Improving the Accessibility of Health Services through the Implementation of Mobile-Based Applications

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ABSTRACT: Advances in information technology have a significant impact on various aspects of life, especially in health services. The development and emergence of Innovations in mobile technology are essential to transform and improve accessibility, efficiency, and quality of health services. This research focuses on Karangampel Community Health Center, despite its comprehensive services and the existence of operational challenges, limited by ineffectiveness in the process of report data collection system to transaction services. The purpose of this research is to develop a mobile application to improve the transaction process of reporting drug purchase data. This can help improve administrative efficiency. By using the observation method and the Systems Development Life Cycle (SDLC) as a system design, then testing using black box and Mental Model Representation, resulting in a value of 90%, indicating that the application is feasible to use. Through the implementation of mobile applications, health services can facilitate interaction between patients and health service providers regarding operational activities. In addition, this application also facilitates health service providers in recording patient histories, monitoring schedules, and developing treatment plans electronically, real-time ambulance calls, as well as drug purchase service features, to transactional reporting accessible via mobile.

KEYWORDS: Health Service Applications, Mobile Applications, Digital Pharmacies, Transactions, Emergency Units.

I. INTRODUCTION

In the era of globalization and the development of information technology, digital transformation has become a necessity, including in the healthcare sector [1]. The use of mobile apps in the context of health services does not only reflect technological progress but also an innovative means to improve transaction processes and data reporting [2]. The utilization of this technology not only provides easy access for patients but also provides effective solutions for healthcare providers to improve operational efficiency and service quality.

in facing the challenge of increasing transaction volume and the demands for rapid and accurate information, mobile applications become a bridge that connects patients with healthcare providers [3]. This research is a development of previous research highlighting operational challenges related to the effectiveness of patient registration systems to information services around community health centers [4]. This research is a continuation of that approach, with a digital pharmacy focus on the development of mobile applications aimed at improving the efficiency of drug purchase services and data reporting transactions related to purchase history, with the hope of making a positive contribution to improving administrative efficiency and reducing queues, this application not only streamlines administrative processes, but also significantly reduces queues, increases convenience, and speeds up services for users[5][6]. This research was centered at the Karangampel Community Health Center which is one

of the community health service providers, the health center is located at the Address: Jl. Lapang Bola Desa Benda No.10, Benda, Kec. Karangampel, Kabupaten Indramayu, West Java 45283.

Karangampel Community Health Centre has implemented digital health services in monitoring doctor's schedules, recording patient history, developing more intensive treatment plans, and emergency calls electronically[7]. The ability to upload and access medical documents, inspection results, and other information safely [6] [8], ensures the accuracy of data required for diagnosis and treatment[9] and also reduces the risk of loss or leakage of drug stock data. So the additional feature of digital pharmacy is expected to provide a new dimension in the management of transaction services and drug purchases at the Karangampel Community Health Centre service, By implementing these features in mobile applications, health services can improve operational efficiency, optimize patient experience, and strengthen the overall quality of health services. The implementation of mobile applications can bring positive changes, not only in operational efficiency but also in improving patient experience and strengthening the overall quality of health services[10]. The practical implications and recommendations that arise from this study not only offer a deep view of the potential transformation of health services through mobile applications [11] [12] but also provide a foundation for further development that supports the innovation and effectiveness of health care systems [13]. The

mobile application is the main key to converting the paradigm of health service, integrating technological innovation in aspects of data transaction and reporting with the main objective of improving the overall welfare.

RESEARCH METHODOLOGY

This research implements mobile-based applications in health services using the System Development Life Cycling (SDLC) method. a structured approach in designing and building information or software systems includes, problem identification stages, data collection, system requisition, system design, implementation, and Black Box testing is carried out to evaluate application function and performance. Furthermore, app maintenance is carried out systematically. The design methodology of the study is also based on the prototype designer, allowing model-structured creation described in that chart in Figure 1.

