

## Technology Design in Health Services: Feature Planning Strategy Filter for HMIS Optimization

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### ABSTRACT

Health information management in hospitals requires an efficient and structured system to accurately present patient data. This study aims to develop a filter feature in the Hospital Management Information System (HMIS) to enhance the efficiency of patient coding status management at Muhammadiyah Hospital. The development method involves a software development approach based on the Software Development Life Cycle (SDLC), involving medical record officers and administrative staff as the study population. The results show that the addition of the filter feature in HMIS successfully improves the efficiency of managing patient coding status. The filter feature enables medical record officers to easily identify the filling status of each patient efficiently, enhances the accuracy of health data management, and minimizes the risk of errors.

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## INTRODUCTION

Health information management in hospitals is a critical aspect of providing high-quality medical services (Rosihan Adhani et al., 2022). The Hospital Management Information System (HMIS) has become a focal point in this process, aiding in the organization and presentation of patient data and other health information (Handiwidjojo, 2020). The Hospital Management Information System (HMIS) has become a key element in managing health information in many medical facilities, including Muhammadiyah University Hospital Malang (Kristanti & Ain, 2021).

Muhammadiyah University Hospital Malang has an advantage in developing its own internal HMIS application. This provides a significant opportunity to enhance the functionality and user experience of the HMIS (Fadilla & Setyonugroho, 2021). One concrete step proposed is to design the HMIS interface with intuitive and efficient filter features (Ningsih et al., 2021). With this feature, it is hoped that the process of managing patient disease coding information can be conducted more effectively and accurately (Ihsan & Reno Saputra, 2022).

The development of filter features in HMIS is also expected to transform the system into a more efficient and adaptive tool in health data management (Jibrán et al., 2023). Focusing on the needs of users at Muhammadiyah University Hospital Malang will help improve the overall quality of healthcare services (Cendani & Hanafiah, 2022). These improvements are also expected to minimize the time required for routine tasks such as checking patient coding status, allowing medical record officers to focus more on crucial clinical tasks (Sondakh, 2022).

One common challenge faced in the use of HMIS is the complex manual process involved in checking and managing patients' clinical information (Malahayati & Syamsuar, 2022). Such challenges can result in service delays, errors in data management, and even potential risks to patient safety. These constraints need to be thoroughly addressed to ensure that HMIS can provide maximum benefits in supporting medical service processes (Malahayati & Syamsuar, 2022).

Through these efforts, it is hoped that HMIS at Muhammadiyah University Hospital Malang can be transformed into a more adaptive, efficient, and user-friendly tool in health information management (Malahayati & Syamsuar, 2022). By focusing on specific improvements tailored to the needs of local users, enhancing the quality of HMIS will bring positive impacts in improving overall healthcare services at this hospital.

This research is important because it addresses concrete challenges in health information management at Muhammadiyah University Hospital Malang, which directly impacts the efficiency and accuracy of medical services. The aim of this research is to develop a planning strategy for filter features in the Hospital Information System (HMIS) to facilitate the efficient management of patient coding status. The specific objectives of this research include designing a user interface for HMIS that allows medical record officers to easily view and filter patient coding statuses, implementing filter features that can present clear and structured information about the coding status of each patient, and

improving the efficiency and accuracy of the medical record process through the optimized utilization of filter features in HMIS.

The hope of this research is to provide a tangible contribution to the development of a more adaptive and user-friendly Hospital Information System (HMIS), as well as to deliver significant benefits in enhancing the efficiency of healthcare services through the utilization of innovative information technology. Therefore, the results of this research are expected to serve as a foundation for further advancements in the field of healthcare technology.

## **LITERATURE REVIEW**

Healthcare services involve complex interconnections with various nonlinear components and systems (Fadilla & Setyonugroho, 2021). This is known as a complex adaptive system, comprised of four main components. Firstly, individual agents such as doctors, nurses, and patients collaborate across various healthcare settings, whether in hospitals, private practices, or community facilities. Secondly, there are interconnections among individual agents within the adaptive system, even though they may not always be in the same room, they work interactively to achieve common goals. Thirdly, dynamic systems adapt to changes over time to address disruptions arising from complex interactions. Fourthly, government policies create complexity in healthcare services through regulations that affect practitioners and patients.

