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Optimizing Human Resource Data Digitalization Processes In Clinics Through Mobile-Based Application Using A Prototype Method

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Abstract: This study aims to develop a mobile-based application to optimize the digitalization process of human resource data management in clinics. The existing manual system was found to be inefficient, prone to data loss, and time-consuming. By applying the prototype development method, this research successfully produced a mobile application that allows users to input, store, and retrieve employee data more accurately and efficiently. The application was designed with separate modules for doctors, nurses, and administrative staff, incorporating user-friendly interfaces and data validation features to minimize input errors. User testing and feedback revealed that the application enhanced the speed and accuracy of data processing, improved accessibility, and supported real-time data updates. The results suggest that mobile technology can play a significant role in transforming data management practices in small-scale healthcare institutions. This innovation is expected to serve as a model for future digital transformation efforts in similar settings.
Keywords:Mobile Application, Digitalization, Human Resources, Clinics, Prototype Method

INTRODUCTION

Advancements in information and communication technology have brought significant changes across various sectors, including healthcare services. Technology has become a key component in enhancing operational effectiveness and efficiency, particularly in data management and information systems (Laudon & Laudon, 2017). Clinics, as frontline healthcare providers, are required to manage data quickly, accurately, and in an integrated manner, especially human resource (HR) data such as doctors, nurses, and administrative personnel. Manual data management practices tend to be inefficient, time-consuming, and prone to input errors or data loss (Jogiyanto, 2005).

In organizational management, human resources are considered valuable assets that directly contribute to service quality and success (Hasibuan, 2017). Therefore, HR data must be managed using well-structured information systems. An information system is defined as a set of organized procedures that, when executed, produce information to support decision-making and organizational control (O'Brien & Marakas, 2010). One approach to improving the efficiency of data management is system digitalization, which involves transforming conventional processes into technology-based systems (Stair & Reynolds, 2012).

Mobile-based applications have grown rapidly and are widely adopted in information systems due to their flexibility, accessibility, and ability to present real-time data (Shelly & Rosenblatt, 2011). These systems support organizations that require high mobility and fast access to information (Bocij et al., 2008). This is particularly relevant for clinics, especially in administrative operations and HR data documentation.

In developing mobile-based information systems, selecting the appropriate software development method is essential for ensuring system success. A widely used method is the prototype approach, which involves iterative development that allows users to view early versions of the system and provide feedback before full-scale development (Pressman, 2014). This method is effective for user-oriented systems, as it enables developers to understand user needs directly through quick and flexible iterations (Satzinger et al., 2010). The prototype method is highly recommended in user-driven system development, as it fosters continuous interaction between users and developers, ensuring the system is built based on real-world needs (Kendall & Kendall, 2011). This method emphasizes building an initial model (prototype) that is tested and refined based on user input. It is especially effective in information system projects because it captures user requirements directly through iterative design and evaluation (Nugroho, 2020).

This study aims to develop and optimize a mobile application that supports the digitalization of HR data in clinical settings. The application features dedicated input forms for doctors, nurses, and administrative staff, along with data validation and fast search functionalities. Using the prototype approach, the system was developed in stages by involving end-users in the testing and refinement process. The application is expected to improve efficiency, accuracy, and speed in managing HR data in an integrated manner within clinical environments.

RESEARCH METHOD

This study employed a prototype development method to design a mobile-based application aimed at improving the digitalization of human resource data in clinics. The prototype method was chosen because it allows continuous interaction between developers and users, ensuring that the system being built aligns closely with actual needs. This iterative approach is particularly effective for systems that are user-centered, where feedback and refinement are critical to usability and functionality.

The research began with a needs analysis phase, involving observations and informal interviews with clinic staff to understand the challenges faced in managing HR data. Most data management was still carried out manually using paper-based systems and simple spreadsheets, which often led to data duplication, difficulty in searching records, and lack of centralized storage. These findings confirmed the need for a more efficient and integrated system.

Once the user needs were identified, the design phase commenced. The application was conceptualized with three main modules: data input forms for doctors, nurses, and administrative staff. Each module was designed to reflect the specific attributes and data types required for each category of personnel. A user-friendly interface was prioritized to ensure accessibility and ease of use for non-technical users, such as clinic staff with limited exposure to digital platforms.