Figure 1. Research Stages

A. Identification of problems

The initial step of this study involves the analysis stage of the needs of the relevant parties in health services. Based on the analysis results, it was concluded that while the Karangampel Public Health Center provides comprehensive health services, this study highlighted the continued operational challenges, especially related to ineffectiveness in the process of data collection systems ranging from registration to transactions. These processes are at the heart of healthcare management, and lack in terms of effectiveness may affect various aspects of operations and user experience.

- Ineffectiveness in the Data Collection System:

  Data collection processes of pharmacy operational services to transactions are still facing obstacles in terms of effectiveness. This includes problems like data input errors, recording delays, and lack of access for end users.

- Sustainable Operations Challenge:

  Operational obstacles continue to create obstacles in providing optimal health services. These challenges can include increased patient wait times, administrative confusion, and a lack of accurate and fast data.

- Inefficient reporting of data related to drug purchase history transactions:

  Ineffective systems also affect the process of reporting data related to drug purchase history transactions. The inability to collect and report data quickly can hinder effective analysis, treatment planning, and decision-making.

B. Data Collection

At this stage, the researcher conducts observation to collect data by observing and taking the data required for research [10], the author conducts direct observations to the Karangampel Health Center, The data obtained was the number of patients who received treatment and the availability of drugs.

C. System Analysis

System analysis is used to define and describe system requirements in detail. With system requirements analysis, it is expected to be fully described as components of a system with the objectives of identifying, and evaluating the problems and needs by the expected. The System Requirements Specifications for building a mobile-based application for health services include:

- Operating System: Microsoft, Windows, or Linux
- Server: using Xampp (MySQL and Apache package).
- Text Editor: Android studio

The system design stage is carried out to produce an initial application model that reflects user needs. The results of this analysis are a system design that will guide system development to the next stage. This design includes an overview of the operational system that currently exists at the Karamgampel Community Health Center. By identifying the ineffectiveness of the process of data collection to transactions, the main objective of the study is to build an innovative solution through mobile app development. This app is directed to improve the transaction process and report data related to patients at the Public Health Center. Through the implementation of this application, it is hoped that it can address the problems that have been identified, improve operating efficiency, and improve the quality of overall health services. The current design image or operating system can be seen in Figure 2.
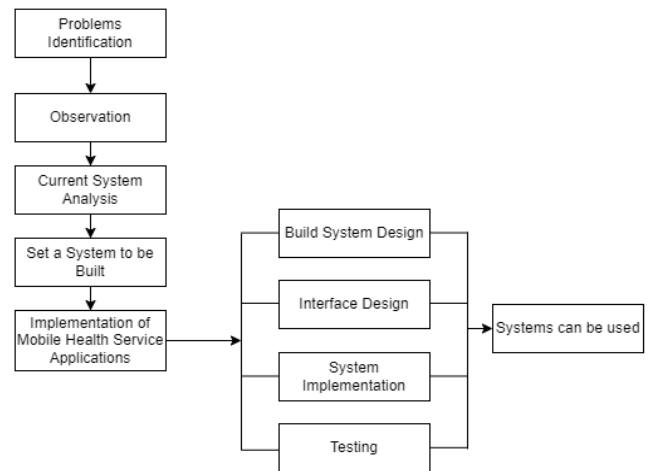

