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# Hospital Management System Using Low Code Solutions

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**Abstract ~ Healthcare systems worldwide, including in India, are experiencing an unprecedented surge in demand for medical services, necessitating the adoption of efficient, reliable, and comprehensive record-keeping solutions to ensure seamless hospital operations and high-quality patient care. Traditional hospital management practices heavily rely on manual processes, which are often prone to human error, time-consuming, and inefficient, leading to delays in patient care, increased operational costs, and mismanagement of critical medical records. This study introduces a transformative approach by leveraging low- code technology to develop a robust Hospital Management System (HMS) designed to automate and optimize various hospital operations, including patient registration, medical record storage, doctor and nurse assignments, and billing processes. The proposed system assigns a unique identification number to each patient, facilitating seamless tracking of medical history and treatment records while eliminating redundancies. Its computerized billing system enhances financial transparency and minimizes calculation errors, ensuring smooth and efficient transactions. Furthermore, the system incorporates a dynamic search function that enables hospital staff to instantly check room availability, locate specific patient or doctor details, and retrieve vital medical information in real time. The implementation of low-code technology ensures rapid deployment, cost- effective development, and seamless scalability, making it adaptable to various healthcare environments. Additionally, the system supports interoperability by integrating with existing healthcare technologies such as Electronic Health Records (EHR) and Laboratory Information Systems (LIS), further improving hospital efficiency and coordination between departments. The adoption of this advanced HMS significantly enhances hospital administration by increasing accuracy, streamlining processes, reducing paperwork, and accelerating data retrieval, ultimately leading to improved patient care and operational excellence. Future enhancements will explore the integration of artificial intelligence (AI) and data analytics to enable predictive healthcare management, advanced patient monitoring, and data-driven decision- making, further revolutionizing the way hospitals function and deliver medical services.**

***Keywords: Hospital software, low code solution, data management, administration, efficiency.***

## I. INTRODUCTION

The rapid advancement of technology has transformed various sectors, including healthcare, where efficient hospital management is crucial for delivering quality patient care. Traditional hospital management systems (HMS) often rely on legacy software and manual processes, leading to inefficiencies, errors, and increased operational costs. Key challenges in these systems include difficulty in managing patient records, scheduling conflicts, inventory mismanagement, lack of interoperability, and security vulnerabilities. These inefficiencies result in prolonged patient wait times, administrative burdens, and suboptimal resource utilization, ultimately affecting the overall healthcare experience.With the growing demand for digital transformation in healthcare, the adoption of low-code platforms offers a promising solution to streamline hospital operations. Low-code development platforms, such as Microsoft PowerApps and SharePoint, enable healthcare providers to build, deploy, and manage custom applications with minimal coding effort. These platforms provide pre-built components, drag-and- drop interfaces, and workflow automation capabilities, significantly reducing development time and cost. Furthermore, they ensure seamless integration with existing hospital systems, facilitating efficient data exchange and enhanced decision-making.This paper presents a Hospital Management System (HMS) designed using low-code solutions to address key operational challenges in hospitals. The proposed system incorporates functionalities such as patient registration, appointment scheduling, electronic health record (EHR) management, billing, inventory tracking, and staff management. By leveraging cloud-based infrastructure, the HMS ensures real-time data accessibility, scalability, and security. Additionally, built-in analytics and automation features improve administrative efficiency and optimize resource allocation.Another key advantage of a low-code- based HMS is its ability to leverage predictive analytics to enhance hospital management. By analysing historical patient data, hospital workflows, and resource utilization patterns, the system can anticipate patient inflow, optimize bed allocation, and improve staff scheduling. This predictive approach helps hospitals proactively manage peak times, minimize patient wait times, and ensure optimal resource distribution, ultimately leading to improved operational efficiency and patient satisfaction. The remainder of this paper explores the architectural design, core functionalities, and advantages of the low-code- based HMS. It also discusses the potential of low- code development in healthcare digital transformation and highlights the challenges and future research directions for enhancing hospital management through innovative technologies.

