

DEVELOPMENT OF A WEB APPLICATION FOR ONLINE HEALTH CARE SYSTEM

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Abstract: Computer technology is used by any type of organization or business nowadays in order to exist. The fast advancement of technology, along with the necessity for simple access to information, resulted in the creation of Information Systems (IS). These systems use a variety of information sources and handle data gathered from primary components such as people, hardware, software, and processes. System performance has an impact on the efficiency, dependability, and flexibility of your company or business. The IS is increasingly being used in health care. One of these is the Online Health Care System, which adds features and capabilities to standard medical records. This paper is concerned with this topic, namely the investigation, design, and implementation of an Online Health Care System. The program has been built with web-based technologies like Hypertext Pre-Processor (PHP) and MySQL. It also incorporates patient information based on traffic and the incidents that occur during them. It also covers all patient demographics and medical information pertinent to the patient's personal history. Finally, it gives medical personnel the ability to acquire statistical information. Based on the foregoing, the application built is user pleasant and fulfills all usability and data security standards. The application's significance is that the data is safely saved in a database and is constantly accessible to the physician. A great emphasis was also placed on developing an intuitive management interface that the user may utilize without any specific computer experience.

1. INTRODUCTION

With the advancement of programming language technologies in recent years, the world has become more directive for designing and implementing many systems that was useful and easy for people to use, such as remote sensing systems, satellite image classification systems, and health care management systems, among others [1]. Healthcare Information Systems (HIS) are computer-based systems designed to achieve managerial and medical information that allows healthcare workers to carry out their duties more efficiently and effectively [2]. Medical exercise knowledge is more noticeable with issues of maximum business than previously.

As a result, government rules are forcing healthcare professionals to tell patients many times [3]. Simultaneously, accomplished auspices are gathering various measurements of difficulties

to the healthcare professional by using capitation to avoid payments. Furthermore, the potential of misinterpretation complaints is forcing clinicians to pause specifics of their interactions with patients [4]. Because of these factors, the immediate cost of providing proper care to patients has grown often, and healthcare professionals are progressively seeking qualifications in medicine practice [5]. Currently, healthcare information is exchanged from one healthcare specialist to another through treatise observations or connection of single patients [6]. For more instances, electronic contact between pharmacists and physicians is not usually utilized but, actually, the patient gets a paper about prescription writing by the physician [7]. The patient is still waiting for the prescription to be given to the pharmacy and filled by the pharmacist [8]. Furthermore, incorrectly filled medications result in many fatalities each year, indicating that there is an urgent need to reduce healthcare errors

[9]. Health Net investigation determined that large healthcare systems had difficulty managing personal information, data size, extracting significance-based knowledge, and databases [10]. These issues highlight the need to improve the fineness of healthcare systems and simplify access to healthcare information. An obvious way to increase effectiveness in the medical exercise is to use tools and automate as many processes as possible while maintaining confidentiality and safety. And when it comes to creating a safer health system, these mechanisms make it difficult for people to do the wrong thing while making it simple for humans to do the right thing. E-healthcare systems have taken a long time to build. These issues highlight the need to improve the fineness of healthcare systems and simplify access to healthcare information.

[11] explores constraints and problems of healthcare network integration for more flexibility and operation-oriented design. In [12], an overview of the issue of computer-aided healthcare do property and needs is provided. [13] described how to incorporate healthcare work flow as a BPEL method. Furthermore, disorders such as heart disease, stroke, and cancer are frequently connected to daily living. It is therefore critical that individuals adjust their daily habits in order to avoid and reduce sickness. To understand the change, the most important thing is that citizens can simply know their health conditions and get correct advice from their physiological data based on evidence [14].

