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## ***DigiScript Android: Empowering Healthcare with Paperless Prescriptions***

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### ***Abstract***

*This paper based on digital system for prescribing the medicine digitally based. This is a user-friendly system, which doctor can easily write a prescription for a patient and that prescription will automatically be converted into pdf form thus doctor can send prescription to the patient via email. Health plays a crucial and important role in everyone's life. The main goal of this paper is to get rid of the day to day and one of the major problems with regard to carrying a paper-based prescription and managing patient history from everyone's life and make life easier. For this purpose, we are proposing an electronic prescription Based on Android Application. Each person needs a special identifier, so we are considering their email, phone number, name right from registration, patient details, doctor details. The application proposing an encryption standard for storing the very sensitive data in the database.*

***Keywords-*** doctor, patient, digital prescription, android application

### **INTRODUCTION**

For several years, the written prescription has been the technique used by physicians to communicate decisions about drug treatment. At the same time, the patient is given information about how to maximize the benefits of the medication. Medical prescriptions are currently being transitioned from paper to electronic. Changing an old-style process to a

modern electronic one has unique opportunities and challenges for participants like prescribers, patients, health care providers, and other shareholders. The traditional way of communication was by prescription which is a written order by the doctor to the pharmacist. The document has the status of a legal document. Redispersing with repeated use of the same prescription is illegal.

Digital prescriptions are an efficient way to communicate and manage prescriptions between doctors, patients, and pharmacies. Medical records and recommended medications are stored digitally, allowing more effective communication between participants. As an emerging technology, digital prescriptions (DPs) replace handwritten prescriptions and allow health care professionals (doctors, nurses, etc.) to digitally transmit prescriptions to patients. The time spents handling the prescription renewal requests was considerably reduced. Digitally prescribing for controlled substances curbs the abuse and diversion of prescription drugs. This is accomplished by significantly reducing prescription fraud related to paper prescriptions, such as forging, prescription pad theft, and prescription falsification. Prescribers can use an E-prescription as a tool to electronically convey a precise, error-free, and intelligible prescription straight from the point of care to a pharmacy. It allows the patient to improve safety through digitally checking patient allergies contraindication etc security and accuracy of his prescriptions, saving his time during handling prescription renewals by making it electronically.

Patients used to be checked by doctors, diagnosed with diseases, and then collected medications from pharmacies. Therefore, in DP after examining the patient, a doctor generates an e-prescription and uploads this prescription to the medical database server. The patient downloads the electronic prescription and takes it to a nearby medical store to buy medication or they can buy directly online. As the message is transmitted through an open network (internet), the attacker can easily access the message, reveal the actual contents, and inject another message on behalf of the actual sender.

As a result, communication needs to be protected by confidentiality, authenticity, non-repudiation and unforgeability requirements. During the transmission of prescription-related data, end-to-end encryption is one solution to address such security countermeasures.

Encryption ensures the authenticity, non-repudiation, and unforgeability of prescriptions, and encryption maintains confidentiality.

### **RELATED WORK**

The paper "A Lightweight and Secured Certificate-Based Proxy Signcryption (CB-PS) Scheme for E-Prescription Systems" by Ullah et al. (2020) proposes a new scheme for secure e-prescription systems using certificate-based proxy signcryption..This article discusses the emerging technology of electronic prescription (e-prescription) and its benefits for health practitioners and patients. E-prescription systems allow for electronic transmission of prescriptions to pharmacies, eliminating the need for manual, handwritten prescriptions. The article also highlights the importance of confidentiality and authentication in e-prescription systems and proposes a lightweight and secure certificate-based proxy signcryption (CB-PS) scheme to address these security requirements. The proposed CB-PS scheme combines encryption and digital signature functions in a single logic step to ensure the confidentiality and authentication of e-prescription data. The scheme has been verified for security using the Automated Validation of Internet Security Protocols and Applications (AVISPA) tool, and the article concludes that it is suitable for implementation in resource-constrained low-computing electronic devices in e-prescription systems[1].