Figure 2. System analysis in progress

D. System Design

System architecture designers in implementing mobile-based applications describe the structure and flow of network connections that occur. This architecture includes the main components, the relationships between components, and the way data and information flow in the system, ensuring safe, efficient, and reliable network connections in providing health services. The design is explained in the chart in Figure 3.
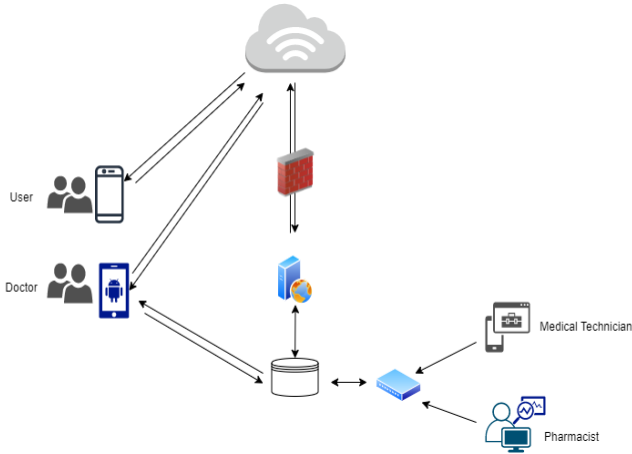

Figure 3. System design

E. Implementation

System implementation in implementing mobile-based health service applications is a critical stage that involves converting concepts and designs into real solutions that can be used operationally. The implementation phase involves implementing the code using a programming language to create a comprehensive information system. The following displays the implementation of the system that has been developed, including the main menu that provides access to various features functioning as a starting point from which users can explore and use various aspects of the app such as in Figure 4.
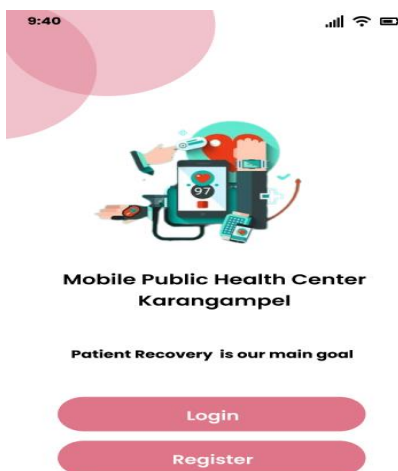

Figure 4. Main page

Registration pages such as Figure 5. allow users to create new accounts or profiles. The purpose of the registration page is to collect information from the user needed to create an account and provide full access to the features or services provided.
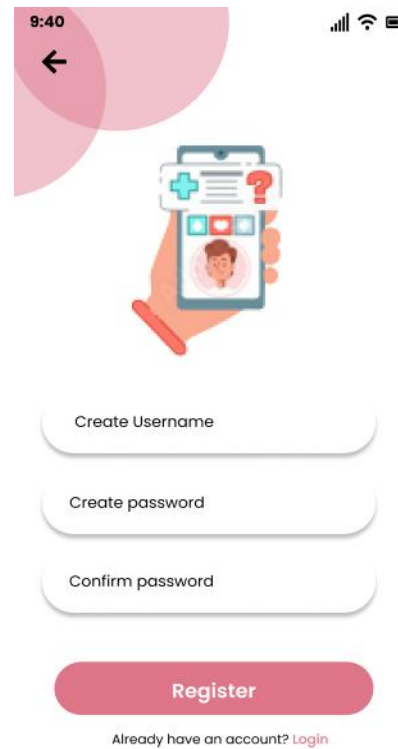

Figure 5. Registration page

The Login Page like Figure 6 enables users to access systems by inserting security credentials, such as the user's name and password. The login button is an element that embarks on an authentication process after users identify information. When pressed, the system will verify user credentials.
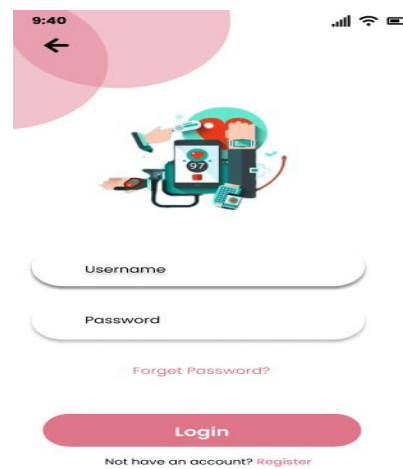