## II. LITERATURE SURVEY

Hospital Management Systems (HMS) have evolved significantly, integrating modern technologies such as artificial intelligence (AI), blockchain, and machine learning (ML) to enhance operational efficiency and patient care. Traditional HMS faced challenges related to data security, inefficiencies in scheduling, and poor interoperability. Recent research focuses on improving data management, optimizing scheduling, and ensuring secure data storage using advanced frameworks. Several studies highlight the importance of distributed machine learning in managing healthcare data efficiently. One study discusses how AI/ML frameworks, combined with cloud infrastructures, enable efficient lifecycle management for healthcare systems, enhancing security, privacy, and interoperability of biomedical data. Similarly, another study explores the extraction of clinical data under large uncertainties, presenting a novel approach to modelling complex medical systems with poor identifiability conditions, particularly in anesthesia control. Blockchain-based models have been proposed to improve trust management in smart hospitals. One such approach integrates a dynamic blockchain-based trust model using the Internet of Medical Things (IoMT) to ensure secure data transmission and authentication in medical environments. Meanwhile, AI-powered scheduling systems have been developed to optimize medical appointment bookings, reducing no-shows and enhancing resource utilization in hospitals. Another area of research focuses on optimizing ICU management through AI-powered patient classification. A study in Türkiye demonstrates how machine learning can improve ICU admissions and cost management, reducing subjective decision- making and ensuring fair patient classification. Additionally, machine learning models have been applied to manage distributed healthcare data, improving patient monitoring, treatment planning, and hospital resource allocation. Hospital Management Systems (HMS) continue to benefit from emerging technologies such as cloud computing, the Internet of Things (IoT), and big data analytics. Cloud-based HMS solutions provide scalability, cost-efficiency, and improved data

accessibility, allowing healthcare providers to access patient records remotely and collaborate in real-time. A study highlights the advantages of cloud-based HMS in streamlining hospital operations, reducing infrastructure costs, and enhancing interoperability between various healthcare systems. Furthermore, IoT integration in HMS has enabled real-time patient monitoring, smart inventory management, and predictive maintenance of medical equipment, ensuring a seamless workflow in hospitals. Big data analytics is another transformative approach in hospital management, allowing healthcare providers to derive meaningful insights from vast amounts of patient data. A study explores how predictive analytics can be used to anticipate patient admission rates, optimize resource allocation, and improve overall hospital efficiency. In addition, real-time analytics enables hospitals to detect potential outbreaks, analyse treatment effectiveness, and make data-driven decisions to enhance patient care.An emerging area of research focuses on the role of digital twins in hospital management. Digital twin technology creates real-time virtual representations of hospital infrastructure, patient flow, and resource utilization. A study highlights how digital twins can enhance predictive analytics, allowing hospitals to simulate different operational scenarios and optimize decision-making for emergency preparedness, resource allocation, and staff scheduling. This approach improves patient outcomes, reduces operational costs, and enhances overall hospital efficiency by providing a data- driven strategy for hospital management. The integration of low-code solutions in HMS remains a relatively unexplored area in academic research. However, existing literature provides valuable insights into AI-driven automation, blockchain security, and machine learning applications in hospital management, which can serve as a foundation for future studies on low-code-based HMS development.

## III. PROBLEM STATEMENT

Hospital Management Systems (HMS) play a crucial role in ensuring the efficient delivery of healthcare services by integrating patient management, billing, appointment scheduling, and resource allocation. However, many existing HMS implementations suffer from inefficiencies, outdated processes, and poor interoperability, leading to significant challenges in hospital operations.One of the major issues is scheduling conflicts and resource mismanagement**,** where hospitals struggle with overlapping patient appointments, inefficient allocation of medical staff, and delays in critical treatments. These inefficiencies not only reduce hospital productivity but also affect patient experience and outcomes. Another pressing challenge is billing errors and financial mismanagement**.** Many HMS platforms still rely on manual data entry or fragmented billing systems, leading to inconsistencies in invoicing, insurance claims processing, and revenue cycle management. This results in delayed reimbursements, financial losses, and disputes between hospitals, insurance providers, and patients. Data security and privacy concerns also pose significant threats to modern healthcare institutions. Hospitals handle vast amounts of sensitive patient data, making them prime targets for cyberattacks, data breaches, and unauthorized access. Weak encryption mechanisms, lack of role-based access control, and failure to comply with healthcare regulations such as HIPAA (Health Insurance Portability and Accountability Act) and GDPR (General Data Protection Regulation) increase vulnerabilities. A compromised HMS can lead to identity theft, legal penalties, and loss of trust among patients. Furthermore, interoperability issues hinder seamless communication between various hospital departments, medical devices, and external healthcare providers. Many hospitals use legacy systems that lack integration capabilities, making it difficult to share patient records, test results, and prescriptions efficiently. This fragmentation slows down medical decision-making, increases administrative workload, and contributes to errors in patient care. Despite the emergence of AI-driven analytics, blockchain for secure data exchange, and cloud-based solutions for scalability**,** their adoption in HMS remains limited. High implementation costs, complexity, and resistance to change prevent hospitals from leveraging these advanced technologies to improve efficiency and security. Given these challenges, there is a critical need for **a** modern, secure, and intelligent Hospital Management System that incorporates automation, advanced security frameworks, and seamless interoperability. Such a system should optimize hospital workflows, ensure compliance with global data privacy regulations, integrate emerging technologies, and ultimately enhance patient care while reducing operational costs.