The initial prototype was developed using standard mobile development tools, ensuring compatibility across Android devices. The design emphasized functionality over aesthetics in the early stages, allowing rapid development and testing. Data validation features were included in the form fields to prevent incomplete or inaccurate entries, which had previously been a common issue in manual systems.

The prototype was then deployed in a limited environment and tested by a small group of clinic users. Their feedback focused on layout clarity, the logical flow of input forms, and the responsiveness of the application. Based on this feedback, several revisions were made, including improving the search function, refining the user navigation flow, and enhancing the visual layout for better readability.

Following refinement, a second round of testing was conducted to assess the performance and reliability of the updated prototype. The system's ability to store, retrieve, and update HR data in real-time was evaluated, and the results indicated significant improvement over the previous manual processes. Users reported increased efficiency in accessing personnel records and reduced errors in data input.

Data from user feedback were analyzed qualitatively to identify usability issues and guide further enhancements. Although this study did not involve statistical hypothesis testing, the iterative development process provided practical insights into user needs and behavior, which were critical in shaping the final design.

The entire development process, from planning, prototyping, testing, to refinement, was carried out in close collaboration with the clinic stakeholders. This participatory approach ensured that the application was not only technically functional but also contextually relevant and ready for implementation. It reflects a model of co-design that can be applied to similar digital transformation initiatives in other healthcare settings.

RESULT AND DISCUSSION

Needs Identification and Initial Design

In this study, the needs identification process was carried out within the environment of a clinic that still relied on manual methods for managing human resource (HR) data, such as using notebooks or spreadsheet files.

The identification activities involved several stages, including direct interviews with administrative and personnel staff. These interviews focused on daily workflows related to HR data management, the types of data handled, encountered challenges, and expectations for a digital system. Additionally, direct observations were conducted to examine the data entry, data retrieval, and HR reporting processes performed by the staff. It was found that data entry processes often experienced delays, data searches required a long time, and there was no standardized data validation, which made the system prone to duplication or input errors.

Manual documents such as paper forms, employee summaries, and monthly reports were also analyzed to understand the data structure and information needed in the new system. Based on this identification process, three main modules were defined for the application: a data input form for doctors, a data input form for nurses, and a data input form for administrative staff. The development process was carried out using a prototype approach, involving users from the initial stages through to evaluation.

Each input form includes fields for basic identity information such as full name, employee identification number, job title, department, and active status. Based on the information requirements, a database structure was designed consisting of several tables for effective data management. The following section illustrates the identified needs through a conceptual use case diagram.

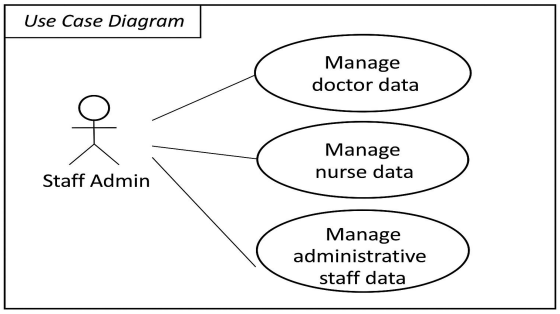

Figure 1. Use Case Diagram

Based on the use case diagram above, the information system is designed to support the role of the admin staff in managing three categories of human resource data: doctors, nurses, and administrative staff. Each category requires a tailored input form aligned with specific data structures and needs. To represent the system's technical specifications more clearly, the following tables outline the data structure for each module. Table 1 presents the input form specification for doctor data, Table 2 for nurse data, and Table 3 for administrative staff data. These tables serve as the foundation for database design and user interface development.

Table 1. Doctor Table Specification

No.	Field Name	Data Type	Length	Description
1	Id	int	3	Primary key
2	Doctor_name	String	35	Full name of the doctor
3	Employee_ID	String	10	Employee identification

4	Gender	String	10	Gender
5	Employment	String	10	Employment status
6	Entry_year	date	10	Year of joining
7	Category	String	10	Doctor category

Table 1 presents the data structure for the doctor module, which is designed to manage personal and employment information of medical staff. It includes fields such as full name, employee identification number (NIP), gender, employment status, entry year, specialization category, and age. This table serves as the foundational reference for storing and retrieving accurate doctor-related data within the mobile information system.

