Automated Hospital Clinic Management System for Private Hospitals

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Abstract— The most essential aspect in the country's development is its healthcare system. Long-term disease treatments are one part of treatment. Private hospitals conduct different clinics to treat these long-term diseases. These clinics are separated into groups based on the types of diseases. Some people suffer from one or more diseases, and need to choose doctors for each disease type for their treatments in private hospitals in Sri Lanka. However, there are still several major issues in private clinic management systems, for which no effective solution has been found. The existing system's huge problem is poor coordination between doctors, patients and medical staff. The other problem is patients face lots of difficulties in maintaining their medical record books for each relevant clinic. Accordingly, this research paper mainly provides an effective solution to the issues highlighted in order to improve the efficiency of Sri Lankan private hospital clinic management systems. The proposed system will connect patients, doctors, pharmacy staff and medical staff into one platform and store information about patients, doctors, appointment details and all medical records. The research is based on the automated clinic management system for private hospitals and has updated it to a computerized automated system. The clinic management system for private hospitals will allow efficient creation and management of patient data, as well as management of doctor's schedules, seamless flow of information from one department to another, handling of the health center's accounting, and accurate archiving of patient information and diagnosis data.

Keywords: ***manual, automated, clinics, private, disease***

I. INTRODUCTION

Year after year, technological advancements become the valuable resource for future professional lives. Apart from that, the digital environment has the power to transform our reality by infusing it with a new scenario and with this development comes the ability to effectively channel patients into contact with this expanding technology, which has resulted in a variety of benefits and prospects. So, clinic systems play a significant part in the healthcare system.

In the developing country, the healthcare system is the main factor. When it comes to healthcare, the role of hospitals is invaluable. Two types of hospitals exist in Sri Lanka. Government hospitals and private hospitals are available in Sri Lanka. The lots of people in this country do their treatments at private hospitals because of they can choose relevant doctors, date, and time due their preference for their treatments. In finding the problems of existing private hospital clinic maintain systems and upgrade that manual system to automated computerized system, this program allows the manual record book system to be replaced and can accelerate information processing, storage, and retrieval. Therefore, reduce the difficulty of the current manual system and make it convenient for users to use. Usually, one private hospital conducts more than one clinic. In these clinics they record patient's day-to-day status in small books. Sometimes these medical record books can usually be the major problem for clinic systems. These record books are lost, misplaced, or destroyed and sometimes patient forgets to bring them. Doctors are unable to determine a patient's true status. As a result of these reasons allergic reactions can be occur, patient privacy may be compromised, and patients may pass away due to these reasons.

However, with the use of information technology current practicing clinic system may be improved. In the healthcare sector, the clinic system will continue to expand and grow. Therefore, in this research computer system implemented with the functions to automated clinic management system for overcome those barriers and difficulties. As a result, this research will discuss the effective clinic management process of doctor, pharmacy staff, patient and medical staff through the automated system and how the process is done through this system in an effective way.

II. LITERATURE REVIEW

This research focused on reviewing the problems with the current private hospital clinic system and how to convert it to an automated computerized hospital clinic system. There are several kinds of existing systems and experiments that may be used to get a better picture of the technologies that have been adopted by other researchers for use in this proposed system. New features have also been explored to improve this system. This literature survey will provide insight into how other researchers approached their study and applied their findings.

Demirel (2017) presented paper under the topic "Hospital Management Information Systems in Health Sector and Development in Turkey". The aim of this research is to examine the how private hospital clinic management systems have evolved and what function they provide in the health-care sector using Turkey as a case study. The study began with an examination of the evolution and several types of hospital clinic management systems. The thesis has been applied to various systems to determine their usage and advantages. The evolution and features of private hospital clinic management systems in Turkey are reviewed in the study's second section. Hospital management information systems (HMIS) provide a framework for storing data relevant to a hospital's financial, management activities and medical processes. The primary implementations of the clinic management systems are confined for patient data monitoring and payment for health management services supplied.

Khan and Saber (2010) the following are the steps to implement this paper solution for a successful hospital management information system; Patients, healthcare workers, managers, and system designers should all be able to use hospital information management systems. The health-care system's stakeholders should have access to it 24 hours a day, regardless of their profession or location. The administrative priorities should be clearly defined by the system administrators. It is essential to standardize primary and secondary health-care records. The processes for obtaining and using information technology should be streamlined. Information system criteria should be decided at the institutional level. At the national level, the Ministry of Health should organize and oversee the hospital management system. During institutional decision-making, political interventions should be avoided. Users of clinic management system must be encouraged to engage in and share to the clinic management system. Healthcare industry professionals must also participate actively in the planning activities process and notify private hospital clinic management of any flaws that might change because of the system in use.