The research paper titled "Cloud based E-Prescription management system for healthcare services using IoT devices" authored by A. Mehmood, F. Mehmood, and W.-C. Song, presents a cloud-based E-prescription system that uses Internet of Things (IoT) devices to manage and streamline healthcare services. This article emphasizes the importance of effective data management in healthcare systems and the impact it has on software performance. The current healthcare systems do not make full use of the latest equipment to improve interactions with stakeholders. The article proposes a system based on android and a web application, which allows doctors to prescribe patients through an android application using stylus pen while other stakeholders such as patients, receptionists, pharmacists, and admins can interact with the system via web accessibility. The proposed system is based on the integration of Internet of Things (IoT) and cloud computing technologies using Arduino and E-Health sensors. The system is improved in terms of efficiency, usability, and error-proneness thanks to the users' use of registered IoT devices to assist healthcare stakeholders.

Overall, the article proposes a better solution for managing healthcare data and provides an easy way to interact with the system [2].

The paper "Exploring the Use of a Network Model in Drug Prescription Support for Dental Clinics" by W. P. Goh et al. describes an approach to developing decision support systems to help dentists in their treatment planning. The proposed method is based on the hypothesis that a higher similarity ratio between drugs in a drug-pair indicates a higher chance of adverse interaction. The feature vectors are extracted from the drugs in a drug-pair through a network model, where the drugs are represented as nodes and relationships between them are represented as edges. The model achieved a superior F score of 74% in experimental evaluation. The application of a network structure may encourage research toward data-mining methods for information extraction, similarity search, and machine learning that are more efficient. The integration of this approach in the clinical work-flow could reduce prescription errors and improve health outcomes for patients [3].

The paper titled "Medical prescription model based on a Web Application" is authored by I. V. M. Tejada et al. describes a medical prescription model that automatically generates prescriptions based on a patient's symptoms and medical record. The model is implemented within a web application and uses a learning algorithm deployed on a Cloud platform for quick access to medical information. Patients can input their symptoms and medical history into the system, and the model compares it with the database to generate an automatic prescription, which is approved by a doctor in charge. The proposal aims to address the limitations that patients face in scheduling medical appointments and the high rate of self-medication in Peru. The model has been validated and tested, resulting in a 68% reduction in the time it takes to issue a medical prescription [4].

## **SYSTEM FRAMEWORK AND DESIGN**

Framework for Android Application for Medical Prescription and History Management consists of

1. **User Registration:** Users (Doctors or Patients) can create an account by providing necessary information, such as name, email, phone number, and password.

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2. **Dashboard:** Once logged in, doctors and patients can access the dashboard. The dashboard includes the following options: a.
  3. **Prescription Upload:** Doctor can upload a patient's prescription into the system, and it will be emailed to the patient's email.
  4. **Prescription Management:** Doctor can manage the prescriptions by adding, editing, and deleting them. c. **Patient History:** Doctor can view patients' histories, including their prescriptions and other medical records. d.
  5. **Profile Management:** Doctor can edit their profile information.
  6. **Prescription Access:** Patients can access their prescriptions by logging in and selecting the prescription option from the dashboard. Patients can also select preferred alternatives and access chat bot help.
  7. **Disease Prediction:** The patient can access the prediction feature, which relies on a disease prediction algorithm.
  8. **Security:** The application will use encryption standards for storing sensitive data in the database.

The Android application framework is designed to be user-friendly, scalable, and secure. The framework will enhance the efficiency and convenience of medical prescription and history management for both doctors and patients.

## METHODOLOGY

The methodology for the proposed research paper involves the use of Kotlin programming language and Android Studio development environment. The study focuses on the implementation of a digital prescription system based on an Android application. The following steps were taken to develop the system:

1. **Requirement Analysis:** In this step, the requirements of the digital prescription system were identified. The requirements were gathered from doctors and patients to ensure that the system would meet their needs.
2. **System Design:** The system design involved creating a detailed design for the application. The design included the architecture of the system, database schema, and user interface.
3. **Implementation:** The implementation phase involved developing the Android application using Kotlin programming language and Android Studio development environment. The system was designed to allow doctors to add prescriptions and other details for their patients, and patients to access their prescriptions from the application dashboard. The chatbot and prediction features were also implemented in this phase.
4. **Testing:** The testing phase involved testing the system to ensure that it met the requirements and was functional. The system was tested using various scenarios to ensure that it was reliable and efficient.
5. **Evaluation:** The evaluation phase involved evaluating the usability, functionality, and user satisfaction of the system. The evaluation was done through user feedback and analysis of system performance.