Developing a web application for online Health Care System to keep patient and health personnel records would benefit health centers and hospital management who would have effortless access to the data securely, more easily and remotely [15]. This online health system is a system that is aimed at supporting the improvement of health care systems by increasing the capacity of health care workers to make decisions based on accurate information. Health information technology is the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, use of health care information, data and knowledge for communication and decision making [16]. It is an automated system that is used to manage patient information and its administration. Health information system is meant to provide the administration and staff with information in real-time to make their work more interesting and less

stressful. It is used by hospitals to input process and display their patient information. This system is used to manage and maintain electronic medical records, patient information, prescriptions, lab reports etc. It is an effective tool in the hand of the health center, management and enhances networking among practitioners to share knowledge. During the automation, these records kept by these health centers and hospitals help in maintaining patient's medical records. The medical records must have correctly all of the patient medical history which includes patient's identity comprising; the patient's first name, last name, sex, age, address, family history, etc. These help in identifying the exact patient and his location as well as any family history (hereditary). As an important source of patient information, the medical record facilitates the transfer of data to other health personnel who are involved in an ongoing treatment of patient or the transfer of patient to another physician/medical assistant at a different branch of the same health center. It also facilitates the transfer of data to health care establishment and other organization as well as stake holders such as Christian Health Association, Presbyterian Health Service, Ministry of Health and Insurance Company. This online web based health information system provides statistical data for national health planning delivery to increase access to health services and improve the efficiency of health service delivery. Also, it provides multi-user health management system to support the activities in various health centers.

Health care professionals now turn to various patient-centric technologies, including Computerized Patient Records (CPR) [17], document management system data warehouses, point-of-care applications, distributed networks, and telematics [18]. While information needs to drive the design of health care systems, sometimes even beyond a sustainable level of sophistication, resource considerations are equally important in health information system design and implementation. Though no two health information systems are alike because needs and resources differ within every country, all health information systems need a management structure. This management structure deals with two components namely health information system resources and organizational rules. Critical resources considered include personnel, supplies, computer hardware and software, and

financial resources. Organizational rules are also very necessary to ensure the optimum use of health information system resources. The design and implementation of a health information system should be driven not only by the perceived need for routine information and its timely availability, but also available resources [19].

Monitoring individual and organizational performance, facilitating information sharing among different health care organizations through a multi-agency approach, and empowering individuals by providing relevant information to consumers, thereby assisting them in making informed choices are all beneficial uses of information and associated technology in relation to health care improvement. According to [20], there is a need to adopt information technology in healthcare in order to eliminate medical mistakes, create more effective ways of communication and information exchange among physicians, and better maintain patient medical records. According to the report, as technology continues to have an influence in healthcare, the adoption of new information technology alternatives has been able to lower costs and boost efficiencies. This paper therefore proposes to develop a web application for an online healthcare system for professional treatment of all sort of ailments affecting people in the society. The literature review of this paper discusses relevant research topics in web application for developing online healthcare system while methodology outlines step by step procedures on how a robust system could be achieved. The experimental results of this paper are presented in a logical manner in the following section and finally, conclusion summarizes our research outputs and contributions to knowledge in the area of health informatics.

2. LITERATURE REVIEW

The value of electronic health record was discussed in [21], where the importance of electronic medical records of the patient was considered to be very vital in the hospital and some other health care organization administration and in the provision of a better healthcare to the patients. The Electronic Health Record (EHR) uses some automatic presumed

quality benefits such as improved data organization, accessibility to data and information legibility. Increase in percentage in terms of patient visitation was also considered since the advents of an electronic health record of patient database can reduce the patient waiting time at the institution. Consistent use of EHR to document visit progress notes helped to reduce the need for manual medical records of staff and transcription resulting in more complete documentation. However, it is important to note that the author did not tackle the system development and design. Much emphasis was rather on the financial cost and benefits of the system. Indeed, the importance of the data from the system for shareholders interpretation was acknowledged. It failed to discuss the tools that are needed for the design of such system, the system implementation and the relevance of the system. Also lacking in this study was information regarding the ability of nurses to use the HIS to summarize clinical data on patients. The system would not improve access for geographically isolated communities with health centers or hospitals. It does not provide support for the healthcare workers to aid in data sharing and therefore not an effective electronic means for data capture, storage, interpretation and management. In this context, the electronic health care record system is supposed to be a tool that will facilitate the communication, processing or transmission of information by electronic means for the purpose of improving human health.

