It also makes the documentation and retrieval of patient past information difficult, as well as waste time and resources. We also have problem with missing patient's files, inability of the current doctor attend to patients read the information in the file documented by the previous doctors. Akadiri et al (2009) confirmed that most sub Saharan African countries like Nigeria, have poor knowledge and utilization of ICT among their general populace.

Some patient find it very uncomfortable to interact with the doctors directly to give a full details of what is wrong with them due to humiliation and emotions that undergo in face to face setting, and as such the doctor will find it difficult to diagnose the ailment due to incomplete information given by the patient which will not aid in proper diagnosis and proper treatment of the patient. The reluctance of men to consult medical professionals and seek social support is amplified for prostate cancer sufferers, who at various stages in the course of the illness and its treatment might experience problems with sexual performance and continence resulting in a fear of humiliation, Hines, (1999).

However the rate at which technology is advancing and exploring all the opportunities information technology has provided, it is obvious that there is a light at the end of the tunnel. The Internet and other related technologies have change the way businesses operate and people work and how information systems support businesses, processes, decision making and competitive advantage, Bimal (2011). With the introduction of the computer System and information System, most of the activities we carry out today can be automated therefore, the process of registration of patient cannot be an exception.

As a result of the problems enumerated above, a hospital management system that incorporate biometric facilities for capturing and identification of patients, an online web application where patients can log in to meet the doctor and get remedial treatment for some critical ailment before going physically to the doctor will be developed to address the problems above. With this system in place, the records of patients can easily be retrieved using their biometrics even if the patient cannot remember his/her hospital number. Also patients can also get solution for common ailments online without passing through stress to see the doctor. Most importantly, this will reduce the death rate of patient.

2. REVIEW OF RELATED WORKS

Case Study One: Design and Implementation of Health Management System

Adegbenjo et al. (2012) opined that disease has been one of the humanity's greatest enemies. In the early years, most people were treated of illnesses by neighbors and friends in the confinement of their homes; which is costly both in energy usage, and the risk of damaging their bodies. This work aim at developing health management system capable of storing and retrieving the medical record of patients as well as diagnose, give health tips to patients and prescribe medication for five major diseases -Hepatitis, Malaria, Cholera, Tuberculosis and Typhoid. The system is to provide assistance to the human health expert in reaching logical conclusion about diagnosis of certain disease, and to create reference tool on the symptoms of the disease. This health management system comprises both management and expert system capable of diagnosing five major diseases and storing and retrieving the records of patients.

Meanwhile, Adegbenjo et al. (2012) listed three major problems associated with the conventional health care system which are:

1. Lack of immediate retrievals: It is very difficult to retrieve information .For instance, to find out about the patient's history, the user has to go through various registers.

2. Lack of immediate information storage: The information generated by various transactions takes time and efforts to be stored at right place.

3. Preparation of accurate and prompt reports: This becomes a difficult task since information needed may not be available as at when due.

These problems were considered using analysis and design and an expert system was developed. Expert systems have been found to be very useful in today's world driven by technology. When expert's knowledge is extracted and stored, such knowledge can be used to

replace the expert in case of demise. Medical field benefits greatly from expert system. Knowing that specialties in the medical field cannot satisfy all the population; the knowledge of such specialist can be replicated and made use of in times of extreme necessity. As changes in business occur, so do requirements, hence, the system has been developed in such a way that it can be modified to accommodate new requirements. Though, this system has been developed using BUTH as case study, any health organization can adopt it. This is because it is indisputable that the use of a computerized Health Management System would enhance the effectiveness, accuracy of the patient records held by the health organization. This software has been designed to diagnose only five types of diseases- malaria, tuberculosis, hepatitis and cholera, and the system is not capable of carrying out any examination(s) on the patients. Adegbenjo et al. (2012) suggested that further works can be carried out incorporating several diseases, not only this; the system can be extended to carry out examination on the patients.

Case Study Two: Design of a Hospital-Based Database System (A Case Study of BIRDEM)

Khan et al. (2010) opined that as technology advances, information in different organizations can no more be maintained manually. There is a growing need for the information to become computerized so that it can be suitably stored. This is where databases come into the picture. Databases are convenient storage systems which can store large amounts of data and together with application programs such as interfaces they can aid in faster retrieval of data. An initiative was taken to design a complete database system for a hospital management such as Bangladesh Institute of Research and rehabilitation in Diabetes, Endocrine and Metabolic disorders (BIRDEM) in Dhaka so that its information can be stored, maintained, updated and retrieved conveniently and efficiently. The existing information

in BIRDEM is partly computerized via databases only in patients' admissions, doctors' appointments and medical tests and reports sections. A partly slow and tedious manual system still exists in BIRDEM for example, in record of ambulances in service, assigning ward boys and nurses to rooms, the billing process and record of doctors' prescriptions etc. However, this paper outlines one complete database design for the entire BIRDEM hospital in which data maintenance and retrieval are in perfect harmony and speedy. Sample SQL-based queries executed on the designed system are also demonstrated.

