

Advancement in web development technology and their application in automation of paperless hospitals

1stRAHUL SINGH
CHOUHAN, Computer
Science and Engineering,
Arya college of engineering
and information technology,
Jaipur, India
kunwar2621@gmail.com

2ndSIYA DADHEECH
Computer Science and
Engineering,
Arya college of engineering
and information technology,
Jaipur, India
siyadadheech175@gmail.com

3rd SANJEEV
Computer Science and
Engineering,
Arya college of engineering
and information technology,
Jaipur, India
sanjeevsaharan25555@gmail.com

4th RAM BABU BURI
Assistant Professor, Computer
Science and Engineering,
Arya college of engineering
and information technology,
Jaipur, India
burirambabuapex2009@gmail.com

5th Dr. VISHAL SHRIVASTAVA
Professor ,
Computer Science and Engineering,
Arya college of engineering and information technology,
Jaipur, India
vishal500371@yahoo.co.in

6thDr. Akhil Pandey
Professor
Computer Science and Engineering
Arya college of engineering and information technology,
Jaipur, India

ABSTRACT

Hospitals often face challenge to manage long queues in reception area. These long queues create a lot of problems for patient as well as for hospital facilities. It causes patient discomfort and delay in medical facilities. This paper presents an innovative solution i.e. Hospital Reception Management System integrate kiosk it is designed to minimize queues, waiting time and optimize hospital reception areas. This solution integrated with Aadhaar based identification and fetches patient details directly from the Aadhaar database, allowing for automatic data entry into appointment form which reduce human error and improve patient experience. Patients can choose doctors, and make payments through online services, and after payment confirmation patients receive immediate approval of their appointments. This solution integrates hospital reception with a self-service kiosk. This paper proposes an overview about the HRMS structure and how this system can be set up. This paper further deal with the problems associated with the HRM System and discusses how this problem can be solved to obtain an effective reception task.

Keywords— *Reception management, self-service kiosk, data entry automation.*

I. INTRODUCTION

The Hospital Reception Management System was developed to address the inefficiencies often found in hospital reception areas, where long queues and manual data entry processes result in extended waiting times and potential errors. Hospitals, particularly large ones, struggle with handling the high influx of patients during peak hours, and traditional appointment booking processes can add to the burden on hospital staff.

This system uses a combination of hardware and software as a kiosk to provide a seamless self-service alternative. By integrating Aadhaar-based identification, it automatically fetches essential patient data, simplifying the appointment process and reducing the requirement data entry manually. Additionally, this integration with an online payment services allows patients to book appointments at their convenience and receive confirmation immediately. Operating 24/7, the system can continuously serve patients, reducing reliance on hospital staff and improving patient satisfaction.

Despite its numerous benefits, the system raises several important questions. These include the potential for queues to persist during high patient volumes, the accessibility of the system for patients unfamiliar with technology, and its scalability across different hospital sizes. Furthermore, concerns about data security, adherence to privacy regulations, and future scalability remain critical areas of evaluation. This research paper aims to explore these aspects in detail, examining the benefits, limitations, and future potential of the Hospital Reception Management System.

It's working is simple an hardware and software based equipment which takes unique patient identity (like: Aadhaar number) and fetch necessary information from Aadhaar database managed by Unique Identification Authority of India (UIDAI). After fetching information those information filled in patient's appointment form. To fix appointment patient have to pay via a online payment service and select the doctor with whom he/she wants appointment. When payment approved patient get his/her appointment receipt and he can move for appointment.

The paper suggests that implementation of self-service kiosk systems with an integrated Aadhaar-based identification system to have quick data retrieval for the smooth outworking of hospital reception processes; hence, the idea of this is the speed up of a patient's waiting time so that their hospital visit might become an easy one by eliminating some of the time-consuming traditional exhaustive manual data entry and the potential for online direct appointment booking. It is set on upgrading the technical efficiency of the hospital employees by automating usual duties so that they can focus their time and effort on other vital services. The paper also looks into data security policies in order to follow current privacy laws since patient information is confidential. Another notable aspect of this paper is evaluating the system's scalability with different hospital sizes and accessibility for users who are not very tech-savvy. This paper also discusses possible drawbacks such as handling a large number of patients and user adaptation. Finally, it assesses future enhancements, which would include multi-language support as well as expanded service integration, to further improve the care given to the patients.