Health care system was designed and developed using java as the programming language. Application of a relational database approach was utilized in constructing the Hospital management system. In this work, readers are not provided the ultimate objectives of the designed system and so it is difficult to identify the objectives that the researcher deems fit to achieve in his work. More so the system does not provide any clue in respect to validation in the process of using the system. It could not tell who should have access to what data and who should not have access to which data. Roles have also not been given to users of the system hence a user at pharmacy for instance can have access to the same data that the records department has. Also, the work of the researcher clearly shows that admission department can interfere with the procedures of stores department. It must be noted that the researcher's ability to elaborate on the tools needed for the system design for the development would have served

much importance to other researchers. The researcher did not make any comment whatsoever on the system design, system requirements, hardware requirements and methodology that were employed. It is also difficult to determine the type of system development cycle that was implemented. Furthermore, there was little information on the researcher's choice of using Java programming language for the design and development of the Hospital Management System.

[22] acknowledged that most European countries and United States are increasingly adopting Electronic Medical Record (EMR) technology, which can also be addressed as health care system to enhance health care outcome and quality. William and Boren posited that Nigeria lacks robust health care infrastructures and policies for implementation of information and communications technology (ICT). Complicated by challenges of epidemics and civil wars, African countries lack ICT in their health care systems. The authors asserted that historically, lack of human expertise and inadequate financial resources have been a bane to robust adoption of ICT in Sub-Saharan Africa.

[23] reviewed in a health care system as regard medical and clinical informatics applications in relation directly to health care organizational processes, structure, and clinical outcomes. Electronic medical record system that serves as part of health care is a major medical and clinical information system aimed at lowering cost of health care therapies. In its earliest applications, health care organization like the hospital which provide information systems were mostly used for patient's electronic record keeping, but has advanced into almost all areas of medical discipline. Common applications of hospital information technologies include Computerized Physician Order Entry, Pharmacy Information Systems, Laboratory Information Systems, Radiology Information System and Picture Archival and Communication Systems, telemedicine, and many others as these technologies are constantly evolving.

[24] defined information literacy that affects medical practice as the ability to identify the need for information and seek, evaluate, and use information in any presented format. Information technology infusion that aids globalization refers to the degree to which various information technology tools integrate into organizational

activities. The growth of computer technology in the 1980s with consequent improvement in information literacy saw the advent of the first breed of hospital information systems [25]. Earlier researchers in hospital information systems categorized them into three types: Consumer informatics, medical and clinical informatics, and bio informatics based on areas of application. Consumer informatics focuses on communications between patients and the public. [26], [27] recommended creating a culture of safety in health care organizations by recognizing and accommodating the multiple complexities of those organizations. A laudable approach would be to take advantage of the ability of large-scale data systems to a mass information as means of identifying significant trends, and enable creation of blame-free sanctuaries in which care errors and observations of incompetence receive prompt solutions. Data production and collection requires knowledge to facilitate this undertaking. Various forms of knowledge are essential business asset used for development of new products and services, thereby useful in developing a competitive advantage in the marketplace.

3. METHODOLOGY

The system's goal is to develop a health-care system that can assist health-care companies. Users was able to engage with the system via a web interface. Anyone who wants to visit the website and engage in a discussion is considered a user. Users should be able to submit a log stating if they are satisfied with the information they have received from querying the health care system in addition to interacting with the online health system. The online health system's methodologies and procedures for selecting the best practice framework are analyze in the sections below;

In the context of this project, the use case diagram is a behavioral diagram defined by and created from a use-case analysis. Its purpose is to present a graphical overview of the online health care system and the functionality provided by the requirements in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The diagram in figure 1 below illustrates the use case diagram of the online health system, which shows the behavior that the system will exhibit to an external user

which is generally known as end user. It involves two main actor (User and Admin) and it technically analyses their role with respect to the online health care system. Figure 1 above analyze the receptionist module for the online health care system, where the receptionist will have to input information about a patient into the system such as; registering a patient, filing patient’s medical report etc.

