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Hospital Management System (HMS)

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ABSTRACT

A hospital management system (HMS) is a computer-based or web-based software that makes it easy to manage how well a hospital or other medical facility is performing. This system will help to make the entire function paperless. It integrates all information related to patients, doctors, appointments, hospital administrative details, etc. into one system. It has sections for the various professionals that make up the hospital. This study on hospital management systems is designed to transform the manual way of searching, sorting, storing, and accessing hospital information (files) into electronic medical records to solve related problems. This paper generally seeks a more accurate, reliable, and efficient computational method to facilitate hospital record keeping in hospitals and thus ensure an efficient result that reduces time consumption. Registering, and storing details in the system as well as computerized inventory, doctors, patients, and appointments. The interfaces are very user-friendly. Data processing is fast as it is highly secured for personal use. The initiative aims to automate every aspect of the hospital.

Keywords— Hospital Management System (HMS), Portal, Website, Unauthorized, Element, Managing Data, Administration, User Friendly

I. INTRODUCTION

A hospital management system happened to address a specific need to help hospitals speed up their processes. The 'Hospital Management System' project is based on database, object-oriented programming, and network techniques. Since there are many areas where we keep records in the database for which we use SQLite software, it is one of the best and easiest programs to store our information. This project uses PYTHON/Django as a backend that has SQLite connectivity. The Hospital Management System is custom-built to meet the specific requirements of medium and large hospitals. All the mentioned modules and functions have been specially designed to exactly match the requirements [8], [9]. It covers all the required modules right from Registration, Medical Details, Doctors, Admin, Store, Patient Appointment, Patient, Report Generation, etc. The package is highly customizable and can be customized as per our client’s needs and requirements.

The purpose of this project is to automate or online the process of daily activities like adding new patients / doctors / appointments / drugs and deleting / viewing / searching records etc. It has the ability to provide a unique ID for each patient / doctor and automatically stores the details of each patient / doctor. It includes a search facility to find the current status of any patient or doctor by their ID or name. Users can search for medication availability and appointment details using their appointment ID. we tried our best to simplify the complex process of the Hospital Management System as much as possible. the main purpose of this project is to carry out hospital operations computerized rather than manually which is time-consuming. We believe that this software package can be easily used by non-programming personnel, thus avoiding the risk of human error.

The goal of this project is to provide complete documentation of the requirements, design, and implementation of the system. It also explains the user interface, hardware and software, and the different models that can be used to develop software like this.

The application will be used by hospitals, clinics, and other medical facilities. The admin module is one of the modules in our application. With the help of our application, the administrator will be able to edit, add and/or update records in addition to previewing monthly and/or annual data. The administrator will also benefit from the software's ability to track changes and generate reports.

A hospital needs to keep track of its daily activities and records of its patients, doctors, appointments, and other records that ensure the smooth and successful running of the hospital. The main goal of our project is to

provide a paperless hospital system of up to 90%. In addition, it intends to automate current systems in a reliable and affordable way. In this research paper, we will discuss the research methodologies we used, related works, the proposed system, how successfully the system was implemented, the system's performance, the system's achievements, and future works.

II. RELATED WORK

Sri Lanka is a rapidly aging country of 21.7 million people and is in the late stages of both demographic and epidemiological change. Strong health outcomes have been achieved beyond what is reasonable given his economic level. The efficiency and equity of these outcomes can be largely attributed to an efficient state health system

A nation leaves a legacy by having a healthy population. It increases the overall productivity of the country. A comparably high amount of Sri Lanka's budget is earmarked for health. The maximum benefit from this money can be obtained by making health care efficient and effective. If we are able to implement the paperless hospital concept with the government reengineering process, it would be a great achievement in the information technology era. Ultimately, this would help increase productivity in Sri Lanka.

Some researchers have made positive contributions to the management systems of healthcare organizations. As a result, in the following section, we will review several related studies that experts in the field have conducted on hospital management systems.