Figure 6. Login page

The Main Menu pages are like Figure 7. containing various services available in the Karangampel Public Health Center, namely: Patient Registration, Examination of Medical History, Delivery of Referral Letters, Drug Purchase, Transactions, and Summoning Emergency Units.
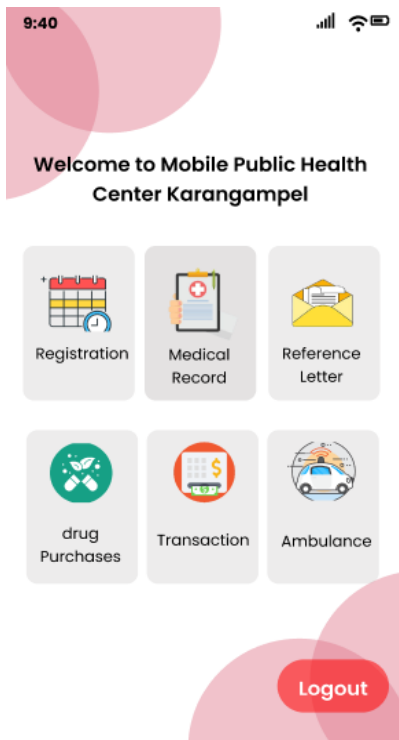

Figure 7. Menu page

The patient's Registration page as in Figure 8. contains a menu of treatment registration service options for prospective patients, namely there is a registration service for old patients and new patients.

Figure 8. Patient Registration Page

The New Patient Registration page as in Figure 9. is a registration service for new patients who will register for treatment at the Karangampel Community Health Center.

Figure 9. New Patient Registration

The
Community Health Center Reservation service page is in Figure 10. is a registration service for existing patients who will register for treatment at the Karamgapel Community Health Center, so there is no need to register patients but instead fill in the reservation schedule for the health center they will go to.
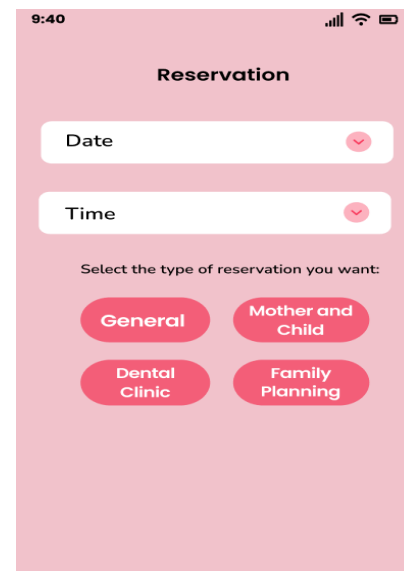

Figure 10. Reservation Service Page

Reservation Data page as in Figure 11. is the result of the old patient registration service which has input the reservation schedule, so that it can make reservations on the queue for treatment.
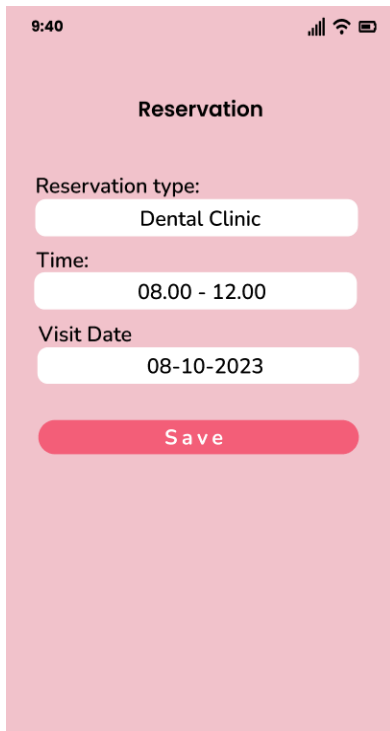
Figure 11. Reservation data page