Table 2. Nurse Table Specification

No.	Field Name	Data Type	Length	Description
1	Id	int	3	Primary Key
2	Nurse_Name	String	35	
3	Employee_ID	String	10	
4	Gender	String	10	
5	Status	String	10	
6	Year_Joined	Date	10	
7	Age	String	4	

Table 2 describes the data structure used for recording nurse-related information. Similar to the doctor table, it consists of fields such as name, employee ID, gender, employment status, and year of entry. This table is tailored to reflect the administrative and professional attributes specific to nursing personnel and is essential for supporting nursing data management within the clinic.

Table 3. Administrative Staff Table Specification

No.	Field Name	Data Type	Length	Description
1	Id	int	3	Primary Key
2	Nama_staff	String	35	Staff Name
3	NIP	String	10	Employee ID
4	Jns_kel	String	10	Gender
5	Status	String	10	Employment Status
6	Thn_masuk	date	10	Year of Entry
7	Usia	String	4	Age

Table 3 outlines the format for managing administrative staff records. It includes primary fields such as staff name, unique identification number, gender, employment status, and entry year. The table enables streamlined input and retrieval of administrative staff data, ensuring consistency and efficiency in the overall human resource management process within the clinic environment.

Initial Prototype

The following is the result of the initial prototype design from this study, consisting of three main aspects, namely the input form layouts for doctors, nurses, and administrative staff.

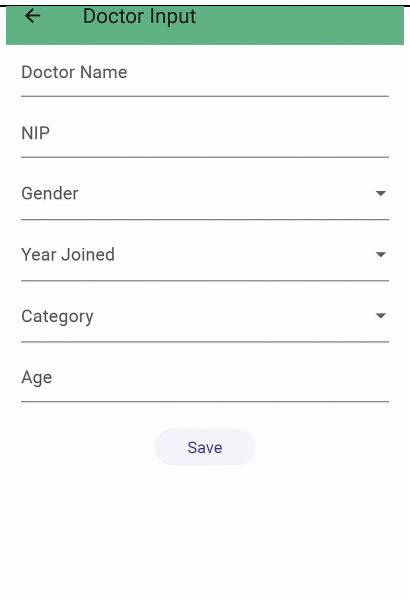

Figure 2. Doctor Information Entry

This figure displays the layout of the input form designed specifically for managing doctor data. It includes fields such as name, employee ID number (NIP), gender, employment status, year of entry, category, and age. The interface ensures clarity and efficiency for administrative users during data entry.

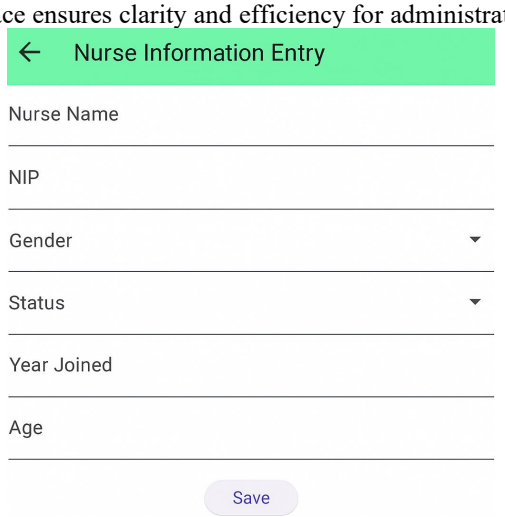

Figure 3. Nurse Data Input

This figure illustrates the nurse input form, which features fields similar to those in the doctor form but is tailored for nursing personnel. It includes essential data such as full name, NIP, gender, employment status, year of entry, and age. The design prioritizes user-friendly input for accurate HR data processing.