## VI. PROPOSED METHODS

### System Architecture

The proposed low-code HMS architecture is divided into two key components:

### PowerApps Frontend (User Interface & Application Logic)

PowerApps provides an intuitive, customizable interface that enables hospital staff to manage

critical tasks such as patient records, appointment scheduling, and inventory management with minimal coding. The drag-and-drop functionality and pre-built templates facilitate rapid deployment and easy customization based on hospital needs.

**SharePoint Backend (Data Storage & Security Management)**

SharePoint serves as a secure, scalable backend to store hospital-related data, including patient records, staff information, inventory details, and financial transactions. It provides role-based access control to ensure that sensitive information is accessible only to authorized personnel, thereby enhancing security and compliance with healthcare regulations.

**Core Functionalities**

The low-code hospital management system integrates PowerApps and SharePoint to streamline hospital operations, improve accessibility, and enhance workforce efficiency.

**Login Credentials (User Registration):**

The system provides secure user authentication, allowing hospital staff and administrators to register and log in with role-based access. SharePoint securely stores user credentials, ensuring data protection. Multi-factor authentication (MFA) can be implemented to enhance security and prevent unauthorized access.


**FIGURE 1: LOGIN CREDENTIALS**

**Nurse List:**

A centralized nurse directory enables staff to view and search for nurses based on department, specialization, and availability. The system allows efficient shift allocation, ensuring balanced workload distribution. Quick access to nurse contact details and duty status enhances hospital coordination.

**FIGURE 2:NURSE LIST**

**Attendance Tracker:**

The attendance tracking module logs staff work hours through a clock-in/clock-out system via PowerApps. Attendance data is stored in SharePoint for payroll processing. The system also supports leave and absence requests, allowing supervisors to approve or reject them digitally, ensuring proper workforce management.

**FIGURE 3: ATTENDANCE TRACKER**

**Roaster Planning:**

The system automates shift scheduling, generating weekly and monthly rosters based on staff availability. Nurses and doctors can request shift swaps, subject to approval by supervisors. Real-time updates ensure that staff members can access their schedules instantly, minimizing conflicts and enhancing hospital workflow.

**FIGURE 4: ROASTER PLANNING**

**OT Hours (Overtime Tracking):**

Overtime tracking enables accurate recording of extra work hours logged by staff. Employees can submit overtime requests, which are verified and approved by supervisors. This ensures fair compensation and prevents excessive workload distribution. The system integrates with payroll, streamlining salary calculations**.**

**FIGURE 5: OT HOURS**

**Bed Occupancy:**

A real-time bed management system monitors hospital bed availability, ensuring efficient patient allocation. When a patient is admitted or discharged, the system updates bed status automatically. Alerts notify administrators when bed occupancy reaches critical levels, optimizing hospital resource management.

**FIGURE 6: BED OCCUPANCY**

**Daily Dashboard**:

A real-time dashboard provides an overview of daily hospital operations, including patient admissions, discharges, and staff attendance. The system also tracks bed occupancy and shift status, helping administrators make informed decisions to enhance hospital efficiency.

**Monthly Dashboard:**

The monthly dashboard generates comprehensive reports on hospital performance, including staff attendance, overtime trends, patient admission statistics, and financial records. These insights help hospital management optimize workforce planning, resource allocation, and budget forecasting, ensuring efficient healthcare service delivery.