Medical Record Result pages such as Figure 12. provide access to patients or the authorities to see or manage patient electronic medical records. This includes the patient's medical records, diagnosis, treatment, and other medical information related to the patient's medical history.
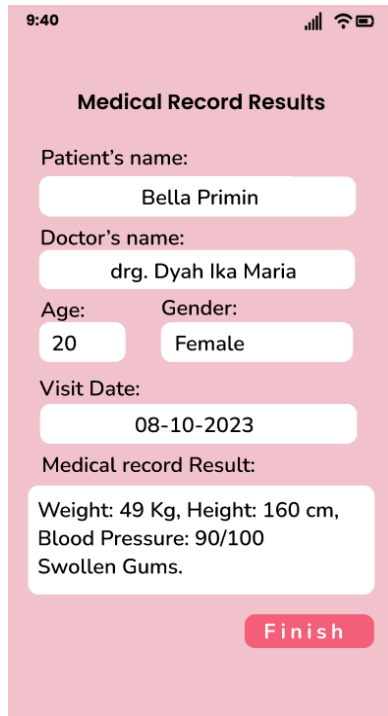

Figure 12. Medical Record Results Page

The A referral Letter page such as Figure 13. allows an individual or patient to apply for a referral letter from a doctor or health care provider. The referral letter is usually necessary to obtain further health services, such as consulting a

specialist or undergoing an examination at the hospital or other medical facilities.
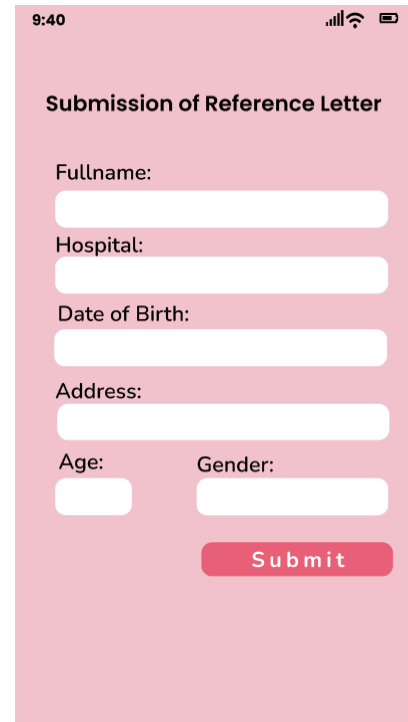
Figure 13. Referral Letter Page

Drug purchase pages such as Figure 14. provide users with information and options to buy drug products or health supplements. This is generally related to pharmacies at the Public Health Center which allows users to find, choose, and buy drugs or other health products.

Figure 14. Drug purchase pages

The Product Catalog Page such as Figure 15. presents a product catalog that includes different medications and health supplements available for purchase. Each product is

accompanied by individualized information, including active ingredients, indications of use, dosage, potential side effects, and use clues. This information helps users make informational and safe decisions.
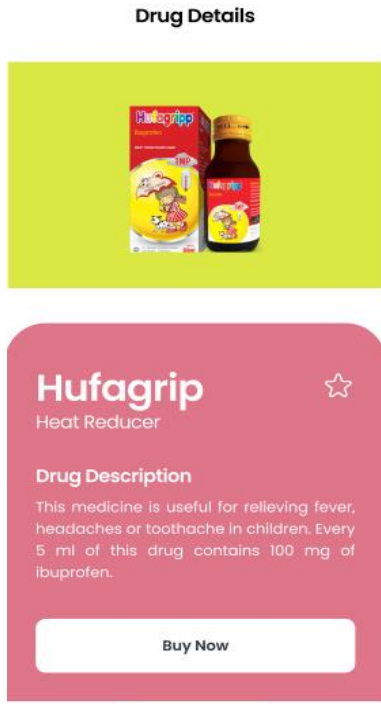

Figure 15. Product Catalog Page

The Purchasing Medical Prescription page is shown in Figure 16. allows users to purchase prescription drugs at the digital pharmacy.