The complexity of healthcare services encompasses various dimensions, including medical, situational, and systemic complexity. Medical complexity involves chronic conditions, functional limitations, and the use of medical technology, requiring accurate diagnosis and comprehensive care. Situational complexity relates to environmental and personal factors influencing healthcare, such as local culture and the social conditions of patients. Meanwhile, systemic complexity encompasses issues such as service fragmentation, differences in funding and policies, and the impact of technological innovation on practitioners' workloads.

Technology innovation has the potential to reduce complexity in healthcare services by supporting optimal implementation and reducing workloads. However, failures in implementation or the use of technology that does not fully support can increase complexity. Thus, optimizing the use of technology can enhance overall efficiency in healthcare services (Fadilla & Setyonugroho, 2021).

## **METHODOLOGY**

This research employs a technology development approach with a focus on designing filter features to optimize the Hospital Information Management System (HMIS). The research design involves software development stages using a methodology based on the Software Development Life Cycle (SDLC) (Paksi et al., 2023). The research population comprises medical record officers and administrative staff who use HMIS at Muhammadiyah University Hospital Malang. Instrument development is carried out by designing a prototype of filter features based on user needs identified through a requirements gathering study. Data collection techniques involve observation, interviews, and surveys to

understand user perspectives and needs related to patient coding status management.

## RESEARCH RESULT

In this research, the development of filter features on the interface of the Hospital Information Management System (HMIS) was conducted to optimize the management of patient coding status. The process of developing filter features was based on the results of data collection on user needs involving medical record officers and administrative staff at Muhammadiyah University Hospital Malang. After development, the filter features were successfully implemented and tested to evaluate their performance in improving the efficiency of managing patient coding status.

The research results indicate a significant difference in the interface of HMIS after the use of filter features. Prior to rearrangement and redesign, the inpatient coding interface appeared crowded and cluttered, making it difficult to manage efficiently. However, after redesign and rearrangement with the addition of filter features, the interface became cleaner and more structured. The addition of status options/filters in the sections to be filled by coding and electronic medical records (EMR) facilitated staff in checking the completion status of each patient.

### Use Case Diagram

The Use Case diagram explains various types of objects within the system and the various types of static relationships between them. The Use Case diagram also displays the properties and operations of a class.

Figure 1 shows the relationship between actors, as well as the constraints that apply to the actors regarding their access rights to the system and their authorization to perform access.

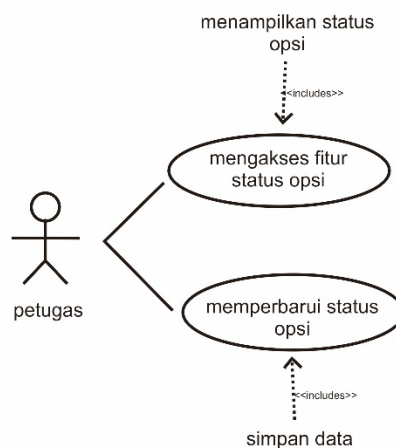


Figure 1. Case Diagram

### Activity Diagram

An activity diagram is a diagram that depicts various flows of system activities to illustrate the activities occurring within a designed operation, how each flow begins, possible decisions that may occur, and how they conclude.

Activity diagrams can also illustrate parallel processes that may occur in multiple executions.