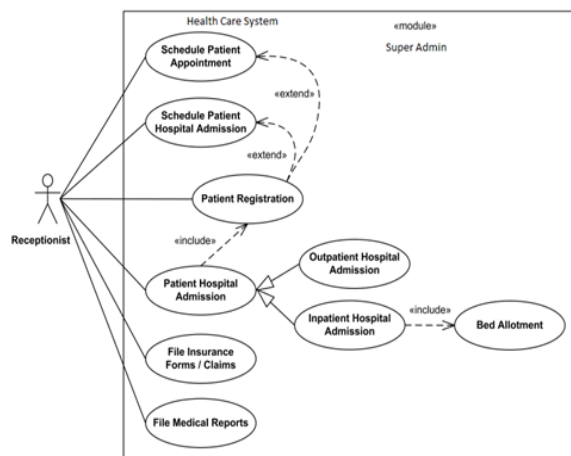


Fig. 1 Use Case Diagram for Super Admin Module

Figure 2 shown below is the class diagram. It shows a collection of classes, interfaces, associations, collaborations, and constraints, all for the technical design of the online health care system. It technically explained the interaction with the health care system as well as the admin. The technical novelty of this methodology in this paper is that use case diagram, class diagram and data flow diagram have been used to design an interactive platform between the user and the admin for an online health care system. The use case diagram designs all the functionalities approach of the medical doctor in treating any patients while the class diagram deals with the technical design and interfaces of the project. And lastly, the data flow diagram specifies the requirements and evaluation of the model for a systematic approach of online healthcare system. Based on the above, the application developed is user friendly and meets all the requirements usability and security of personal data. The importance of the application is that the data are stored securely in a database and are always available to the physician.

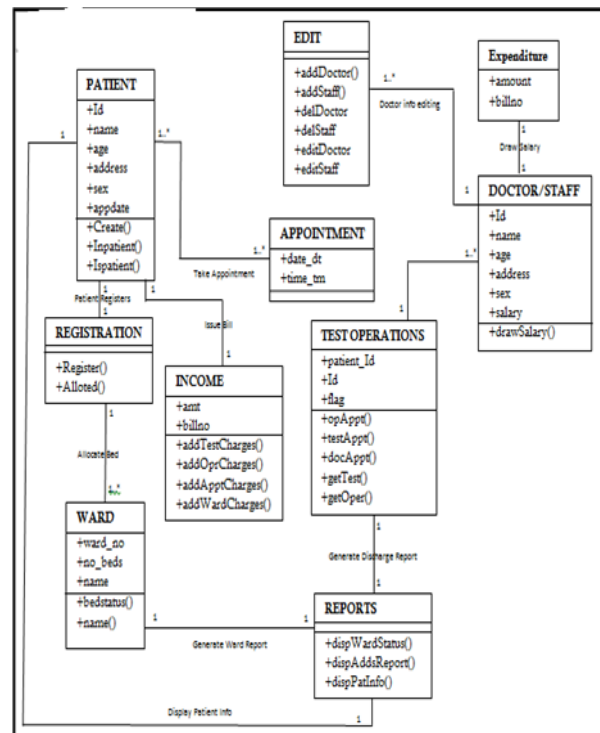


Fig. 2 Class diagram for Online Health Care System

Also strong emphasis was given on creating an intuitive management environment, which the user can handle without requiring any special computer knowledge.

4. RESULTS AND DISCUSSION

The proposed system was successfully tested to denote its effectiveness and achievability. It basically reduces the paperwork, manpower and time for any individual. In this project, we had developed a system that includes patient’s information in accordance with the traffic and the episodes created in the proposed system. It also includes all patient demographics and medical information in concern according to personal history. In the end, provides medical staff the possibility of obtaining information of a statistical nature.

The system has been fully built and is ready to be used. The image in figure 3 is the screenshot that shows the GUI welcome page, sign in and forget Password of the Online Health Care System after launching it on a web application.