A growing number of corporations, government entities, and healthcare organizations are switching from paper to electronic records today. Healthcare institutions use electronic medical record (EMR) systems to collect, organize, store, and retrieve patient medical records. A complex database called an EMR application is used to store and manage patient health records. EMR has replaced conventional paper medical records as the single source of information in health services for all scientific, regulatory or organizational reasons. The purpose of this study is to examine current electronic record management systems (ERMS) and assess how EMR systems will impact the healthcare industry [18].

A paper named "Development of an Automated Healthcare Record Management System" was presented in 2019[13]. The authors claim that the goal of this project was to create a smart card-based clinic record management system to enhance the University of Ilorin's clinic management service. The manual paper-based patient medical record system must be distinguished from this, and a computer-based system must be used instead.

The effort to maintain patient data and track their progress is addressed by the Hospital Clinic Maintaining System from the Doctors' perspective. The information on the doctor's patients is kept in the office. [25]'s study focuses on the factors that affect clinical recording technology acceptance. Factors that influence user acceptance and behavioral intentions towards a clinical record system are aspects related to the adoption of the UTAUT2 technology as well as factors that are new in this study [25].

Hospital management systems in the healthcare sector and development in Turkey was the subject of an article presented by Demirel in 2017. This study uses Turkey as a case study to evaluate how the management systems of private hospital clinics have changed and what services the healthcare industry offers [20]. The first step of the study was the analysis of the development of different hospital clinic management systems. The work was used to find out the advantages and use of different systems. The second part of the study evaluates the development and characteristics of management systems of private hospital clinics in Turkey. Hospital management information systems (HMIS) provide a framework for storing information related to a hospital's financial, management, and therapeutic procedures. The main use of clinic management systems is limited to tracking patient data and payment for health management services provided [20].

In order to improve clinical research and analysis, this study proposes a novel real-time system, which will facilitate access to medical information and advanced therapy. The medical records of patients who have vanished and other important documents are only a few of the problems that still plague hospitals today. This essay will deal with these problems. By assisting to replace the manual process and accelerating information processing, storage, and retrieval, the system will considerably assist medical personnel in carrying out their responsibilities. The greatest benefits of ongoing cost savings would accrue to hospitals due to increased output and general efficiency[26].

III. METHODOLOGY

Utilizing both quantitative and qualitative methods, it is possible to accurately define the procedures and methods for communicating the requirements of hospital clinic management system users. The primary goal of data collection is to find information about private hospital centers. The majority of the information is obtained through structured and unstructured interviews with subject matter experts by resolving the issue and finding pertinent documents using the documents analysis method. By using books, the internet, case studies, and

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research papers on current clinic systems as the primary data sources, all the specifics and specifications of all other pertinent data were gathered. A combination of these techniques is used to collect both quantitative and qualitative data. Client Server Architecture is one of the main methodologies employed in this study. The suggested system has been developed using HTML, CSS, JavaScript, the Bootstrap framework, and Django.

Waterfall Model

A typical variation of the techniques programming life period design for systems engineering is the waterfall design. The waterfall design outlines a linear and sequential programming approach that is generally regarded as the conventional approach to your approach's programming lifespan. With waterfall programming, there are specific goals for each stage of the development process. Imagine a waterfall amid a steep hill's cliff. The water features then proceeded to flow down the slope's side and have begun their journey down the hill; they cannot switch back at this point. The same holds for waterfall programming. Once a programming stage is complete, the growth proceeds to the next step without a direct switchback.

Project Planning and Scheduling

Project planning is a part of project management, which deals with the use of timetables such charts to plan and then report progress within the project environment. The initial project scope is set, and the best methods for completing the project are selected. Following this stage, the durations of the various tasks that must be completed in order to complete the work are listed and arranged into a work breakdown structure.

To manage our project, we have used Azure boards DevOps services. Agile planning tools are available through Azure Boards, several of which can be used simultaneously. It has features like task boards, dashboards, analytics reporting, and product and sprint backlogs. They all make it simple for project teams to monitor their workflow over the course of the development cycle.

You can sync with an on-premises Active Directory (AD) using Azure, connect to your Azure Active Directory (AD), and even extend invitations [27]. All users are restricted to access rules, which limit what they may see. In addition, once Users are eventually placed on teams, they have access to code, may review work, and can cooperate with others. An administrator adds each user to Azure DevOps.