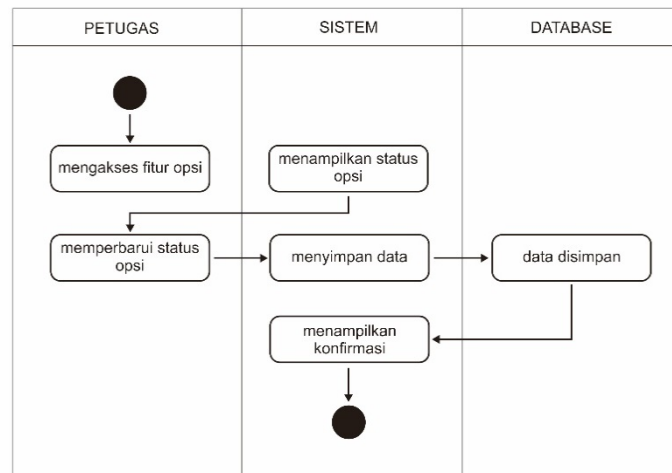


Figure 2. Activity Diagram

1. Identification of Actors and Use Cases:

a. Actors:

- 1) Staff
- 2) System
- 3) Database

b. Use Cases:

- 1) Accessing the status option feature
- 2) Updating the status option
- 3) Storing data to the database
- 4) Retrieving data from the database
- 5) Displaying the status option to the staff

2. Relationship Between Actors and Use Cases:

- a. Staff can access and update the status option.
- b. The system will store and retrieve data from the database.
- c. The database will store and provide data as requested by the system.
- d. The system will display the updated status option to the staff.

3. Use Case Diagram:

- a. Staff interacts directly with the system to access and update the status option.
- b. The system interacts with the database to store and retrieve data.
- c. The system displays the status option to the staff based on the data retrieved from the database.

The *Use Case Diagram* illustrates the interaction between actors and the system, as well as between the system and other elements such as the database. The involved actors are the staff, the system, and the database. Identified *Use Cases*

include activities such as accessing the status option feature, updating the status option, storing data to the database, retrieving data from the database, and displaying the status option to the staff. The relationship between actors and *Use Cases* is explained; staff can access and update the status option, while the system is responsible for storing and retrieving data from the database. The ultimate outcome is the system displaying the updated status option to the staff based on the information retrieved from the database.

No	Nama Pasien	Usia	Tgl MRS	Ruang	Dokter	Pengasin	Tgl Pasien / Keluarga	Aksi
MARADL Th (00M-000000000)	45 Tahun 6 Bulan 7 Hari	29-10-2023 00:00:00	Mawar-A	dr. Jason Simatupang, Sp. PD	BPJS Kesehatan	Kode: 19000	Input RM	
MARADL Th (00M-000000000)	45 Tahun 6 Bulan 7 Hari	29-10-2023 00:00:00	Mawar-A	dr. Jason Simatupang, Sp. PD	BPJS Kesehatan	Kode: 19000	Input RM	
MARADL Th (00M-000000000)	45 Tahun 6 Bulan 7 Hari	29-10-2023 00:00:00	Mawar-A	dr. Jason Simatupang, Sp. PD	BPJS Kesehatan	Kode: 19000	Input RM	
MARADL Th (00M-000000000)	45 Tahun 6 Bulan 7 Hari	29-10-2023 00:00:00	Mawar-A	dr. Jason Simatupang, Sp. PD	BPJS Kesehatan	Kode: 19000	Input RM	
MARADL Th (00M-000000000)	45 Tahun 6 Bulan 7 Hari	29-10-2023 00:00:00	Mawar-A	dr. Jason Simatupang, Sp. PD	BPJS Kesehatan	Kode: 19000	Input RM	
MARADL Th (00M-000000000)	45 Tahun 6 Bulan 7 Hari	29-10-2023 00:00:00	Mawar-A	dr. Jason Simatupang, Sp. PD	BPJS Kesehatan	Kode: 19000	Input RM	

Figure 3. Interface Display of Inpatient Care Before Redesign

With the rearrangement of the HMIS interface after redesign, there is an addition of status options/filters (Complete/Incomplete) in the sections to be filled, both by coding and the content of the Electronic Medical Record (EMR) itself. The purpose of this rearrangement is to present a cleaner and more structured display, making it easier for staff to quickly check the completion status of each patient. This feature not only applies to disease coding status but is also useful in managing the content of electronic medical records as a whole.