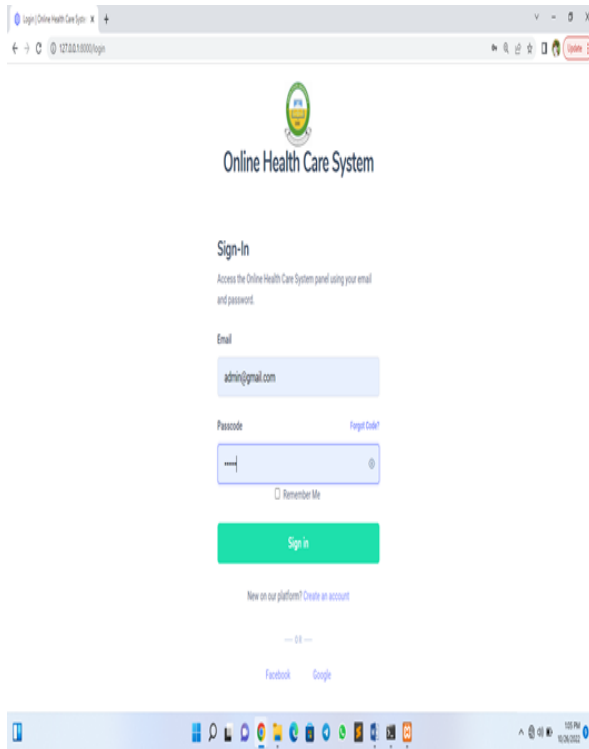


Fig. 3 Sign in and forget password of the Online Health Care System

The image in Figure 4 is the screenshot that shows the main page, after signing in with Admin, Email and password, the main page shows the total users, total patients and total system administrators added, the dashboards, patient records, all users and sign out. Total users consist of the total number of patient and total administrators account created, the dashboard is the super admin and patient dashboard where account for system administrators and patients are being created for use. All users show name, email and role of the user that make use of the web based system recently and when the account was created. Users can also sign out easily. The image in Figure 5 is the screenshot that shows the dashboard that consists of the super admin dashboard and patient dashboard. Super admin dashboard is where accounts are created for the health professionals or workers like doctors and nurses. The image in Figure 7 is the screenshot that shows the dashboard that consists of the super admin dashboard and patient dashboard. Create new admin account, when the account was created, view the list of accounts and delete admin account.

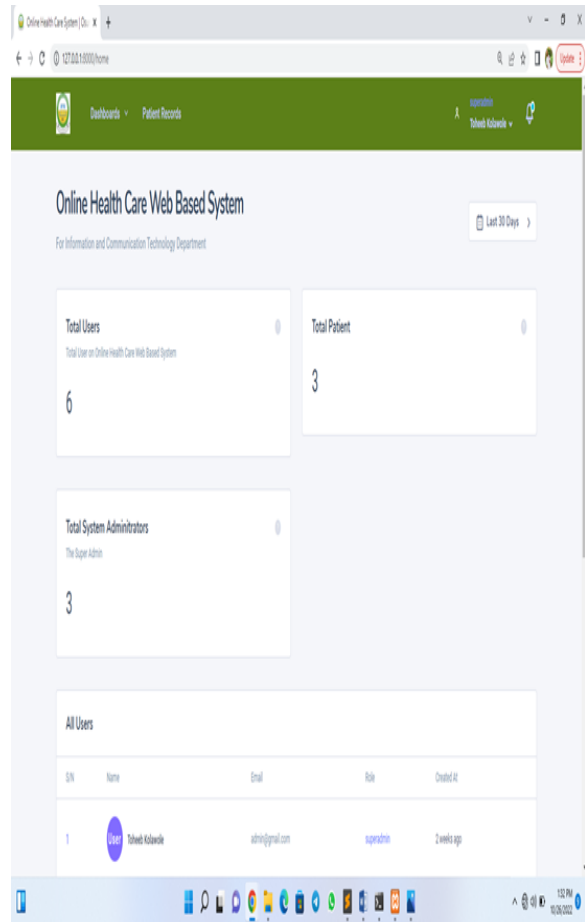


Fig. 4 Main page for online health care system

Patient dashboard is where accounts are created for in-patients or out-patients of the hospital. Create new account, when the account was created, view the list of accounts and delete patient account. The image in Figure 6 is the screenshot of super admin dashboard to create new admin and delete admin. The plus icon is for creating a new admin. The image in Figure 6 is the screenshot of patient's record page that can be used to upload and add patient information. The patient information to be filled include next appointment and vital signs (temperature and blood pressure), uploading of X-ray image, MRI image and CT image result of the patient. Evaluation of the model was carried out to determine the system performance; if it is good or bad; if it can be used effectively on other health-based facilities and produce a good result. The system was evaluated by keeping logs of questions and answers, invoking and revoking and by feedback received by healthcare workers that used it.