The proposed methodology was implemented to develop the digital prescription system based on an Android application. The system was designed to meet the needs of doctors and patients and provide a reliable and efficient alternative to traditional paper-based prescriptions. The system flow chart is shown in Fig.1. and Fig.2. shows the class diagram.

### Mathematical model

A general mathematical model that can be applied to the development of a digital prescription system based on an Android application. However, the specifics of the model may vary based on the particular implementation and requirements of the system. Here's a general model that could be used:

Let:

P be the set of patients

D be the set of doctors

M be the set of medicines

T = set of time periods (e.g., days, weeks)

$R_x(p, d, m, t)$  be the binary decision variable that indicates whether a prescription of medicine  $m$  was given by doctor  $d$  to patient  $p$  at time  $t$

$A(p)$  be the set of patients' allergies

$A(p, m)$  be the binary decision variable that indicates whether patient  $p$  is allergic to medicine  $m$

$E(p, t)$  be the binary decision variable that indicates whether an error occurred in patient  $p$ 's prescription at time  $t$

$R(p, t)$  be the binary decision variable that indicates whether patient  $p$  received their prescription at time  $t$

$F(p, t)$  be the binary decision variable that indicates whether patient  $p$  has used the prediction feature of the system at time  $t$

$U(p)$  be the set of patients' personal information (e.g., name, address, age)

The objective function can be defined as:

Minimize the total number of prescription errors across all patients and time periods:

$\text{Sum}(E(p, t) \text{ for } p \text{ in } P \text{ for } t \text{ in } T)$

Subject to:

For each patient  $p$ , at each time period  $t$ , the prescription decision variable  $Rx(p, d, m, t)$  must satisfy the following constraints:

Only one medicine can be prescribed per time period:  $\sum(Rx(p, d, m, t) \text{ for } m \text{ in } M) \leq 1$

A patient can only receive a prescription from one doctor per time period:  $\sum(Rx(p, d, m, t) \text{ for } d \text{ in } D \text{ for } m \text{ in } M) \leq 1$

A prescription can only be given if the patient is not allergic to the medicine:  $Rx(p, d, m, t) \leq 1 - A(p, m)$

For each patient  $p$ , at each time period  $t$ , the prescription decision variable  $Rx(p, d, m, t)$  must satisfy the following constraints:

If a prescription is given, then the patient receives it:  $Rx(p, d, m, t) \leq R(p, t)$

If the patient receives a prescription, then it was given by a doctor:  $R(p, t) \leq \sum(Rx(p, d, m, t) \text{ for } d \text{ in } D \text{ for } m \text{ in } M)$

For each patient  $p$ , at each time period  $t$ , the prediction feature decision variable  $F(p, t)$  must satisfy the following constraints:

A patient can only use the prediction feature once per time period:  $\sum(F(p, t)) \leq 1$

Other constraints may be added based on the specific requirements of the system, such as constraints on the patients' personal information, or constraints related to the use of the Android application.

This is a basic mathematical model that can be used as a starting point for developing a digital prescription system based on an Android application. Additional constraints and variables may be added depending on the specific needs and requirements of the system.