The development team can concentrate on finishing a pre-selected set of tasks during sprints. The team's sprint backlog contains the tasks assigned to each sprint. Portfolio backlogs are not included in the definition of sprint backlogs; only product backlogs are. Some of the built-in analytics reports in Azure DevOps are control charts, cumulative flow diagrams, and burn-down charts. These can help product owners uncover workflow trends to a considerable extent. Using the Azure Boards feature, charts may be added to dashboards or viewed separately. This type of data visualization provides a project overview and aids in their ongoing progress. Without a detailed project timeline and a well-developed project strategy, a project is insufficient and cannot be successful. We must plan and schedule the project in order to reach its milestones [27].

System Attributes of Software

- Usability: Usable Software can be used repeatedly without suffering damage.
- Availability: The system must always be accessible.
- Correctness: software that is free of bugs and meets the client's needs and expectations exactly.
- Maintainability: The capacity to update, change, and manage data in order to address systemic issues.
- Accessibility: The administrator has access to the system, however depending on their individual jobs, each user has limited access.

System Requirements

This section provides a detailed explanation of the system's hardware requirements (1 table) and software requirements (2 table).

Hardware Requirement				
Mouse	Keyboard	Disk space	RAM	Processor
3 / 2 buttons	keys104	5 GB of free hard disk space and a 5400 RPM hard drive	RAM of 1 GB (1.5 GB if running on a virtual machine)	1.6 GHz or higher CPU speed

Table 1: Hardware Requirement

Software Requirements		
UI design	Database	Operating System
Visual Studio code	SQLite	Windows 11, Windows10

Table 2: Software Requirement

Information on the Project's Programming Languages

- Programming language – Python
- Front End Development – Html, CSS, JavaScript, bootstrap studio

Describe HTML

- The desired markup language for constructing Web pages is HTML.
- Hyper Text Markup Language is what HTML stands for.
- HTML explains how a Web page is positioned collectively.
- There are numerous extraordinary factors in HTML.
- HTML additives educate browsers on the way to show content material.

Bootstrap Background

Mark Otto and Jacob Thornton created Bootstrap on Twitter, and it became posted as an open supply undertaking on GitHub in August 2011.[11]

Why Use It?

- Simple to use: Anyone who knows the basics of HTML and CSS may also start the usage of Bootstrap. Bootstrap has responsive CSS that adapts to phones, tablets, and desktops.
- Mobile-first strategy: Mobile-first patterns are a central issue of Bootstrap 3's framework.253 Bootstrap is suitable to be used with all cutting-edge browsers (Chrome, Firefox, Internet Explorer, Edge, Safari, and Opera)[5],[10]

Describe CSS

- The language we appoint to fashion a Web page is CSS.
- Cascading Style Sheets is what CSS stands for.
- CSS explains how HTML factors need to seem on screens, in print, or different media.
- A lot of labor is stored thru CSS. It can manipulate the layout of numerous internet pages simultaneously.
- In CSS files, outside fashion sheets are kept.

Why do we use Html, CSS, JavaScript, and Bootstrap Studio?

We can expand powerful, creative, and responsive internet programs with the usage of Bootstrap studio. It is embedded with a huge wide variety of additives that can drag to enforce responsive internet web pages. After designing the internet web page, we can without problems export it as a static web page which includes HTML, CSS, and JS. It saves a lot of time for the builders, and it's far more customizable [10]. Bootstrap Studio generates smooth HTML, CSS, and JS this is optimized and supported with the aid of using all internet browsers.

Web Software Framework

What is a framework, framework is a library of reusable modules, and those modules offer the capability for not unusual place tasks? For example, we've modules to paint with HTTP requests, URLs, sessions, cookies, and so on, so all of the capability is baked into internet frameworks like Django.

Background of Django

A high-stage Python internet framework referred to as Django allows the short introduction of secure and reliable websites. Django, which became created with the aid of using pro programmers, handles a variety of problems related to internet development, permitting you to pay attention to growing your app while not having to invent the wheel. It is open supply and unfastened, has a robust community, amazing documentation, and a whole lot of unfastened and paid help options [1].