**FIGURE 7: MONTHLY DASHBOARD**

## VII. RESULTS AND DISCUSSION

The implementation of the low-code hospital management system using PowerApps and SharePoint has led to significant improvements in hospital operations, workforce efficiency, and patient care. The system integrates key functionalities such as user authentication, nurse management, attendance tracking, roster planning, bed occupancy monitoring, and real-time dashboards, providing a seamless and efficient workflow for hospital staff. One of the major benefits is its accessibility and ease of use, as PowerApps offers an intuitive interface that allows hospital personnel to manage essential tasks without requiring extensive technical expertise. Role-based access control ensures that each user can interact only with relevant data, improving security and usability. Workforce management has been optimized through automated attendance tracking, roster planning, and overtime monitoring, reducing manual errors and scheduling conflicts. The overtime tracking feature ensures transparency and fair compensation, while real-time bed occupancy tracking allows for better patient flow management, reducing wait times and improving resource allocation. The daily and monthly dashboards provide insights into staff attendance, patient admissions, financial transactions, and resource utilization, enabling hospital administrators to make data-driven decisions in real time. Although the system offers numerous benefits, some challenges remain. Internet dependency is a key limitation, as real-time updates and accessibility require a stable network connection. Additionally, low-code platforms, while flexible and easy to use, may lack the deep customization needed for highly complex hospital operations. Ensuring data security and compliance with healthcare regulations is another

critical aspect, requiring further enhancements in encryption techniques and integration with national health databases. Overall, the system has proven to be efficient, user-friendly, and scalable, making it a valuable solution for modern hospital management. Future improvements will focus on increasing interoperability, enhancing mobile accessibility, and incorporating AI-driven predictive analytics to further optimize hospital workflows and improve patient care.

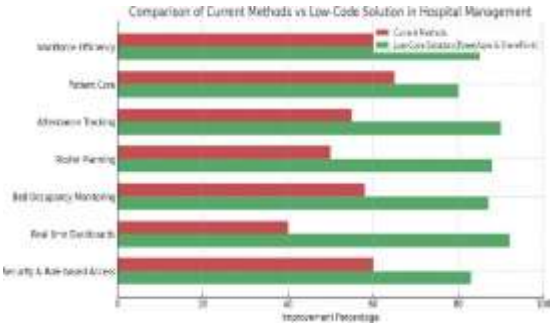


**FIGURE 8: COMPARISON BETWEEN USING CURRENT METHODS Vs LOWCODE SOLUTIONS**

## VIII. CONCLUSION

The implementation of a low-code hospital management system using PowerApps and SharePoint has significantly enhanced healthcare administration by streamlining workflows, reducing manual effort, and optimizing resource utilization. Real-time dashboards provide actionable insights, enabling hospital administrators to make informed decisions and improve operational efficiency. The system's scalability and cost-effectiveness make it an attractive choice for healthcare institutions seeking digital transformation without extensive technical expertise. Additionally, its user-friendly interface empowers non-technical staff to adapt quickly, reducing the need for extensive training and accelerating system adoption. However, challenges such as internet dependency and data security compliance must be addressed through robust encryption protocols and regulatory adherence. Future enhancements should focus on AI-driven analytics, improved interoperability with other healthcare systems, and advanced security frameworks to ensure seamless data exchange and protection of sensitive patient information. Despite these challenges, the adoption of low-code solutions marks a transformative step in modern healthcare, offering an efficient, accessible, and patient-centric approach to hospital management.

## IX. FUTURE ENHANCEMENT

Future enhancements to hospital management systems using low-code solutions will focus on improving interoperability with external healthcare systems, such as EHRs, LIS, and insurance platforms, enabling seamless data exchange and coordinated patient care through standardized APIs and protocols like HL7 and FHIR. AI-driven predictive analytics will enhance patient flow management, optimize resource allocation, and assist in clinical decision-making by analysing historical data to predict surges in patient inflow. Improved mobile accessibility will empower healthcare professionals to access and manage hospital operations remotely, with offline functionality ensuring continuity in low- connectivity environments. Security advancements will include blockchain integration to safeguard patient records, prevent unauthorized access, and automate administrative tasks like billing and insurance claims through smart contracts. Additionally, machine learning models will drive intelligent automation, optimizing staff and equipment scheduling, while NLP-powered chatbots will enhance patient engagement by handling inquiries and appointment scheduling. As low-code platforms evolve, their ability to integrate cutting- edge technologies while remaining scalable and cost-effective will further revolutionize hospital management, setting new standards for efficiency, security, and patient-centric digital healthcare administration.

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