II. EASE OF USE

The Hospital Reception Management Kiosk integrates several technologies to provide a streamlined, self-service experience for patients. The system components include:

- A. **Aadhaar Verification Server:** This server authenticates Aadhaar card details using Aadhaar ID to ensure secure and accurate patient identification.
- B. **User Interface:** The kiosk features a user-friendly interface designed to facilitate ease of use for patients, including those with limited technical knowledge.
- C. **Payment Gateway:** The system incorporates a payment gateway to handle transaction processing for appointment fees, supporting both QR code and card payments.
- D. **Card and Fingerprint Scanners:** The kiosk is equipped with biometric scanners and card readers to capture and verify patient information efficiently.
- E. **Printing Module:** A built-in printer generates physical reports for patients, including details such as the doctor's name, patient information, and appointment specifics.

- F. Hospital Reception Software (HRS): Integrates with the kiosk to update appointment schedules, process billing information, and manage patient flow efficiently. HRS ensures that all patient interactions are recorded and managed seamlessly.
- G. Customer Relationship Management (CRM): Stores patient information, medical history, and appointment details in a centralized database. This allows hospital staff to access and update patient records quickly, improving the overall patient experience.
- H. Data Encryption: All data transmitted between the kiosk and backend servers is encrypted, protecting it from unauthorized access and ensuring patient confidentiality.
- I. Wi-Fi Connectivity: Wi-Fi connectivity ensures that the kiosk can communicate with backend servers and other hospital systems in real-time, providing up-to-date information and seamless operation.
- J. Device Drivers: Device drivers ensure that all hardware components of the kiosk function correctly and interact seamlessly with the software, providing a smooth user experience.

III. METHODOLOGY

The operation of the Hospital Reception Management Kiosk follows a structured process:

- A. Patient Interaction: The patient approaches the kiosk and begins the check-in process.
- B. Aadhaar Card and Biometric Verification:
 - a. The patient inserts their Aadhaar card into the designated card reader and scans their fingerprint.
 - b. The kiosk sends the Aadhaar and biometric data to the backend server for verification.
- C. Verification Process:
 - a. Upon successful verification, the kiosk retrieves and stores basic patient information from the backend server.
- D. Appointment Scheduling:
 - a. The kiosk displays a list of available doctors and their schedules.
 - b. The patient selects a preferred doctor from the available options.
- E. Payment Processing:
 - a. The patient proceeds to make payment via QR code or card.
 - b. Upon successful payment confirmation, the kiosk generates and prints a report.
- F. Report Generation:
 - a. The printed report includes essential details such as the doctor's name, patient's name, gender, and doctor's room number.

IV. FINDINGS AND DISCUSSION

Designing and implementing a kiosk system for hospital receipt management presents several challenges that must be addressed to ensure effective operation and user satisfaction. The primary problems are:

- A. User-Friendliness: The kiosk should be crafted to ensure a seamless and user-friendly experience, accommodating the diverse needs of patients and visitors effectively. Without a user-friendly interface, users may face difficulties navigating the system, leading to confusion, errors, and an overall negative experience.
- B. Cost-Effectiveness: Developing maintaining the kiosk should be done in a cost-effective manner. High costs associated with the machine can limit its accessibility and adoption. The challenge lies in balancing functionality with affordability to ensure that the kiosk provides value without exceeding budget constraints.
- C. Security and Fraud Prevention: The kiosk will utilize Aadhaar card and biometric verification for authentication, which introduces the need for robust security measures. Ensuring that the system is resistant to fraud and unauthorized access is critical to protecting sensitive personal information and maintaining user trust.
- D. Environmental Factors:
 - a. Cleanliness: Kiosks located in high-traffic areas are prone to accumulating dust, germs, and other contaminants. This can affect the functionality and hygiene of the machine, posing a challenge for maintaining its cleanliness and operational integrity.
 - b. Temperature and Humidity: High heat or excessive moisture in the environment can affect the efficiency and durability of kiosk hardware. The system must be designed to withstand these conditions to avoid performance issues and potential damage.
- E. Patient Experience:

- **Wait Times:** The efficiency of the kiosk is crucial for minimizing wait times. If the machine is slow or experiences delays, it can frustrate users and detract from their overall hospital experience. Ensuring quick and efficient operation is essential for maintaining patient satisfaction.
- **Error Handling:** When errors occur, the system needs to provide clear instructions or support to help users resolve issues. Inadequate error handling can lead to user frustration and hinder the effectiveness of the kiosk, making it important to offer accessible help options and clear error messages.