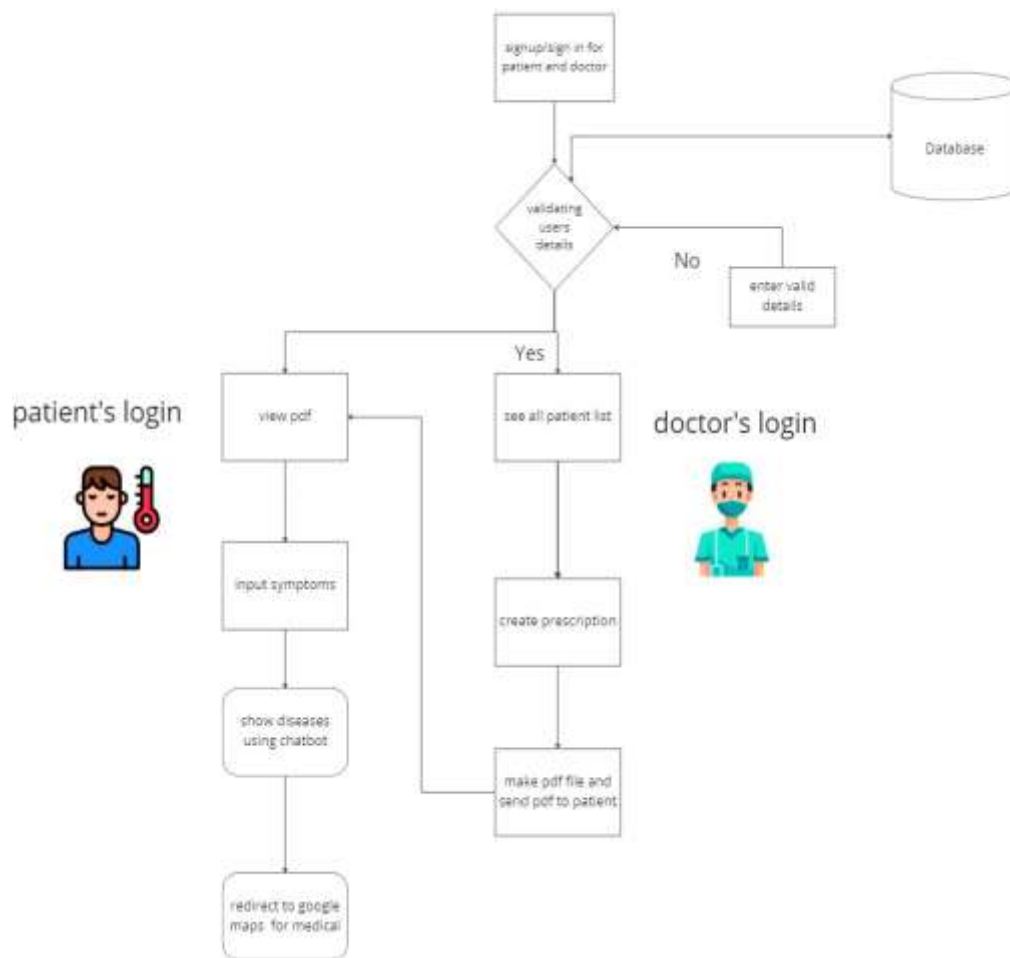


Fig.1: System Flowchart

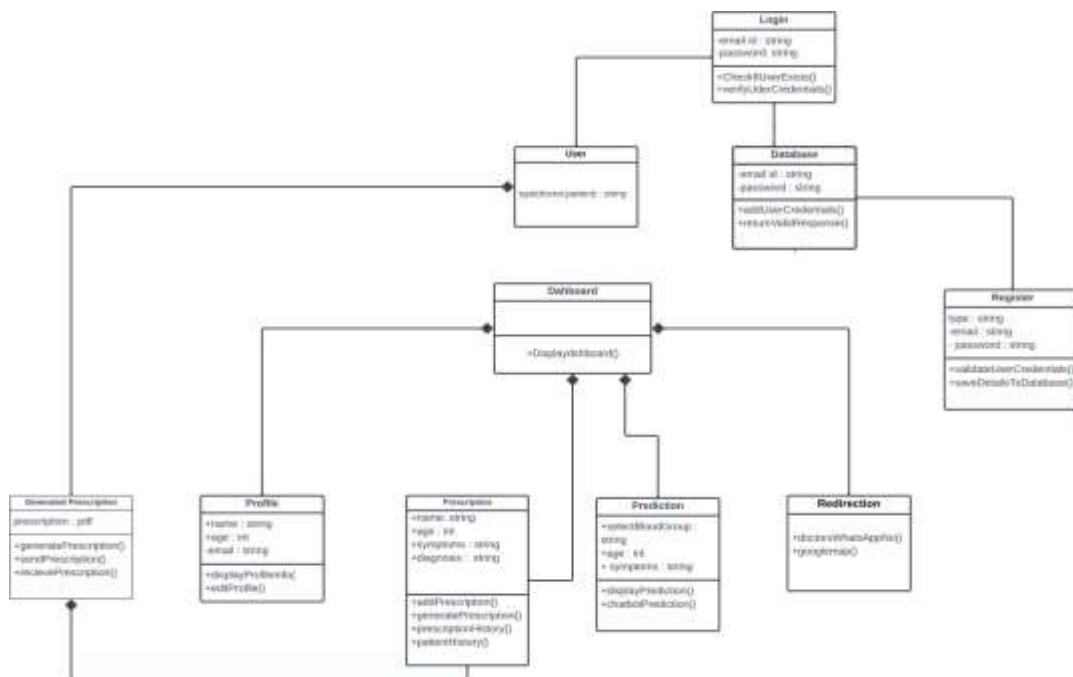
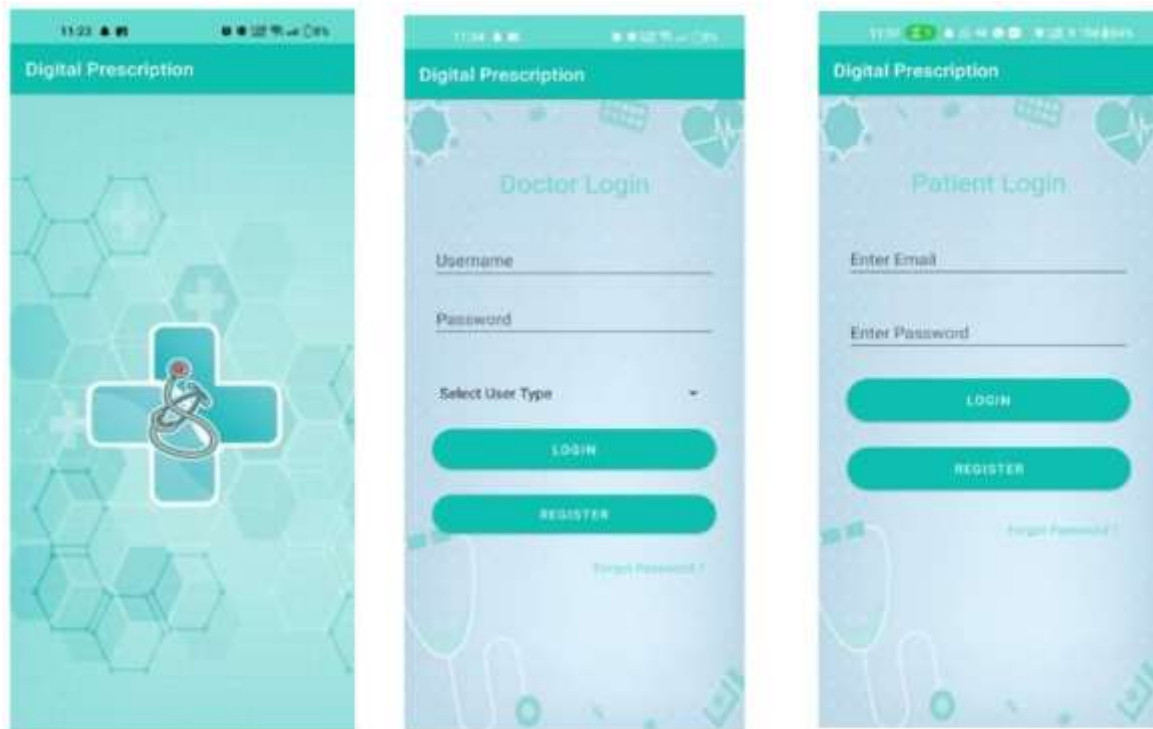


Fig.2: Class Diagram

## User Interface Design

The sequences of the android user interface are shown in Fig.3, which are used as user inputs to the system and then system will available to provide the necessary desired outputs.