With the "Complete/Incomplete" options/filters, medical record staff can easily see whether the required information has been filled in completely or if there are still items that need to be completed. This helps ensure the accuracy and completeness of patient data, making the medical record management process more efficient and organized. Additionally, the use of this feature also enhances the quality of medical services by ensuring that the required information is available in a timely and complete manner. The "Complete/Incomplete" options/filters also allow staff to search for and group data based on completion status. For example, staff can quickly identify patients who still need certain filling or verification, minimizing the risk of oversight in medical record management.

Figure 4. Interface Display of Inpatient Coding After Redesign

No	Nama Pasien	No. RM	MRS	Ruang	Dokter	Perjanjian	YTB	Status	Aksi
MARIADI, Th	(RS) Satrio & Began 7 Hagi	00000000	29-10-2023	Masuar-A	dr. Jason Srimahapang, Sp. PO	BPJS Kesehatan	Kode 198028	Lengkap	Input RM
MARIADI, Th	(RS) Satrio & Began 7 Hagi	00000000	29-10-2023	Masuar-A	dr. Jason Srimahapang, Sp. PO	BPJS Kesehatan	Kode 198028	Tidak Lengkap	Input RM
MARIADI, Th	(RS) Satrio & Began 7 Hagi	00000000	29-10-2023	Masuar-A	dr. Jason Srimahapang, Sp. PO	BPJS Kesehatan	Kode 198028	Tidak Lengkap	Input RM
MARIADI, Th	(RS) Satrio & Began 7 Hagi	00000000	29-10-2023	Masuar-A	dr. Jason Srimahapang, Sp. PO	BPJS Kesehatan	Kode 198028	Lengkap	Input RM
MARIADI, Th	(RS) Satrio & Began 7 Hagi	00000000	29-10-2023	Masuar-A	dr. Jason Srimahapang, Sp. PO	BPJS Kesehatan	Kode 198028	Lengkap	Input RM
MARIADI, Th	(RS) Satrio & Began 7 Hagi	00000000	29-10-2023	Masuar-A	dr. Jason Srimahapang, Sp. PO	BPJS Kesehatan	Kode 198028	Tidak Lengkap	Input RM
MARIADI, Th	(RS) Satrio & Began 7 Hagi	00000000	29-10-2023	Masuar-A	dr. Jason Srimahapang, Sp. PO	BPJS Kesehatan	Kode 198028	Lengkap	Input RM
MARIADI, Th	(RS) Satrio & Began 7 Hagi	00000000	29-10-2023	Masuar-A	dr. Jason Srimahapang, Sp. PO	BPJS Kesehatan	Kode 198028	Lengkap	Input RM

Figure 4. Interface Display of Inpatient Coding After Redesign

This filter feature is not only beneficial for managing coding status but also assists in managing the content of electronic medical records as a whole. With this feature, medical record staff can quickly identify patients who have been filled out or not, making the medical record process more efficient and accurate. Additionally, the use of the filter feature provides a more user-friendly HMIS interface, enhancing the user experience in accessing and managing health information.

Analysis of the use of the filter feature shows positive results. The time required to search for patient coding status information has significantly improved after the implementation of the filter feature. Feedback from users also indicates satisfaction with the cleaner and user-friendly interface changes in HMIS. Thus, this research contributes significantly to improving the efficiency and accuracy of health data management at Muhammadiyah University Hospital Malang through the utilization of innovative information technology.

## DISCUSSION

The results of this study highlight the substantial implications of adding filter features to the Hospital Management Information System (HMIS), particularly in the context of Muhammadiyah University Hospital Malang. The filter feature has proven to make a significant contribution in minimizing the time required for medical record staff to check the coding status of each patient. The efficiency created not only reduces the risk of errors but also enhances the overall accuracy of health data management.