Django is an unfastened and open-supply framework for constructing internet apps with python. Django enables the construction of internet programs quicker and with much less code. However, websites constructed from it are secured, scalable, and maintainable at the identical time.

Django takes safety severely and allows builders to keep away from many not unusual place safety mistakes, including SQL injection, and cross-web website online scripting. Its consumer authentication device presents a stable manner to manipulate consumer bills and passwords. There are a few mounted apps all of which include Django, like admin web website online, authentication device,253 content material types, consultation frame, etc [2][3].

Database– SQLite

By default, Django routinely creates an SQLite database for the undertaking SQLite is an open supply database that allows interaction with relational databases [4]. SQLite is saved as an unmarried file. This facilitates database sharing. The layout desires of SQLite had been to permit applications to be operated without putting in a database control device (DBMS) or requiring a database administrator. SQLite does now no longer require a server to run. Hence, it's far serverless. [12]

Version Control - GitHub

GitHub is a model managing device, this model manages structured facts and the modifications made to the code from time to time in the unique database referred to as a repository. We can without problems observe the undertaking history, additionally, we can without problems revert to an advanced state. It shall we the group to paintings collectively on tasks from anywhere.

Benefits of the usage of GitHub.

- It makes it smooth to contribute to our undertaking.
- It could be a show of our work.
- Track modifications to your code throughout versions.

IV. PROPOSED SYSTEM

Objectives of the Proposed System

The hospital management system's software is user-friendly. The system's primary goals are to display and assist you in gathering the majority of information concerning hospitality services. The system is relatively easy to implement and design.

Its attractiveness will be exalted by the following points:

- Automated inventory will help in knowing the status of the available medications by reducing the stock in the inventory if the medications are given to patients.
- Computerization - Whether a hospital is tiny or large, every aspect of it will be digitized.
- No duplication - For each test that is performed on a person, an automated report is prepared and made consistently available to the interested person.
- Maintain Records - Managing health records for historical purposes will be a simpler chore for management.

Objectives of the Study were to

- To evaluate how well the two chosen hospitals are using their healthcare information systems.
- Determine how much accurate and pertinent information on the patients and doctors is provided by the hospital information system.
- Determine how healthcare professionals view the system.
- Learn about the difficulties that hospitals have using healthcare information management systems.
- Discover potential remedies for the issues found.

Design and Implementation

A hospital is a system that needs to store a lot of information. The hospital management system can be called a huge system that has to manage and process a lot of information. As information systems in a hospital, information about patients, information about doctors, equipment in the hospital system that supports hospital functions, information about medicine, information related to patient appointments, etc. can be pointed out. It is very easy for hospitals to use the computer-based system to support the overall management of healthcare facilities such as record keeping, accounting, etc.

By accurately gathering, storing, processing, and documenting information, the hospital information system supports hospital care and related administration. Knowledge of diseases, including how drugs work and their side effects, to help with diagnosis and therapy; Information about hospital performance, expenses, and the standard of patient care in the hospital management system is crucial in contemporary hospitals.

There are generally four sections to this system. The four fundamental components are information about patients, information about doctors, hospital equipment that supports hospital operations, and information about patient appointments. To learn more about the hospital, informational sections such as home, about us, and contact us have also been developed. The system may offer patients and their families' excellent care and services based on the aforementioned concept.

Technology and Efficiency

Before presenting the system, it is important to identify the necessary hardware since it is a sub-factor of technology, hardware, software, and communication. As a result, at the outset of the project, we must evaluate the hardware that is currently in place and that which is still required in order to properly implement the system. How a user enters data into a system is reflected in their training style. As a result, when entering data, the interface design and structure should be compatible. The dependence on technology is another crucial aspect. The introduction of such a system faces challenges concerning flexibility and adaptation. Healthcare organizations need up-to-date patient information from many sources, which is another problem for any healthcare organization when integrating health information systems. Therefore, more attention should be given to updating. Additionally, there should be accessibility to electricity, backups, poor infrastructure, connectivity, and high costs. These initiatives have a higher chance of success the better they are executed. The success of an information system depends on the true integration of discrete components.