Khan et al. (2010) developed a database which contains all the information needed to be maintained in a BIRDEM hospital. As we have computerized the entire system via a database, the maintenance is very convenient and efficient and also retrieval of data according to demand is speedy. The existing system of BIRDEM is partly manual and partly computerized and it becomes a tedious process to keep track of all the information partly in paper files and partly on computers. Therefore, our designed system is a good and useful implementation. We can further improvise it by enhancing its security. An initiative has also been taken to use Microsoft Visual Studio 2008 and the programming language C# for developing user friendly interfaces to the current database system. That way a software has been developed which is used to interface with the SQL Server and hence data accessed, retrieved and searched for far better in a more efficient and convenient form.

Case Study Three: Design and Implementation of Medical Information Systems For Managing and Following up Work Flaw in Hospitals and Clinics

Elmetwaly (2011) opined that the process of developing medical information systems is deemed to be one of the most critical objectives for professionals in this domain. It is known that any information systems are in need for

development and processing in all contingent work problems. He proposed a system had been structured several years ago and had been experienced in several hospitals and clinics in Saudi Arabia. This research discusses how to utilize modern technologies available and how to use Oracle databases in saving all medical information and data that might be used. Design of this software allows easy and fast reach to information and hence fast execution of orders and easy recall for patients' information. One of the core objectives is to support receptionists, physicians, nursing, laboratory and radiology staffs in hospitals to exchange data and information is deemed to be one of the most important objectives and priorities. This is due to importance of time that helps decision makers implement necessary and most appropriate procedure for patient, especially if provided by internet. Oracle databases facilitates sharing required data and information easily and fast at any time and subject to authorities and powers vested to each user of such potential information systems. as a fundamental tool to analyze the data gathered by Hospital Information Systems (HIS) and obtain models and patterns which can improve patient assistance and a better use of resources and pharmaceutical expense

This research study deals with the problem of maintaining data, deemed to be one of the biggest problems of health entities. Most hospitals and clinic suffer loss of data saved in this databases and unavailability of strong cohesive information systems. Approach: Our need for such databases and information systems motivates us to seek solutions and technologies that might enable us accomplish and complete our works easily and fast. Results: Potential medical system is deemed as one of the unique systems that attempted to reach solutions for some problems faced by leaders and decision makers and by those concerned with medical information systems proposed systems has been structured utilizing Oracle database. Conclusion/Recommendations: Structure of this system

focused on connecting it to internet, due to unlimited e-services provided by this international network that facilitates. Accordingly this facilitates exchange of medical information to all beneficiaries.

The core objective of potential electronic system is to facilitate process of data entry and following up patients files in hospitals and clinics. This system is designed based on Oracle databases due to its excellence in capacity of data volume, number of potential users who can access to the same database at any time. It is also distinguished with availability of following up and managing work flaw in hospitals and clinics easily and fast. The process of developing software is always in need for more effort to reach the desired objectives and hence facilitate procedures and shorten time and lessen effort exerted to reach desired objectives and conclusions.

Case Study Four: Design and Implementation of Hospital Management System

Adebisi (2015) developed an automated system that is used to manage patient information and its administration. This was with a view to eliminate the problem of inappropriate data keeping, inaccurate reports, time wastage in storing, processing and retrieving information encountered by the traditional hospital system in order to improve the overall efficiency of the organization. The tools used to implement the system are Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), Hypertext Preprocessor (PHP), and My Structured Query Language(MySQ).The Proposed system was tested using the information collected from Murab Hospital, Ilorin, kwara State , Nigeria and compared with the existing traditional hospital system. The design provides excellent patient services and improved information infrastructure.

3. METHOD

The methodology adopted in this study is Object Oriented Hypermedia Design Methodology. The activities that is involved in Object Oriented Hypermedia Design Methodology are Requirement gathering, conceptual modelling, navigational design, abstract interface design, and implementation. This methodology is suitable for web application because it promotes design reuse, component reuse and enables users to have a better understanding of the application. The separation of various parts of web development paves the way for reusability and parallel development, effectively shortening the application development time, Karimpoor, & Sadighi, (2008).Conceptual modelling are built using the well-known object oriented modelling which involves class, subclass, attributes and its relationship, the navigational model is built as a view over the conceptual model and abstract interface design includes the way the different navigational object will look like. These objects are classes which are made up of attributes and function. The advantage of modelling a system as object makes the design, modification and implementation of the system easy. Very large project have adopted the object oriented technology due to these reasons mentioned and