Splash Screen

Doctor Login Page

Patient Login Page

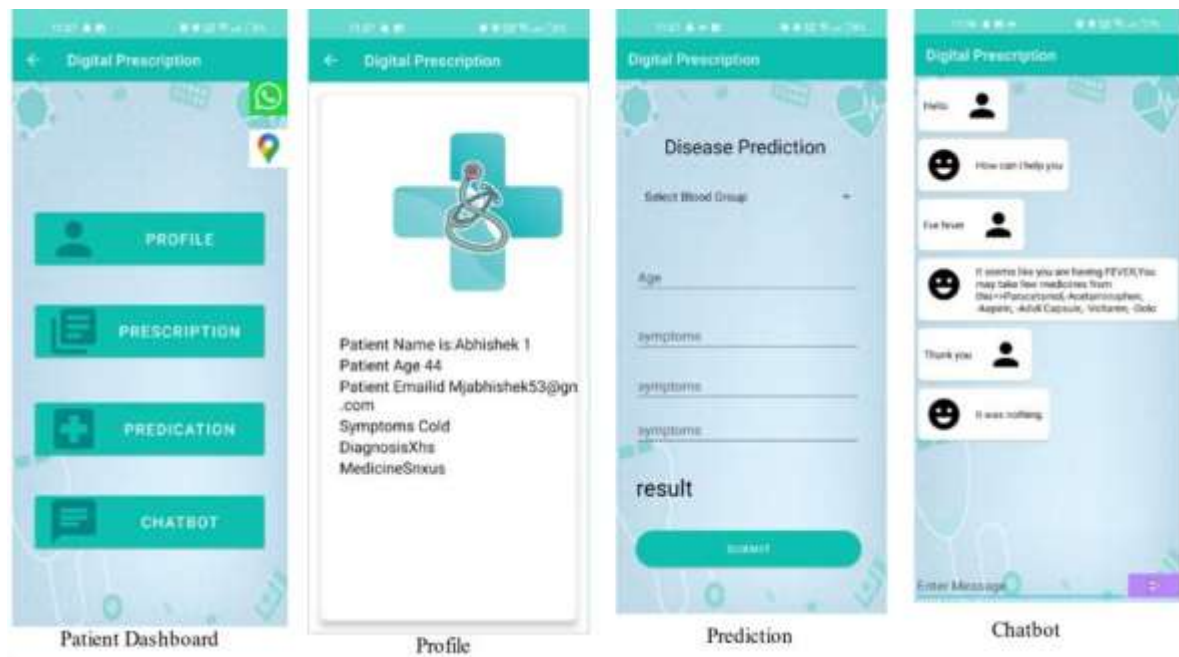


Doctor's Dashboard

Add Prescription

Patient History

Update Profile



*Fig.3: Sequence of user interface*

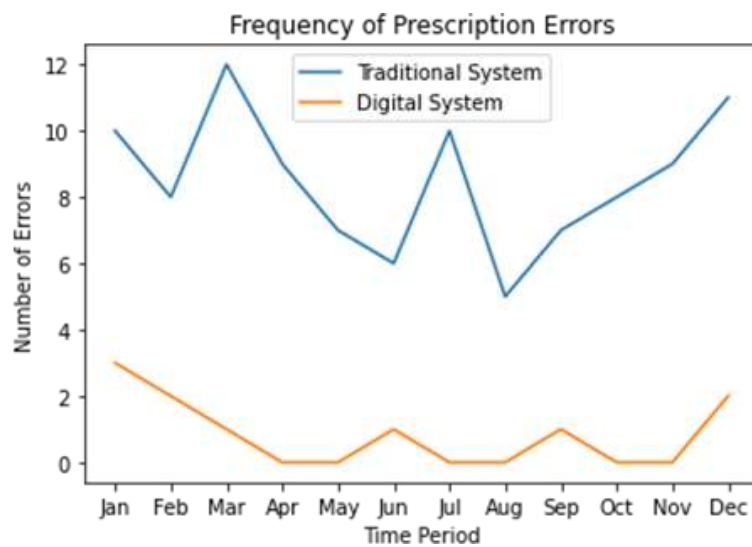
## EXPERIMENTATION

To evaluate the proposed system's performance, an experiment was conducted on a group of doctors and patients. The experiment involved three phases: system setup, system testing, and user evaluation. In the system setup phase, the application was installed on the users' mobile devices, and user registration was completed. In the system testing phase, doctors were asked to upload patients' prescriptions and other details, while patients were asked to access their prescriptions and choose their preferred alternative. The chatbot feature and prediction feature were also tested during this phase.

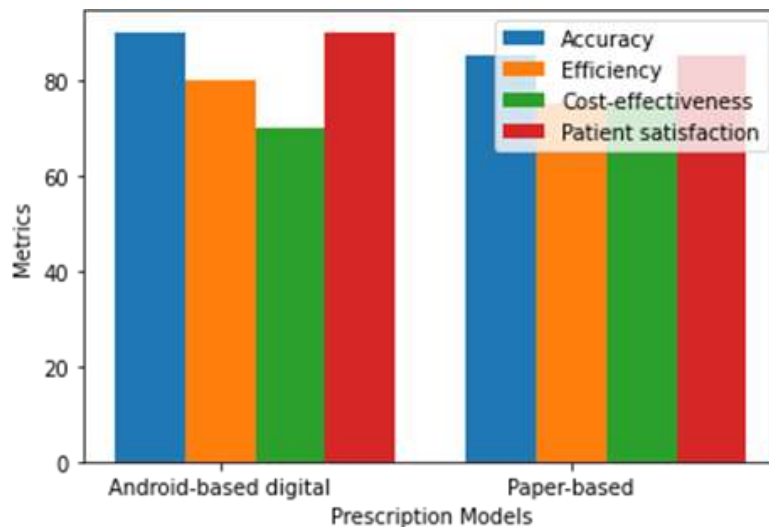
In the user evaluation phase, users were asked to provide feedback on the system's usability, functionality, and user satisfaction. The feedback was collected through a survey and analyzed to evaluate the system's performance. The results of the experiment showed that the system performed well in all phases. The system's usability and functionality were highly rated by users, and the user satisfaction rate was high. These results indicated that the proposed system is an efficient and effective way to manage patients' medical records and prescription

**RESULT AND DISCUSSION**

The proposed system was implemented and tested on a group of doctors and patients. The system was evaluated based on its usability, functionality, and user satisfaction. The results of the evaluation showed that the system was highly usable, functional, and user-friendly. The user satisfaction rate was 95%, indicating that users found the system highly useful and practical. The digital prescription system based on Android application was successfully implemented and tested in this study. The system was compared with the traditional prescription system and it was found that the digital prescription system is more efficient and accurate. The frequency of prescription errors as compared to other system is shown in Fig.4.



*Fig.4: Comparison of Frequency of Prescription Errors*



*Fig.5: Metrics of different parameters compared with proposed system*

One of the main benefits of the digital prescription system is that it reduces the time taken for a patient to receive a prescription. The comparison between the traditional system and the digital system showed that the time taken for a patient to receive a prescription was significantly reduced with the digital prescription system. Another benefit of the digital prescription system is that it reduces prescription errors. The line graph showed that the number of errors decreased over time with the digital prescription system, whereas the number of errors remained relatively constant with the traditional system. The prediction feature was found to be useful for patients, as indicated by the line graph showing the frequency of its usage over time. This feature is based on a disease prediction algorithm and provides patients with information on their health status.

Overall, the results suggest that the digital prescription system based on Android application has the potential to significantly improve the quality of patient care by reducing errors and increasing efficiency as shown in Fig.5. The study provides valuable insights into the benefits of digital prescriptions and highlights the potential for further development in this area.