Figure 16. Purchasing Medical Prescription page

The Prescription Transaction page is in Figure 17. The Prescription Transaction page is like Figure 17. is a page that contains the prescription drug purchase details form.
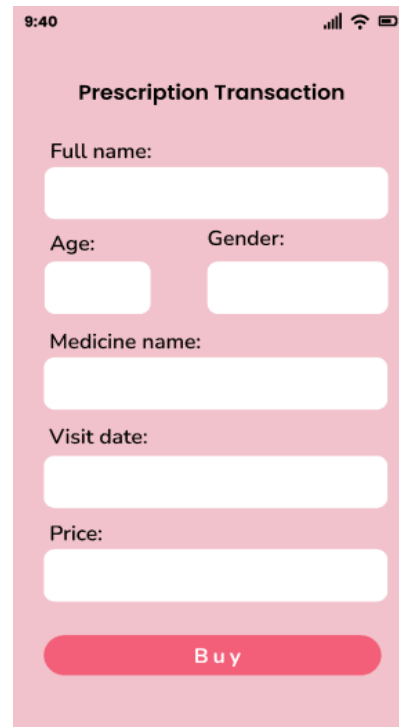
Figure 17. Prescription Transactions page

The Transactions page such as Figure 18. allows users to carry out various transactions related to health services. This page is designed to facilitate transaction processes quickly, safely, and efficiently.

Figure 18. Transactions page

Emergency Unit pages such as Figure 19. provide ways for individuals to seek emergency medical assistance or emergency department assistance in urgent situations. This page presents an emergency phone number that can be contacted by users in an emergency.

Figure 19. Emergency Unit Call Page

Table 1. BlackBox Testing

No	Menu	Data Field	Testing	Results Obtained	Conclusion
1	Main Page	Login	True	The system will provide access to the user's login page	Success
		Register	True	The system can display a registration form for users who do not have an account	Success
2	Login	Username Password	True False	The system will deny access to login and display the message "Username and Password do not match"	Success
		Username Password	True True	The system accepts the login and goes directly to the main menu of the system.	Success
3	Register	Username Password Confirm Password	True True True	The system saves the user data correctly. Then return to the login page	Success
4	Reservation Service	Date Time Reservation type	True True True	The system can save the reservation date The system can save the reservation time The system can save the reservation type	Success Success Success
5	New Patient Registration	Full Name Date of Birth No Handphone Address Age Gender	True True null True True True	The system cannot save the data in the database but will display "fill in the data fields completely"	Success
		Full Name Date of Birth No Handphone Address Age Gender	True True True True True True	The system can save patient data in the database	Success
6	Medical Records	Patient's name	False	The system cannot display the results of the patient's medical record history	Success
		Patient's name	True	The system can display the results of the patient's medical record history	Success
7	Reference Letter	Full Name Hospital Date of Birth Address Age Gender	True True True True null True	The system cannot save patient referral letter submission data into the database	Success
		Full Name Hospital Date of Birth Address Age Gender	True True True True True True	The system can save patient referral data in the database	Success
8	Drug Purchases	Non-medical prescription	null	The system can save the user's non-prescription drug purchase details in the database	Failed
		Medical Prescription	True	The system can save the user's prescription drug purchase details in the database	Success
9	Transaction	Button Menu Transaction	True	The system will display the results of the user's transaction history	Success
10	Emergency Department	Call Button	True	The system can make a call to the Emergency Unit	Success

F. Testing

The testing of this study was carried out through a black box method approach, namely the testing system carried out by testing the functionality of the input system and the resulting output[9]. In addition, the Model Mental testing method is a representation of the concept so that it is easier to understand[14] through a testing system analysis of programs created to measure satisfaction levels, ease, and convenience of users when running the program [13] [15].