Yahaya et al., (2019) Presented paper under the topic of "Development of an Automated Healthcare Record Management System". According to the authors, this project has focused on improving the University of Ilorin's clinic management service by developing a clinic record management system with a smartcard. This needs to be differentiated away from the manual paper-based patient's medical record system and toward a computer-based system.

According to the Abraham and Joyce (2016) paper under the topic of "Designing a Web Based Hospital Management System for MOUAU Clinic". This paper proposes an effective web-based framework to improve the analysis on medical research as well as making it easier to access medical records and receive care. Today, certain issues in hospitals remain, such as the disappearance of patients' medical records and other vital files. This research study will identify these problems. This proposed system will assist medical personnel in conducting their duties by replacing the manual method and speeding up

the encoding, storage, and retrieval of information. Hospitals can save money over time because of improved productivity and overall performance.

Edmund, Ramaiah and Gulla (2009) presented a paper under the topic of "Electronic Medical Records Management Systems". This research paper has focused to review the existing Medical Records Clinic Management Systems (MRCMS) and on the healthcare industry assess the impact of medical record clinic management systems. The research study also addresses the benefits and drawbacks of medical record clinic management systems as well as the challenges that various groups of users face when implementing and utilizing them. A good MRCMS will not only store, collect and handle data efficiently but will enable authorized staff to assign the system at the same time, ensuring that everyone gets the most out of the system.

According to the research paper of "Hospital Patient Database Management System", Asabe, S. A, Oye, N. D and Monday Goji (2013) they investigated a hospital patient data management system that was created to replace the manual method of scanning, sorting, storing, and accessing private hospital's patient medical records with a medical clinic record due to remove the problems associated with the existing clinic method. The existing clinic management system was investigated, and a computerized program was developed to change it. The existing hospital clinic management system has been investigated, and a computerized application has been developed to replace it. When patients check in and out of the hospital, these computer-based systems produce patient reports. This paper aims to find a more accurate, dependable, and effective computer system for maintaining patient records in general hospitals to ensure an efficient result that is less time consuming. According to the report, the building of a hospital patient database record would be a solution to the difficulty that the current manual system of storing patient medical records has.

The study investigates the problems with the hospital's manual patient records system and proposes solutions by building an online clinic management system. Interviews were the primary tool used in this study. Two doctors, three nurses, and medical staffs were interviewed. Several numbers of fifty outpatient records were sampled. The webpage was designed, and data was entered using a combination of PHP, MySQL, and Macromedia Dreamweaver. The records were generated into the configured clinic management system. The records were generated after the records were entered into the configured outpatient management system. The findings demonstrate the difficulties that the manual inventory control system faces. The changing of a patient's medical folder and the complexity of scanning a patient's medical folder, the complexity of concerning prior complaints to current complaints due to the folder's capacity, quick access for patient's medical diagnosis histories during an emergency, the lack of backup when data is lost, and the compilation of trustworthy. This research study focuses potential solutions for above problems based on the results. To keep track of outpatient records and enhance medical care delivery, an online clinic database management system was developed. (Abisoye, Abisoye and Ojonuba, 2016)

The focus of Mamra et al., (2017) is on the elements that influence clinic record technology acceptability. The factors studied in this study are the UTAUT2 technology adoption factors and the factors introduced by this study, as well as how they influence user acceptance and behavioural purpose toward the Clinic Record System.

The research by Sawaneh et al., (2018) on a patient database management system aims to replace the conventional system by converting the manual process of scanning, sorting, and gaining access to patient medical data in an electronic medical record (EMR). Existing platforms (manual systems) have been scrutinized, and a computer-based system is now needed for the best results. The computer-based software generates patient records, allowing doctors to keep track of their patients in and out of the hospital on a regular basis. The research aimed a more dependable and efficient method to process patient health records using computer technology, providing a proficient outcome that is cost-effective, saves time, and speeds up treatment. The study proposed a patient

database as an alternative solution to the world's growing population, especially in third-world countries. The device would act as a coordination mechanism, facilitating the efficient transmission of patient medical data to healthcare professionals for accurate monitoring both inside and outside the hospital. It also speeds up the transition of patient healthcare data to medical repositories or individuals such as insurance companies or employers. Accurate diagnosis is enhanced by efficient medical record storage, which leads to more accurate and detailed prescriptions that can be referred to as required.