The importance of these research findings is not limited to the operational level but also extends to its impact on the overall quality of medical services. With the integrated filter feature, health information management becomes more structured and organized. This provides opportunities for medical record staff to focus more on essential clinical tasks and improve the overall medical record process.

This research emphasizes that the use of innovative information technology, such as filter features in HMIS, can address complex challenges in health data management in hospital environments. With the development of these features, there are significant improvements in operational efficiency and the quality of health services, both of which are critical indicators of effective medical information management.

Compared to previous research, this study highlights a specific focus on the development of filter features in the context of managing patient coding status. Through direct comparison with previous studies, it can be seen that this research provides a specific contribution by offering more targeted and measurable solutions to improve the efficiency of health information management in hospitals. For example, research by Fadilla and Setyonugroho (Fadilla & Setyonugroho, 2021) demonstrates that HMIS can minimize the complexity of healthcare services through innovative development of business process management-based information systems. These findings provide a strong theoretical basis that supports our findings regarding operational efficiency improvements through the use of filter features in HMIS. Additionally, the research by Situmeang, et al. (Situmeang et al., 2023) highlights the importance of strategic planning in the development of Nursing Management Information Systems (NMIS) to enhance the effectiveness and efficiency of hospitals. Their findings align with ours, which emphasize the development of filter features as part of a well-planned strategy to improve health information management in hospitals.

The strategy analysis in the research by Hasibuan et al. (Novitri et al., 2024) is also relevant to our findings as it highlights the role of HMIS in optimizing healthcare services. Their findings indicate that the implementation of HMIS is an effective strategy in enhancing healthcare services through the comprehensive development of medical services and hospital management. Considering these findings in the context of previous research, it is important to acknowledge that the development of filter features in HMIS is a strategic step in enhancing the effectiveness of health information management in hospitals. The results of this research make a significant contribution to promoting the adoption of innovative information technology in the healthcare context.

Comparison with previous studies provides a strong foundation for understanding the practical implications of these findings in efforts to enhance operational efficiency and healthcare service quality. It is hoped that the results of this research will make a significant contribution to improving hospital operational efficiency and overall healthcare service quality.

By integrating the findings of this research with existing literature, we can better understand that the implementation of information technology, particularly filter features in HMIS, is a progressive step in improving healthcare service quality. It also provides broader insights into the potential and benefits of developing health information technology in medical information management. It is important to acknowledge that the development of filter features in HMIS is a strategic step in enhancing the effectiveness of health information management in hospitals (Pane et al., 2023). The implications of these findings can be extended to various hospitals and healthcare institutions to implement innovations in patient data management, with the ultimate goal of providing better and more affordable healthcare services to the community.

A deeper discussion of the research findings by directly linking them to existing literature will provide broader insights into the potential and benefits of developing health information technology in medical information management.

## **CONCLUSION AND RECOMMENDATION**

The development of filter features in the Hospital Management Information System (HMIS) has brought positive changes in the efficiency of health information management at Muhammadiyah University Hospital Malang. This research demonstrates that the implementation of innovative information technology can facilitate medical record staff in monitoring patient coding status more efficiently. These findings provide a strong foundation for hospitals and other healthcare institutions to consider similar developments to enhance service quality and operational efficiency.

For further development, it is recommended to continue evaluating and improving the filter features based on user feedback and involve more stakeholders in the implementation process. By engaging users and other relevant parties, it can be ensured that the filter features are continuously updated and tailored to the needs and developments in the field. Thus, it is expected that the use of innovative information technology will continue to provide positive contributions to improving health information management and medical services overall..

#### **ADVANCED RESEARCH**

Research on the development of filter features in the Hospital Management Information System (HMIS) at Muhammadiyah University Hospital Malang has shown an improvement in health information management efficiency. However, further studies should consider integration with other systems, long-term performance evaluation, development of additional features, cost-benefit analysis, and a deeper understanding of user preferences and potential barriers in using filter features. This will provide guidance for further information technology development in the healthcare context.

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