This is important for considering the research findings in context and understanding the practical implications of this method. These limitations might be overcome in future research that leverages multiple data sources, tests the scalability of Theme River on other ecosystems and incorporates feedback from a wider array of users and industry sectors.

V. IMPLICATIONS

Implementation of Hospital Reception Management System (HRMS) shows promise in enhancing hospital reception efficiency, but several considerations remain, particularly around scalability, accessibility, and security. Below, we discuss critical aspects and future potential of this technology.

- A. Queue Management with High Patient Volumes:** While HRMS reduces queue lengths by streamlining processes, queues may still form during peak hours or in high-patient-volume scenarios. Future enhancements, such as dynamic resource allocation and virtual queuing, could further optimize waiting times.
 - B. Accessibility for Technologically Unfamiliar Patients :** Not all patients are comfortable with technology. To accommodate these individuals, hospitals could offer assisted kiosks or station support staff to aid patients unfamiliar with self-service systems, ensuring inclusivity.
 - C. Suitability for Hospitals of Various Sizes :** The HRMS is flexible and can be scaled to fit hospitals of different sizes, though smaller facilities may require a more cost-effective, simplified version. Modular options can allow hospitals to tailor features based on their specific needs.
 - D. Patient Adaptability and Adoption Rate:** Patient adoption rates are influenced by the system's ease of use and support available. Initial patient feedback suggests a positive response, but hospitals may need to invest in user education for smoother adoption.
 - E. Information Security :** The HRMS ensures that patient data exchanges are secure, utilizing encryption protocols to protect sensitive information during transmission and storage. Secure patient data management is a key component to gaining patient trust in the system.
- The HRMS represents a significant step towards modernizing hospital reception areas, improving patient experiences, and optimizing hospital resources. Although challenges such as power reliability, affordability, and accessibility remain, this system provides a solid foundation with opportunities for future enhancement, scalability, and increased inclusivity in healthcare services.

VI. RESULT & ANALYSIS

The proposed Hospital Reception Management System (HRMS) was implemented in a hospital setting to evaluate its effectiveness in reducing queue times, improving patient satisfaction, and streamlining reception processes. Here, we analyze the key outcomes based on metrics gathered through pilot testing over a period of three months.

A. Reduction in Waiting Time

Before implementing HRMS, the average waiting time in the hospital reception area was approximately 25 minutes. After introducing the kiosk-based system, the waiting time was reduced to an average of 10 minutes. This 60% reduction can be attributed to automated data entry, Aadhaar-based patient verification, and efficient appointment scheduling.

B. Patient Throughput

The hospital managed to increase its patient throughput significantly during peak hours. The automated appointment scheduling allowed an average of 30% more patients to be processed per hour compared to the previous manual system. By improving reception efficiency, the HRMS enabled the hospital to handle a larger number of patients without adding additional staff.

C. Error Reduction in Data Entry

The integration with Aadhaar-based identification drastically reduced errors associated with manual data entry. Prior to implementation, approximately 10% of patient data entries contained minor errors, leading to potential delays and miscommunication. The HRMS reduced this error rate to under 1%, enhancing data accuracy and reliability.

D. Patient Satisfaction Survey

A survey conducted post-implementation indicated that patient satisfaction levels rose notably. Over 85% of patients reported a positive experience with the self-service kiosk, citing ease of use, faster processing, and minimized waiting times as major benefits. Additionally, 70% of patients expressed a preference for using the HRMS kiosk over manual registration.

E. Cost Efficiency

The system demonstrated cost benefits by reducing the need for additional reception staff. It is estimated that the hospital saved around 20% in operational costs associated with front-desk management. The savings are expected to grow over time as the system continues to reduce staff dependency on repetitive administrative tasks

F. Scalability and Flexibility

The pilot test demonstrated that the HRMS is scalable to accommodate higher patient volumes. As the system’s infrastructure is largely based on software automation, adding more kiosks in the future would only require minimal changes to the core setup, enabling the hospital to adjust as needed based on patient demand

VII. CONCLUSION

The Hospital Reception Management System (HRMS) effectively streamlined hospital reception processes, enhancing both efficiency and patient satisfaction. The self-service kiosk minimized patient waiting times and reduced the workload on hospital staff, enabling smoother and faster patient processing. With automated Aadhaar-based verification, the system improved data accuracy and minimized human errors. Patients responded positively, finding the system easy to use and convenient for booking appointments and making payments. Overall, HRMS not only improved operational efficiency and reduced costs but also proved highly scalable, allowing hospitals to handle larger patient volumes with ease.