III. METHODOLOGY

To appropriately determine the processes and communication of hospital clinic management system users' requirements, quantitative and qualitative methodologies are applied. Finding data on private hospital centres is the major focus of data collection, and most knowledge is gained through both organized and unstructured interviews with domain experts by solving the problem, discover relevant documents utilizing the documents analysis method. All the details and requirements of all other relevant data was collected by interviewing doctors and pharmacy staffs at the private hospital to gain a comprehensive concept of the proposed clinic management system. To get patient's requirement distributed a google form with required information. And developer refers books, the internet, case studies and research papers of current clinic systems as key data sources. The collection of quantitative and qualitative data is accomplished using a combination of these strategies. One of the key approaches used in this study is Client Server Architecture. As technologies has been used for the proposed system is PHP, HTML, CSS, JavaScript, Bootstrap framework, and SMS gateway.

A. Requirement Analysis

There are four main login interfaces in this system. This proposed system may be accessed by the administrator (receptionist), doctor, pharmacy staff, and patient using those four unique logins. Furthermore, each doctor and pharmacy staff have a unique username and password provided by the system when they register. Patients can login with their username and password, which they created when they first registered with the system. There are major functional requirements are listed below.

Admin(receptionist) able to,

- Add clinic categories
- Add doctors and pharmacy staff to the system
- Add doctors under the clinic categories
- View doctors, patients, and pharmacy staff
- Remove doctors and pharmacy staff
- Add available date and time for each doctor
- Sending username and password to each doctor and pharmacy staff
- View appointments of patients under relevant doctors and date wise

Doctor should be able to,

- View appointments of patients
- Enter description of disease and prescriptions
- Search patient medical histories
- Change own profile details and password
- Send prescription to the pharmacy department

Patients should be able to,

- Make an appointment for doctors
- View appointment histories
- View medical histories
- Change own profile details and password

Pharmacy staff should be able to,

- View prescriptions of patients
- Change own profile details and password
- View prescriptions details date wise

B. *Conceptual model*

Private hospital clinic management system uses proposed hospital clinic management system.

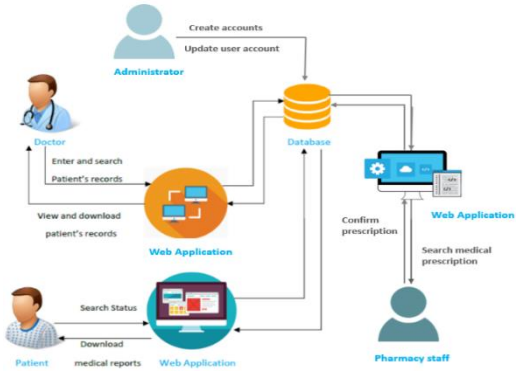

Figure 1. Proposed Clinic Management System

This proposed web-based system will send patient's appointment details to the relevant doctors and admin of the hospital center and when patient make an appointment, the confirmation Email and SMS will send to the relevant patient with relevant appointment details. All patients can make an appointment registering to this system and able to cancel those appointments if required.

In doctor side, doctors can print or send medical prescription to the pharmacy department without any issue. This is a less time-wasting process because of patients cannot waiting in a queue to get their medicines and it reduces inconveniences of pharmacy staffs because of it is not written prescription note; some handwritten is not clear for pharmacy staffs.

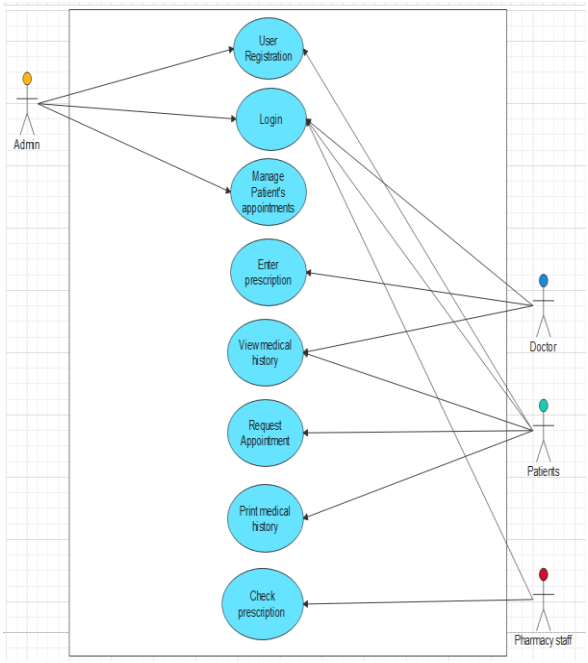

Figure 2. Use Case Diagram

C . Implementation.