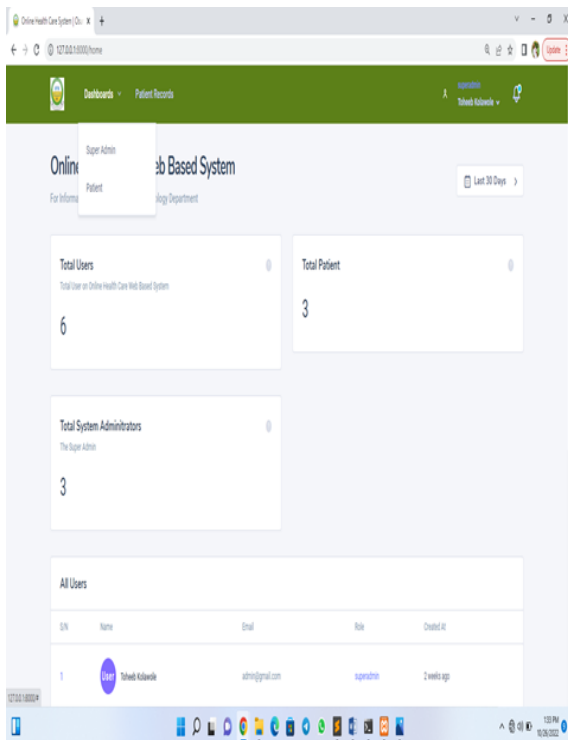


Fig. 5: Dashboard (Super admin and Patient)

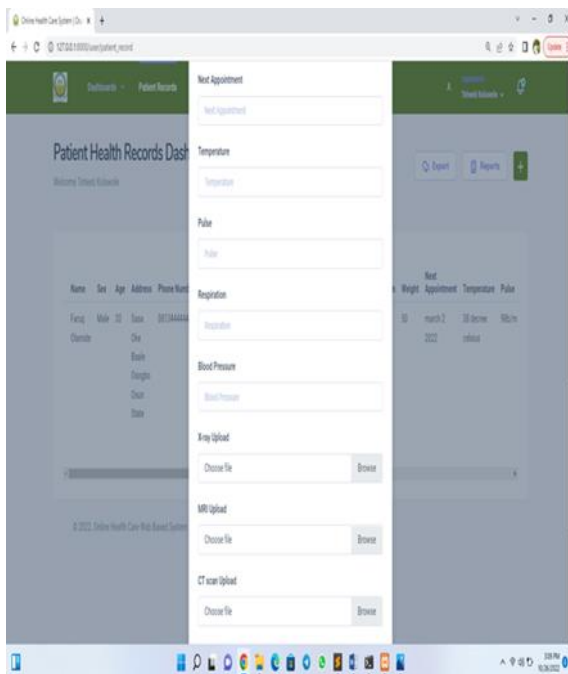


Fig. 6 Patient records page for upload

The accuracy is determined by quantitative key performance indicators, which allow user to evaluate the effectiveness of the health system and the way it is used.

5. CONCLUSIONS

The vision for the use of technology in the field of health in 21st century includes a centralized human-service health system with core of this citizen. In such a system, care is based in continuous medical supervision and is customized according to the needs of citizen who is the focal point of control. Health information systems in conjunction with electronic health record, which stored all the data of an individual patient (demographics, details of illness prior examination, therapeutic plan and medication), accelerate and facilitate the processing in daily processes of a healthcare facility. In this paper, Electronic Health Record System has been developed as a web application to support health workers and improve the quality of treatment in our various hospitals. It has been constructed in such a way that it displays the usability of every user's choice and provides information directly to the administrator without much trouble. The information of each patient is shown in various tabs and these tabs contain all the information from medical to demographics. The developed system was evaluated and tested using some parameters such as time, quality of service and friendliness of interface.

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