Implementation of the System

This System is enabling hospitals to manage information and data related to all aspects of healthcare – processes, providers, patients, and more, which in turn ensures that processes are completed swiftly and effectively. This System brings together all information and processes of a hospital, in a single platform. The major functionalities of this system are appointment management, managing doctors, inventory management, and managing patients. Administration in the hospital relies less on paper and more on software. This reduces the need to preserve records in paper files and relies more and more on the software system. We can make the conclusion that the hospital management system is a necessary component of the evolution of the contemporary medical institution. A fantastic opportunity to develop a distinctive, effective healthcare model is to develop the hospital system software [9].

1. Create Admin dashboard

Figure 1: Create Admin dashboard

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Purpose: Figure 1 will be used to login into the Different admin perspective dashboard
Flow: After logging into the admin system, the admin will be shown his/her dashboard. Figure 1 interface shows how the admin dashboard looks. On the left side of the page, it shows how to welcome to the admin dashboard called welcome to the admin portal and on the other side, four links related to the tasks performed by the admin are shown. Accordingly, in this system, because it is a hospital management system, four links are shown in Figure 1 for the actions performed by the admin related to doctor, patient, appointment, and inventory.

- **Doctors Management system** - Provide the functionality to manage doctor records and check the total number of doctors. The purpose of this function is to add, update, view, delete doctor records, and search doctor's details from the doctors' list. Provide the ability to check all the doctor records, displaying the added doctors along with details about the doctors and giving the admin a chance to make changes and also generate doctor's reports.

2) Implement the add doctor function

Figure 2: Implement the add doctor function
Purpose: Figure 2 will be used to add doctors by the admin
Flow: click on the "Doctors" hide menu bar in the dashboard section and then go to the "Add doctor". Initially, the admin has to enter the details of the doctors by filling in the name, contact no, and email, and selecting the specialty and gender. After entering the required values, the user needs to click on the 'Submit' button to save the data entered.

- **Management of appointments** - The intended purpose of this appointment management is primarily to get doctor appointments by patients who are admitted or pre-admitted to the hospital. Accordingly, web pages have been created as a dashboard and viewpoint to take care of entering an appointment and the amount of all appointments received by the hospital as well as all the details related to each appointment. It is possible to get details about appointments through it. If there have been any mistakes in the appointments, the opportunity has also been provided for that. For that, the opportunity to update the data in any appointment is provided. Also, if there are any unwanted appointments, the opportunity to remove them from this website is provided here.

3) Create view Appointments, Search appointments & generate a report.

Purpose: Figure 3 will be used to view appointment lists, search appointments, and get all details (report) about appointments using CSV or PDF File format
Flow: When clicking on the view appointment in the appointment hide menu bar in the dashboard section, the appointment list shown on the right will be displayed. Here, then add the required appointment number in the search section on the upper right side and enter, only the details of the relevant appointment will be displayed. It is possible to generate a report by clicking the CSV button to get the appointment list as an excel sheet. If necessary, the opportunity to log out of the system has also been provided on this page. For that, a logout button is shown at the bottom left corner.

- **Inventory management** - Provide the functionality to track all the records of medical products that come into the inventory and products that leave the inventory. Whenever a medical product is sold, the data must be updated within the inventory system, and therefore the quantity is going to be deducted from the inventory list. The capability of inserting, updating, deleting, and searching for product details within the inventory stock and checking the quantity for each product. The ability to generate an inventory report. Use the barcode of the product and scan it using the camera unit that is synchronized with the system to get the medical product details.