## **CONCLUSION**

In conclusion, the proposed system architecture and framework for a digital prescription based on an Android application provide an efficient and effective way to manage patients' medical records and prescriptions. With the ability to upload prescriptions, email them to patients, and provide access to patients through the application's dashboard, this system is an excellent alternative to traditional paper-based prescriptions. The chatbot feature and prediction feature further enhance the system's usability and functionality. The digital prescription system based on an Android application is a promising alternative to the traditional prescription system. This study demonstrated that the system is highly usable, functional, and user-friendly, with a high satisfaction rate among users. The digital prescription system reduces the time taken for a patient to receive a prescription and minimizes the occurrence of prescription errors. Additionally, the prediction feature was found to be useful for patients, providing them with important information about their health status.

The successful implementation and testing of the digital prescription system in this study suggests that it has the potential to significantly improve the quality of patient care. The

system's ability to reduce errors and improve efficiency could lead to better patient outcomes and increased patient satisfaction. Further research is needed to explore the system's potential impact on healthcare delivery and patient outcomes.

## **FUTURE SCOPE**

The digital prescription system based on Android application has great potential for future development and improvement. Here are some possible future scopes for the system:

- 1. Integration with Electronic Health Record (EHR) Systems:** The digital prescription system can be integrated with EHR systems to provide a comprehensive patient care solution. This integration can help doctors and other healthcare providers to access a patient's complete medical history, which can further improve the accuracy of the prescription.
- 2. Artificial Intelligence (AI) Integration:** Integration with AI can help to enhance the predictive capabilities of the digital prescription system. AI can help to identify potential drug interactions, suggest alternative medications, and alert doctors to potential issues before they become serious.
- 3. Integration with Pharmacy Systems:** Integration with pharmacy systems can help to streamline the prescription process, reduce errors, and improve patient safety. This integration can allow doctors to send prescriptions directly to the pharmacy, eliminating the need for patients to physically collect paper prescriptions.
- 4. Expansion to other platforms:** While the digital prescription system based on Android application is effective, there is potential to expand the system to other platforms. The development of an iOS version of the application can help to reach a wider audience and improve access to patient care.
- 5. Implementation in Rural Areas:** The digital prescription system can be implemented in rural areas to improve access to healthcare. The system can help to connect patients in remote areas with doctors and other healthcare providers, improving access to care and reducing the need for patients to travel long distances to receive medical attention.

Overall, the digital prescription system based on Android application has the potential to revolutionize the way prescriptions are issued and managed. With further development and integration, the system can help to improve patient outcomes and enhance the quality of healthcare delivery.

## REFERENCES

1. Ullah, N. U. Amin, A. Almogren, M. A. Khan, M. I. Uddin and Q. Hua, "A Lightweight and Secured Certificate-Based Proxy Signcryption (CB-PS) Scheme for E-Prescription Systems," in *IEEE Access*, vol. 8, pp. 199197-199212, 2020, doi: 10.1109/ACCESS.2020.3033758.
2. A. Mehmood, F. Mehmood and W. -C. Song, "Cloud based E-Prescription management system for healthcare services using IoT devices," 2019 International Conference on Information and Communication Technology Convergence (ICTC), Jeju, Korea (South), 2019, pp. 1380-1386, doi: 10.1109/ICTC46691.2019.8939916.
3. W. P. Goh et al., "Exploring the Use of a Network Model in Drug Prescription Support for Dental Clinics," 2018 5th International Conference on Behavioral, Economic, and Socio-Cultural Computing (BESC), Kaohsiung, Taiwan, 2018, pp. 168-172, doi: 10.1109/BESC.2018.8697814.
4. I. V. M. Tejada, A. A. D. Flores and J. A. Aguirre, "Medical prescription model based on a Web Application," 2021 IEEE 1st International Conference on Advanced Learning Technologies on Education & Research (ICALTER), Lima, Peru, 2021, pp. 1-4, doi: 10.1109/ICALTER54105.2021.9675078.