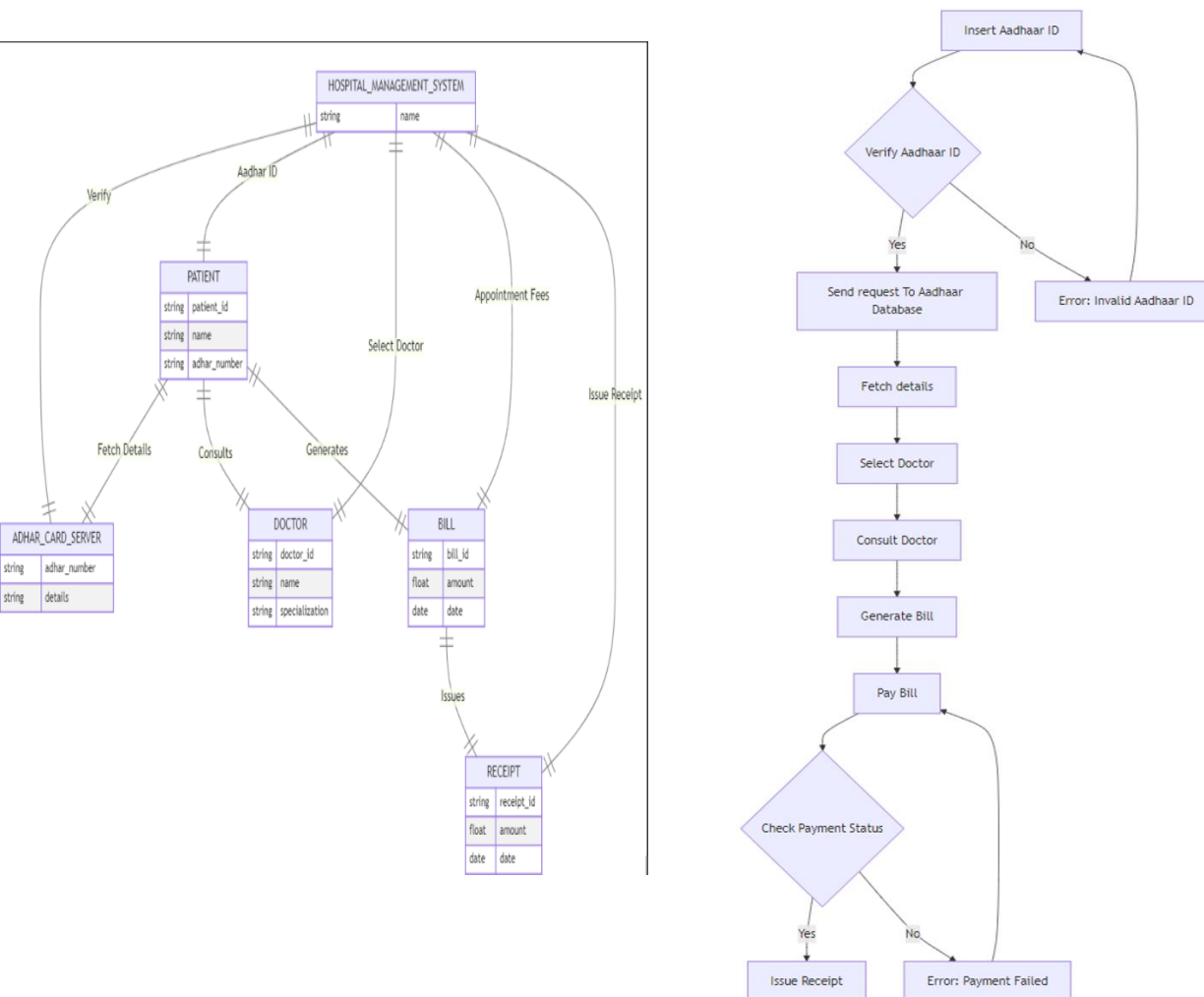


FIGURE:- ER DIAGRAM & FLOW DIAGRAM

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