4) Implement Generate Barcode feature and Implement the Scan Barcode function

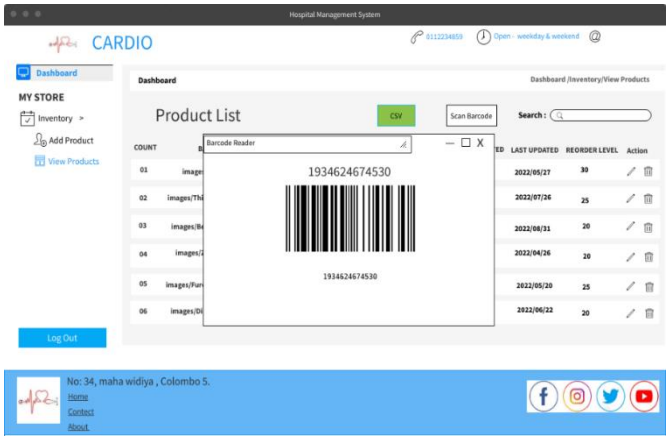

Figure 3: Implement Generate Barcode feature and Implement the Scan Barcode function

Purpose: Figure 4 illustrates how to scan a product's barcode and get the details of that product.
Flow: Once the user is on the Product List page, they can click the Scan Barcode button to scan. Once they click that button, the barcode scanning interface will pop up. When

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the barcode is recognized, it will display the relevant information according to that barcode.

- **Patient Management** - This function adds, displays, updates, and deletes details of patients. Admin can generate a report of patient details and generate a QR code for each patient. The system can scan the QR code through a camera and verify the patient later.

5) Implement a QR code scanner

Figure 4: Implement a QR code scanner

Purpose: Figure 5 will use to scan the QR code through the camera and check the details.

Flow: Once the user clicks on the Scan QR button will redirect to this interface. Users can show the QR code to the camera and it will display on the screen and show the patient's details.

V. DISCUSSION

Both difficulties and advantages frequently come along with changes. We are willing to accept the challenge and make adjustments to the conventional management system when the reward outweighs the challenge. Implementing software represents a significant departure from standard operations. It's important to recognize the difficulties up front and develop a strategy to address them if you want to implement software successfully and overcome any obstacles.

Researchers have discovered three major human problems that hinder the implementation of the HMS in the healthcare sector.

• A dearth of competent educators in the field of healthcare who are knowledgeable about HMS and related technologies.

• The poor acceptance rate for HMS Software.

• A dearth of specialists in health informatics with the necessary training to create and implement the procedures.

The requirement for data entry and data retrieval standards, the difficulty of user technical training, and network and computer maintenance concerns are other minor technical issues that obstruct the successful implementation of HMS in the healthcare sector. The majority of hospitals still have trouble implementing the Hospital Management System since some still use manual processes and others that use computerized methods find it difficult to adjust to them.

Medical professionals may be under more stress as a result of healthcare transformation brought on by digital transformation in the following ways:

1. Lack of immediate retrievals: It is quite difficult to find certain information, for example, and to recall it. The user must search through several registers to learn about the patient's details. Inconvenience and time waste follow from this.
2. Inadequate immediate information storage: It requires time and effort to properly store the information produced by numerous transactions.
3. Information is not promptly updated: Due to the paperwork needed, it is challenging to make changes to information such as patient information or a child's immunization history.
4. Manual computations are labor-intensive and subject to errors, which can lead to inaccurate results.
5. The preparation of accurate and timely reports: This activity becomes challenging since it is challenging to gather information from numerous registers.

However, if the appropriate help and instruction are given promptly, the unfavourable qualities that are listed above can be addressed.

Our software is able to handle all of these challenges and performed well. The system is relatively easy to implement and design. The system works in practically all configurations and calls for very few system resources.

- Data security.
- Ensure data precision.
- The system is under the supervision of the administrator.
- Substantially reduce manual data entering.
- Increased effectiveness.
- Interactive and user-friendly.
- minimum time necessary.

Results

Selenium Automation Testing

The Selenium Tool Suite's Selenium IDE is one of the easiest-to-use records and plays tools because it doesn't need any special setup. Firefox and Chrome both include add-ons for the Selenium IDE. The test cases and test suites can be created by a user or test case developer using the Selenium IDE and afterward modified to meet their needs.

After one of the test cases in our system has been successfully performed, Figure 6 below shows how the Selenium IDE on Firefox looks like.