4. RESULTS AND DISCUSSION

The objective of the design is to implement a web based hospital integration platform for Nigerian Hospitals. Efficiently captures patients' bio data and store it efficiently for reference purpose. The system enables patients to communicate with the doctor online once their account is credited. The system allows the identification and retrieval of patient's record using unique identification code. It enables patient to lay their compliant online get medical attention for minor cases online. It allows doctors to review patients past medical history. It maintains the security of patients' records.

also due to the ability to build large class library. Object-oriented design and development is a very popular approach in today's scenario of software development environment. This approach improves software productivity, reusability and flexibility of software systems.
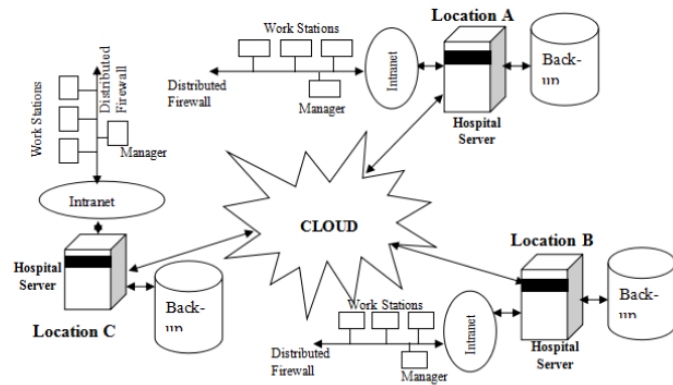
System Architecture of the New System
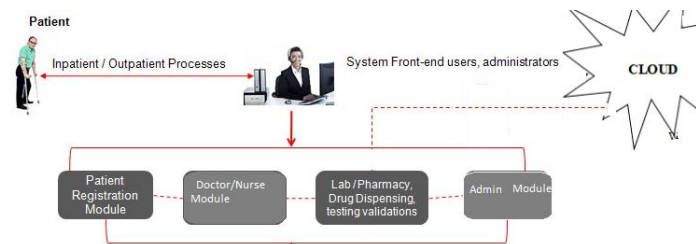
The system enables the pharmacist to access the medication administer to the patient by the doctor.

Login Page

I.   **Create patient information form part A.**

Figure 4.1 Create patient information form

This module deals with registering of new patients, for either OPD (Out-patient department) or IPD (In-patient department) and issuing unique identification numbers to the patients. These numbers are unique throughout the system. A patient is first registered at the OPD front office. If eventually the patient is admitted, the same number is used. The IPD / OPD identification number is used for tracking the medical records of the patient for any OPD visit or IPD admission.

All medical records of this patient are identified by this number. The number helps in a flexible search in finding the patient records. This number is assigned to the patient together with a patient card. The number will be used to track the patient record and medical history throughout the life cycle of the patent medical section.

II.   II. Admin _create Department form

Figure 4.2 shows the create drug form. This form will be used by Admin to insert and modify records in the drug table.

Figure 4.2 Admin_ create drug form

This module is used to create a new staff in the hospital. When a Doctor, Nurse or any other staff is employed in the hospital, his or her information is entered into the system with a unique staff number.

III.   **Diagnosis Form.**

Figure 4.3 Diagnosis Form
The patients' diagnostic form is shown in Figure 4.3

Here all diagnosis is logged into the database serially according to the date and time. The doctor carrying out the diagnosis will have to provide his name, clinic or department, go through the previous diagnosis and then enter details of the new diagnosis.

IV.   **User login form**
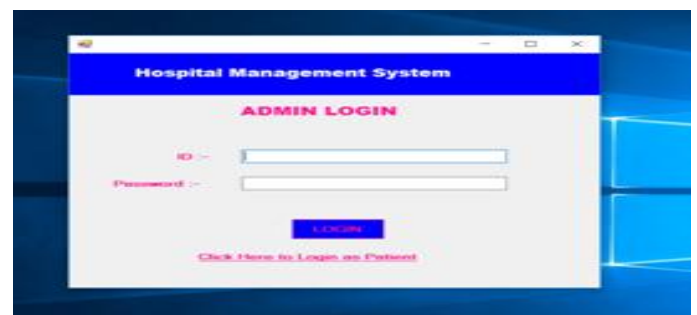
Figure 4.4 User login form

Figure 4.5 shows the user login form

When the software starts the user is presented with a log in page where he /she can enter login information (user name and password)