Based on the tests that have been carried out, results can be obtained based on conclusions. consists of 10 menus in the mobile application, by testing the data fields, each of which has a value to meet Success, it can be concluded that there is only 1 menu with a null testing value resulting in a failed conclusion obtained from the overall calculation. Accuracy = $\left(\frac{\text{Number of Correct Menu Items}}{\text{Total menu Items}}\right) \times 100$ produces an average accuracy value of 90%, calculated from 9 of the 10 menus successfully tested correctly, this number reflects the extent to which the application or system has passed functional tests on various menus or features tested, this shows the success and effectiveness of the application in meeting user needs. The conclusion results from these calculations are recorded in Table 1.

This test was carried out by looking at the development of the many application users within a period of 4 weeks, to provide an assessment of how the application is used, including efficiency and convenience for users. The test accuracy results can be seen in Figure 20.
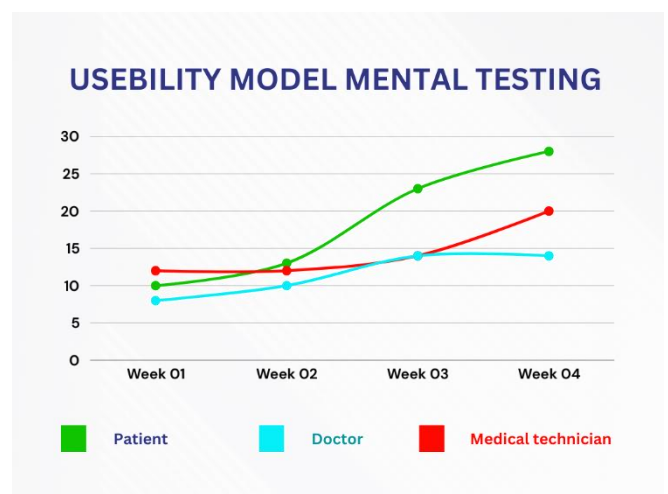

Figure 20. Usebility Model Mental Testing

Based on the results of the test, both have results with an average of 90% for convenience and effectiveness and the feasibility of the app's use.

II. RESULT AND DISCUSSION

The research results show that the implementation of mobile applications to improve health services using the SDLC method was developed to user specifications and needs. After going through a series of system design stages to coding implementation and functionality testing using the Black box method, which measures application capabilities based on input and output functions, it produces an average value of 90%, this shows that the system representation functions well and is easy to understand by users, making This application is worth using.

Through the implementation of this mobile-based application for health services, it is possible to maximize administrative efficiency in purchasing medicines at the Karampel Community Health Center service. The implementation of this feature aims to increase operational efficiency. Reporting data related to drug purchase history transactions, optimizing patient experience, and strengthening the quality of health services. Overall, the application not only streamlines administrative processes but also significantly reduces queues increases convenience, and speeds up service for users. Apart from that, this application also facilitates health service providers in recording historical drug purchase transactions, monitoring doctors' schedules, and patient medical history results, and preparing treatment plans electronically. In implementing the implementation, it is hoped that it can provide comfort in obtaining fast and precise health services, such as a system for calling emergency rooms quickly and accurately. Medical documents, examination results, and other information can be uploaded and accessed securely, minimizing the risk of information loss or leakage. This reporting system can also help with real-time data analysis.

CONCLUSIONS

From the above discussion, increasing accessibility of health services through the implementation of mobile-based applications, it can be concluded that the Community Health Center mobile application has been designed and developed to provide comprehensive information and services related to the Karangampel Community Health Center, to make it easier for patients to carry out digital drug purchase transactions, monitor doctor's schedules, register for treatment, patient medical history results, and prepare intensive care plans electronically, up to calling the emergency department. The system modeling that has been created can make it easier for medical technicians and doctors to facilitate operational activity processes so that they can improve health services to the community efficiently.

This research uses a qualitative approach through observation to evaluate the effectiveness of mobile applications in improving health services. The research results show that implementing this application can improve operational efficiency, optimize patient experience, and

strengthen the overall quality of health services. Thus, this mobile application has great potential to change the paradigm of health services by bringing technological innovation into aspects of data transactions and reporting.

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