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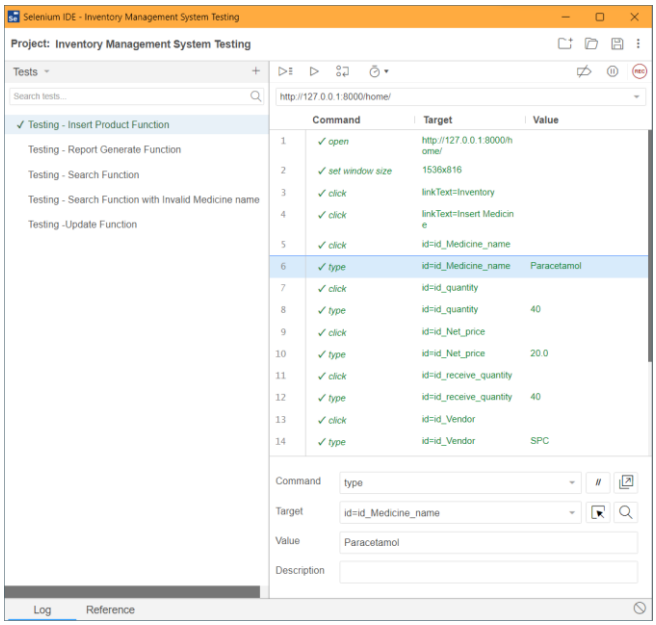

Figure 5: Automation test script (Selenium IDE)

SonarQube Testing

You can assess the Reliability, Security, and Maintainability of all the languages in your project, as well as all the projects inside your domain, using SonarQube static analysis [23]. To maintain value and reduce false positives to a minimum, we have made and will continue to make significant investments in our analyzers [22].

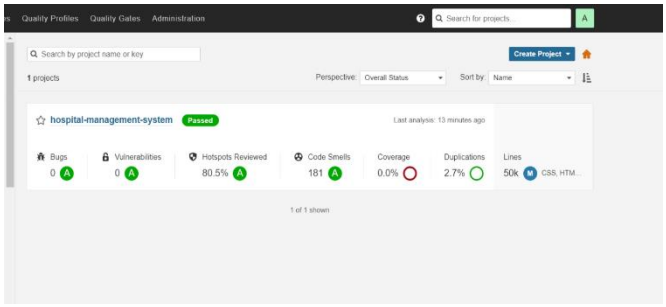

Figure 6: Overview status of the analyzed project using SonarQube

An Overview of the SonarQube Report will be displayed in Figure 7. Analyzers include rules in the SonarQube report that are applied to source code to produce issues [22]. We can correct the significant problems highlighted using this tool and generate the report once more. Figure 7 demonstrates how well the system has been constructed in accordance with developer standards.

VI. CONCLUSION

Aiming to computerize hospital operations is the Hospital Management System (HMS) initiative. The program can easily and effectively save hospital-related information while taking care of all the needs of a typical hospital.

In this article, we'll look at what a hospital management system is, what it does, and how it makes the healthcare sector more efficient. The Advanced Hospital Management System can only be accessed with a username and password. It can be accessed by administrators. They alone are capable of growing the database. Data retrieval is straightforward. The user interface is quite basic. The processing of data is swift, and it is adequately safeguarded for personal use.

The HMS, which replaces the current way of handling, sorting, searching, and maintaining hospital records, was the focus of this study. The significance and necessity of the computer and its use in the hospital are thus concluded. With less paperwork, users would spend less time waiting for their papers to be accessed, according to the database. As a result, the files took up less space and the security of the medical records was appropriate. According to the study's findings, the problem with the existing manual system of keeping medical records will be resolved by the design of hospital databases. To prevent lost files and improve record retrieval times, the study has pointed out the significance of employing electronic records for hospital records.

The experience of working on the project was amazing. It assisted us in comprehending the significance of planning, designing, and implementation in perspective of what we had previously learned from our theoretical books. By allowing us to collaborate as a team, it encouraged us to express our creativity. It also understood the value of communication and working together in this assignment. After so many hours of hard work and effort, the project was finally completed. This project underwent several compilations, debugging, error removal, bug-free, adding additional features to the Hospital Management System, and interaction to make it more predictable and effective.