From the fields of the home page the user can choose a particular option. Menu items like admission, diagnosis,

examination, laboratory, discharge, referral and death are selected by pointing with a mouse and clicking.
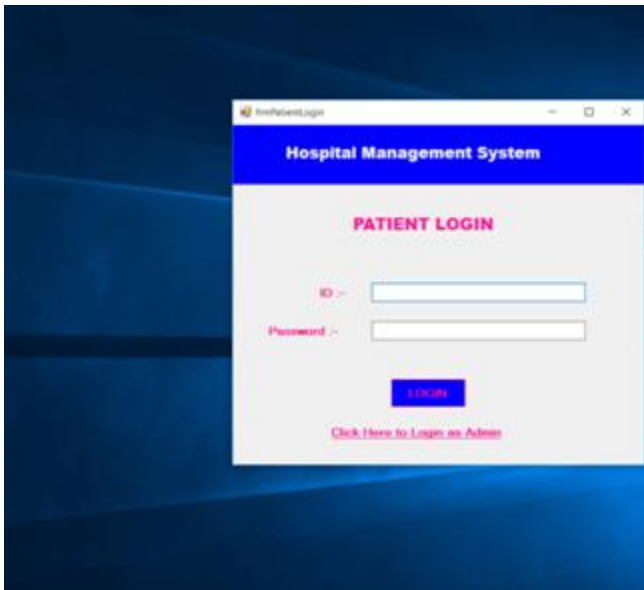
V.   Patient login form.

Figure 4.5 Patient login form

Figure 4.5 shows the patient login form This is the Login page for the Patient, when the logs in, he or she will be able to view his medical history and also will be able to book appointment with doctor by interacting with the doctor online.
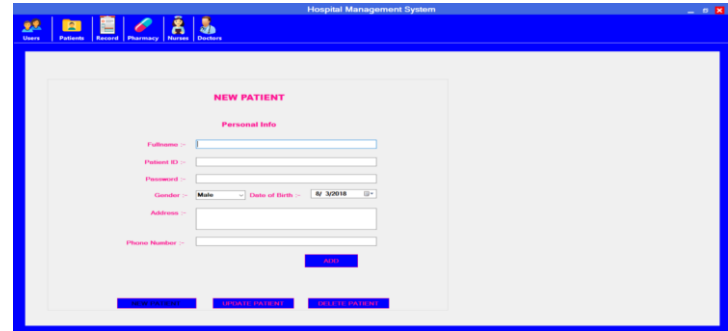
VI Pharmacy form

The components of the Pharmacist module of the system include:

This module allows the pharmacist to create new drugs and also used to view drugs recommended by the doctor.

Patient module

The component of the student module of the system includes web pages that allows patient;

- A web page that allows patient view recommendation of the doctor online (live chat).
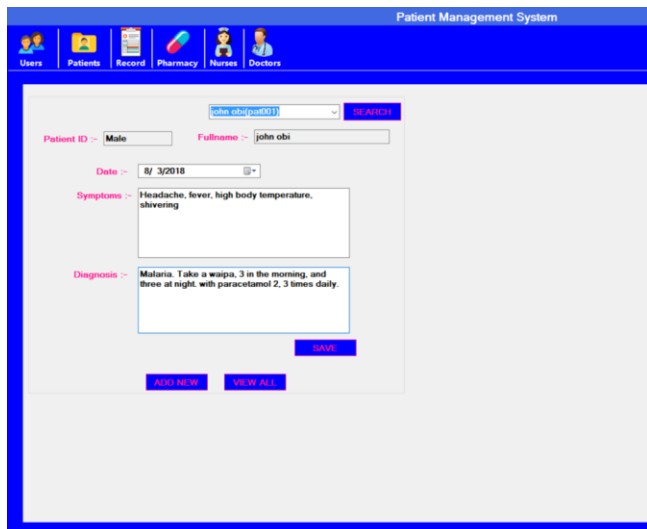
- A web page that allows patient enters complaints.

- This module deals with registering of new patients, for either OPD (Out-patient department) or IPD (In-patient department) and issuing unique identification numbers to the patients. These numbers are unique throughout the system. A patient is first registered at the OPD front office. If eventually the patient is admitted, the same number is used. The IPD / OPD identification number is used for tracking the medical records of the patient for any OPD visit or IPD admission.

- All medical records of this patient are identified by this number. The number helps in a flexible search in finding the patient records. This number is assigned to the patient together with a patient card. The number will be used to track the patient record and medical history throughout the life cycle of the patent medical section.

Diagnosis module

The components of the Pharmacist module of the system include:

- A web page that allows the pharmacist to view drugs prescribed by the doctor.

CONCLUSIONS

The system is developed to aid easy retrieval of patient file using the patient's unique code, provides platform to communicate with doctor online. It ensures the proper management of patient information. Finally system also reduces the queue of patient waiting to see the doctor for minor cases and reduces self-medication.

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