The Private Hospital Clinic Management System consists with four main modules.

Registration Module

Only patients must register to this system by themselves. For register to this system, patients must enter username and password as they preferred. Those username and passwords use for login to this system. If required patient can change their passwords after login to their account.

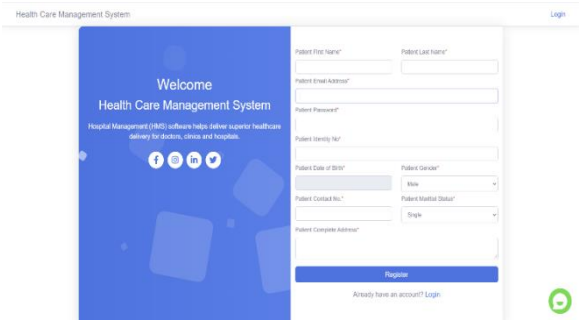

Figure 3. Patient registration

Login Module

The login function should be used to access system's users. To log into the system, users should already have usernames and passwords.

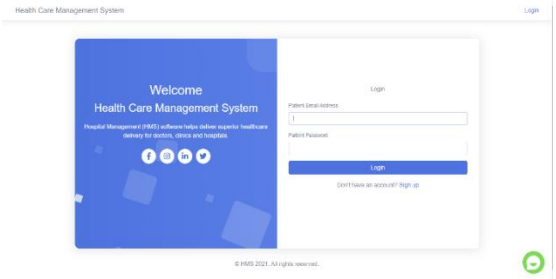

Figure 4. User Login for doctors

Administration (Receptionist) Module

Admins must create user accounts and register with the system. One of the most key aspects of hospital clinic system is the administrator's role. End-users will be added to this proposed clinic system by the admin of the private hospital. The administrator has authority to access to the information adding, editing, deleting and or removing users. Also, the admin(receptionist) can add clinic categories, available data, and times, remove and update doctors and pharmacy staffs apart from that administrator can view the appointments of patients under each doctor and then admin can decide who has the maximum number of appointments as daily, weekly, or monthly then admin can request to each doctor for an additional date. As an analysis part, this is one of the system's main functional requirement for admin.

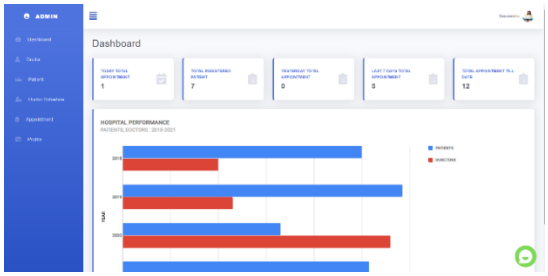

Figure 5. Admin dashboard

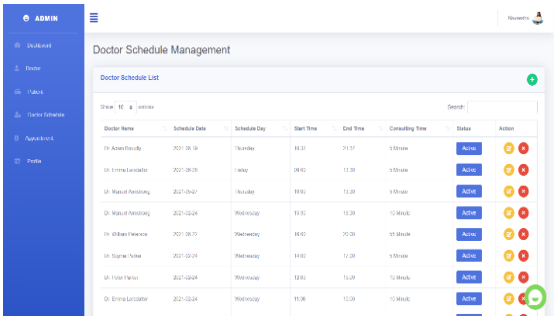

Figure 6. Admin (receptionist) dashboard registered doctors

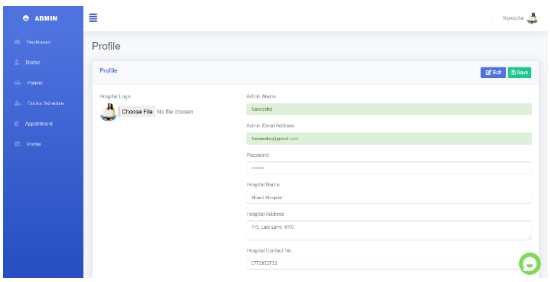

Figure 7. Admin profile details

SMS Module

Each patient will receive an SMS and email from the system confirming their appointment and reminding them of the next clinic date. The unique feature of this system is that it can generate alerts in all three languages for basic mobile phones. If patient required to contact admin (receptionist), the system has provided the SMS facility to contact the admin of the hospital through this system.