According to the specifications, the full project has been created and completed. According to the testing guidelines that are followed, it is discovered to be bug-free. To expand its flexibility, this system may also include a few other functionalities. The list that follows exemplifies future considerations, such as including many different modules like pharmacy, LAB, and many others. We would like to conclude by saying that we gave our project our all during development and attempted to satisfy all of the requirements.

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REFERENCES

[1] https://www.djangoproject.com/.
[2] https://docs.djangoproject.com/en/3.2/.
[3] https://docs.djangoproject.com/en/4.1/
[4] https://www.sqlite.org/docs.html.
[5] http://www.w3schools.com.
[6] https://www.djangoproject.com/.
[7] https://www.youtube.com/watch?v=rHux0gMZ3Eg.
[8] https://www.youtube.com/watch?v=F5mRW0jo-U4.
[9]https://techvidvan.com/tutorials/django-database-connectivity/.
[10] HTML & CSS. https://www.w3schools.com/.
[11] Bootstraphttp://getbootstrap.com/.
[12] S. Consortium, "SQLite,". Available at: https://www.sqlite.org/index.html.
[13] Yahaya, S. et al. (2019). Development of an automated healthcare record management system. Adeleke *University Journal of Engineering and Technology*, pp. 79–90. Available at: https://www.researchgate.net/publication/337950678_Development_of_an_Automated_Healthcare_Record_Management_System.
[14] Stausberg J, Koch D, Ingenerf J, Betzler M. (2003). Comparing paper-based with electronic patient records: Lessons learned during a study on diagnosis and procedure codes. *J Am Med Informatics Assoc.*, *10*(5), 470-7.
[15] Benedictis A, Lettieri E, Gastaldi L, Masella C, Urgu A & Tartaglini D. (2020). Electronic medical records implementation in hospital: An empirical investigation of individual and organizational determinants. *Plos One. 15*(6), e0234108.
[16] C. Ullrich, F. Van Utterbeeck, E. Dejardin, M. Debacker & E. Dhondt. (2013). Pre-hospital simulation model for medical disaster management. In: *Proceedings of the 2013 Winter Simulation Conference - Simulation: Making Decisions in a Complex World*, pp. 2432–2443.
[17] Amarasinghe SN, Alwis S, Saleem S, Rannan-Eliya R & Dalpatadu S. (2015a). Private health sector review 2012. *Technical Reports Series No. 2. Colombo: Institute for Health Policy*. Available at: https://www.ihp.lk/publications/docs/PHSR2012.
[18] Edmund, L. C. S., Ramaiah, C. K. & Gulla, S. P. (2009). Electronic medical records management systems: an overview. *DESIDOC Journal of Library & Information Technology, 29*(6), 3–12. DOI: 10.14429/djlit.29.273.
[19] Abraham, I. & Joyce, A. C. (2016). Designing a web based hospital management system for MOUAU clinic. *International Journal of Trend in Research and Development, 2*(6), 2394–9333.
[20] Demİrel, D. (2017). Hospital management information systems in health sector and development in Turkey. *Journal of Current Researches on Health Sector*, pp. 1–12
[21] Benedictis A, Lettieri E, Gastaldi L, Masella C, Urgu A, & Tartaglini D. (2020). Electronic medical records implementation in hospital: An empirical investigation of individual and organizational determinants. *Plos One, 15*(6), e0234108.
[22] https://docs.sonarqube.org/display/SCAN/Analyzing+with+SonarQube+Scanner.
[23] https://docs.sonarqube.org/latest/.
[24] https://www.seleniumhq.org/.
[25] Mamra, A. et al. (2017). A proposed framework to investigate the user acceptance of personal health records in Malaysia using UTAUT2 and PMT'. *International Journal of Advanced Computer Science and Applications, 8*(3), 386–392. DOI: 10.14569/ijacsa.2017.080353.
[26] Ilo, S. F., Abraham, I. & C, A. J. (2015). Designing a web based hospital management system for MOUAU clinic. *International Journal of Trend in Research and Development, 2*(6), 286–293.
[27] https://learn.microsoft.com/en-us/azure/devops/boards/best-practices-agile-project-management?view=azure-devops&tabs=agile-process.