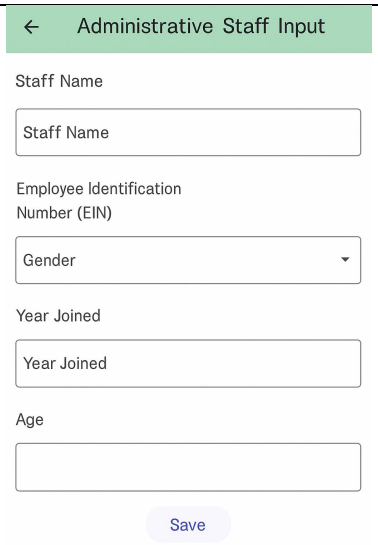

Figure 4. Administrative Staff Data Entry

This figure presents the input form developed for administrative staff. It contains fields for personal and employment data, such as full name, NIP, gender, employment status, year of entry, and age. The form supports fast, standardized data entry for non-medical personnel records.

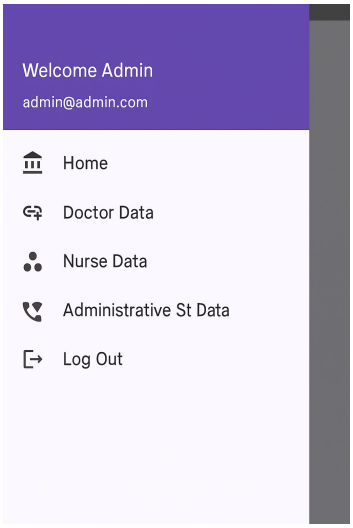

Figure 5. Mobile Application Dashboard

This figure shows the main dashboard of the mobile-based information system. It provides quick navigation to input forms and data summaries for doctors, nurses, and administrative staff. The interface is designed to support ease of access, mobile responsiveness, and operational efficiency in human resource data management within the clinic.

User Evaluation and Feedback (Summary & Translation)
The initial prototype of the mobile application was tested by five users, consisting of administrative staff and clinic operators responsible for managing HR data. The goal of this evaluation was to gather initial insights regarding usability, interface design, access efficiency, and feature completeness.

Two evaluation methods were applied. First, direct observation was conducted, where the researcher monitored how users interacted with the application, including data entry speed, encountered issues, and responses to specific features. Second, a Likert-scale questionnaire (1–5) was distributed, assessing key aspects such as user-friendliness, interface clarity, access speed, feature relevance, and overall satisfaction.

Table 4. Customer Login Data Testing

Evaluation Aspect	Average Score
Ease of use	4.8
Clarity of interface design	4.6
Access speed	4.4
Feature suitability to user needs	4.8
Overall user satisfaction	4.6

The evaluation results indicate that most users are satisfied with the application. They found it helpful for data input, easy to understand without special training, and appreciated its simple yet informative user-friendly interface. Many users highlighted the data validation feature as particularly useful in preventing common input errors found in manual systems.

Key user feedback included:
A request for export features to Excel or PDF for reporting purposes.
The need for automatic notifications for incomplete or unsaved data.
A search function to filter data by work unit or employee status.
A desire for automatic backup features to prevent data loss if the app is deleted or the device is damaged.
This feedback serves as a basis for improving the next prototype version to ensure the system better aligns with real-world workflows.

Prototype Refinement:
This stage repeats the design process based on evaluation findings. Updates include clearer icons, larger and more accessible buttons for different screen sizes, simplified input forms to reduce scrolling with categorized sections (e.g., identity, status, doctor type), and compressed file size for easier installation without sacrificing performance.

CONCLUSION

This study demonstrates the successful development of a mobile-based application designed to enhance the digitalization of human resource data management in clinical environments. Using a prototype method, the research involved users directly in iterative cycles of system evaluation and refinement, ensuring that the final application met actual needs in the field. The findings reveal that the mobile application significantly improves the efficiency and accuracy of data input, while also reducing errors commonly found in manual processes. Users reported that the system is intuitive, easy to operate without extensive training, and provides informative validation features that assist in maintaining data integrity. The feedback also highlighted critical recommendations such as the need for export features, automatic notifications, data filtering, and data backup capabilities, all of which were considered in the refinement stage. As a result, the application's user interface was redesigned to enhance clarity and accessibility, and the overall system performance was optimized without compromising usability. This study contributes to the broader discourse on healthcare information systems by offering practical evidence of how mobile applications can support the transition from manual to digital workflows, ultimately promoting integrated and modern administrative practices in healthcare settings.

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