Appointment Module

All patients able to make appointments after registering to this system. Patient can pick doctors by searching under clinic categories. After submitting the appointment, the confirmation Email and SMS notification will send to each patient about their appointment details with channel number. These appointment details will send to the dashboard of receptionist of the hospital and doctor.

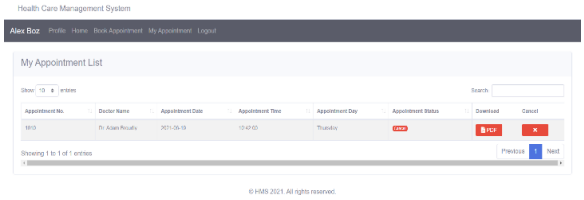

Figure 8. Patient appointment list

Getting Medicine Module

After channelling patient, doctor enter medicine for a particular patient through the doctor dashboard. Then medical staff can view medicine orders of patients through the pharmacy staff dashboard.

Pharmacy staff also able to add new products to this system, view inventories and can view this process as a report.

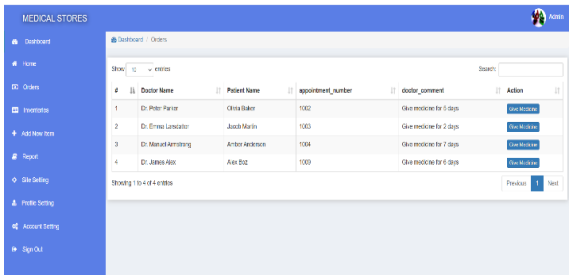

Figure 9. Pharmacy staff dashboard

IV. TESTING AND EVALUATION

During the testing phase, the current private hospital clinic management system to be applied as data analysis tools to ensure that all requirements have been met. Through the management process of certain modules, the system's features tested as modules. In addition, the system accuracy was evaluated using 50 patients. During the evaluation test appointments sample send to private hospital through this system and system is instructed to send automatic reply mail for their confirmation appointments.

According to the pie chart below, 38 patients provide correct appointment information, whereas 12 patients give incorrect information. The system's overall accuracy is 76%.

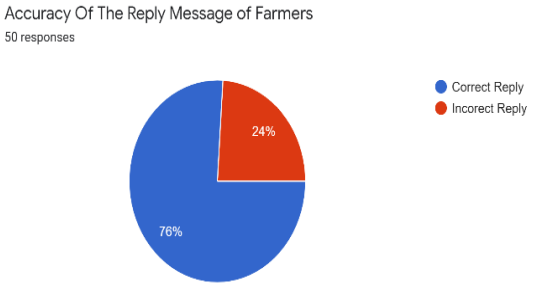

Figure 10. User Accuracy Chart

The automated private hospital clinic administration system appears to have been well adopted, according to the feedback.

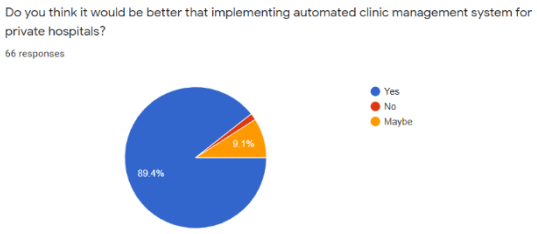

Figure 11. Accuracy pie chart

V. CONCLUSION AND DISCUSSION

Sri Lanka must go forward with technology as a developing country. As a result, private hospital clinic systems that are currently manual must be digitized and automated. According to result obtained by this research, the private's hospital clinic system must be automated. The focus of this study was on one aspect of the private hospital system. As a result, this research is focused on hospital clinic management. If a patient registers for more clinics, the patient must keep separate medical record books for the separate clinics in which they are registered and, they cannot choose a particular doctor as they preferred. Because of the manual approach, it can be the problem of many other issues. According to my study, many consumers are unsatisfied with the current manual system. People need to update their current system to one that is automated and computerized. Most people are dissatisfied with the current system due to several problems. The enhanced automated private hospital clinic management system provides alerts for the next clinic date, appointment's confirmation Email and SMS, simply to understand GUI and it must be simple to use for elder people who are not familiar with IT (Information Technology) knowledge. Hence, to be successful, it must be given to an appropriate time management system; otherwise, more time is spent because of poor management.

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ACKNOWLEDGMENT

The researcher would like to express her gratitude to every one of the Department of Information Technology faculty of computing lecturers for their encouragement and guidance.

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