International Journal of Computer and Information System (IJCIS)
Peer Reviewed – International Journal
Vol : Vol. 06, Issue 03, August 2025
e-ISSN : 2745-9659
https://ijcis.net/index.php/ijcis/index

Analysis Of The Design Of The Inpatient Medical Record Completeness Audit Application At Prof. Dr. Margono Soekarjo Purwokerto Regional Hospital

1st Elisabeth Yuga Nova Meganingtyas, Sri Wulandari[2]
Politeknik Indonusa Surakarta, Solo, Indonesia
elisabethyuga11@gmail.com[1], sriwulandari@poltekindonusa.ac.id[2]

***Abstract*— *The completeness of inpatient medical records plays a vital role in ensuring the quality of healthcare services and compliance with hospital accreditation standards. This study aims to design an inpatient medical record audit application that addresses existing inefficiencies in manual audit processes at RSUD Prof. Dr. Margono Soekarjo Purwokerto. The research was conducted using the System Development Life Cycle (SDLC) with a waterfall model approach, consisting of needs analysis, system design, coding, and testing. Data collection involved observation and interviews with inpatient coding staff, which revealed several issues in the current Google Spreadsheet-based audit system, including inflexible checklists, high risk of data loss, poor synchronization, and duplicate entries. The proposed web-based application offers functional features such as multi-user login, patient data upload, dynamic checklists, open and close audit forms, and graphical audit reports. Non-functional requirements emphasize security, accessibility, simplicity, and responsiveness. User requirements focus on ease of navigation, printable reports, and support for daily work routines. The system was implemented using JavaScript and tested through black-box testing, which confirmed all functionalities performed as expected. User satisfaction was evaluated through a questionnaire distributed in the medical records department with 13 respondents, 1 department head and 12 coders, the results showed an overall satisfaction level of 92.59%. This application improves audit efficiency, reduces input errors, and supports hospital efforts to meet accreditation indicators. The findings suggest that a well-designed information system can significantly enhance the management and monitoring of medical record completeness.*

Keywords*: Medical record audit, hospital information system, SDLC*

I. INTRODUCTION

In an era of globalization driven by rapid advancements in information technology, the healthcare sector is under increasing pressure to improve the quality of medical services. Information technology has become an essential component of modern healthcare systems streamlining administrative processes, enhancing diagnostic precision, increasing service efficiency, and optimizing patient care. As public expectations for high-quality healthcare continue to rise, the integration of technology into healthcare delivery is no longer optional but a necessity [1]. A key aspect of delivering quality care lies in the effective management of medical data ensuring that it is accurate, well-organized, and easily accessible to medical personnel. This depends heavily on comprehensive and detailed documentation within patients' medical records..

Medical record audits serve as a critical tool for evaluating the completeness and quality of clinical documentation, while also ensuring compliance with health service standards and legal regulations [2]. Currently, traditional audit methods—typically conducted manually by reviewing physical files—are time-consuming, error-prone, and inefficient, especially when managing large volumes of records. To address these limitations, healthcare institutions are beginning to adopt system-based audits integrated with electronic medical records (EMRs), which allow for faster, more accurate, and more efficient processes [3].

In parallel with these advancements, numerous applications have been developed to improve the efficiency of medical record audits. These tools aim to boost both the accuracy and speed of audits by automating the review process. Network-based systems for quantitative analysis have proven effective in meeting user expectations and resolving workflow challenges. They are capable of evaluating the completeness of medical records and tracking healthcare providers' documentation habits. However, despite these improvements, many hospitals still struggle to implement these technologies. Common obstacles include a mismatch between system capabilities and user

needs, along with difficulties integrating audit tools into existing hospital information systems [4].

An initial study conducted at Prof. Dr. Margono Soekarjo Purwokerto Regional General Hospital found that, although a medical record audit application had been incorporated into the hospital's system, inconsistencies were identified for example, differences between the documented and actual number of patients in each room. During the use of the application from September 2024 until now, it still has several shortcomings, including 1) the checklist in the medical record audit system is defaulted, 2) if a human error occurs where the officer accidentally deletes a certain item, it will affect all sections, 3) the way patients enter and exit are often not the same, 4) the form that must be filled in is confusing, and several system errors have occurred which cause delays in conducting medical record audits, 5) efficiency in filling out inpatient medical record completeness audits, 6) often occurs 2 times storage in 1 patient. This makes the medical record audit system less effective. The information design system for the completeness of medical record files has managerial implications for hospitals, namely an information system that helps in managing, storing, and displaying data accurately. Ensuring information is processed using appropriate software and presented in an easy-to-understand manner [5].

Conducting effective medical record audits is essential for hospital operations, particularly in meeting accreditation standards. Accreditation organizations assess the quality of healthcare services based on the accuracy and completeness of medical records. One key indicator is the percentage of documentation completed within 24 hours after a patient's discharge, with the ideal target being 100%. This standard holds particular significance for Prof. Dr. Margono Soekarjo Purwokerto Regional General Hospital, which holds a Type A designation, making quality improvement a central focus. This study plays an important role in supporting the hospital's efforts to establish a more efficient, precise, and responsive audit system. Unlike earlier research, this study emphasizes three main aspects: the audit process for evaluating inpatient record completeness, user needs for the information system, and the development of the audit application.

Incomplete electronic medical records continue to present challenges, particularly because they often serve as the sole documentation of a patient's clinical course during hospitalization. Successful EMR implementation requires thorough and continuous documentation review to ensure data integrity and clinical accountability [6].

II. RESEARCH METHODS

The software development method employed in this research is the Waterfall model, which is one of the most established and widely used approaches in system development. As one of the earliest structured models in software engineering, the Waterfall model adopts a systematic and sequential process, where each development phase must be completed before progressing to the next. This linear progression allows for effective quality control and thorough monitoring at every stage. When applied to Information Systems (IS) development, the Waterfall model offers the advantage of structured documentation and clear milestone tracking, thereby enhancing the system's ability to meet user requirements effectively [7]. The diagram of the waterfall model is as follows:

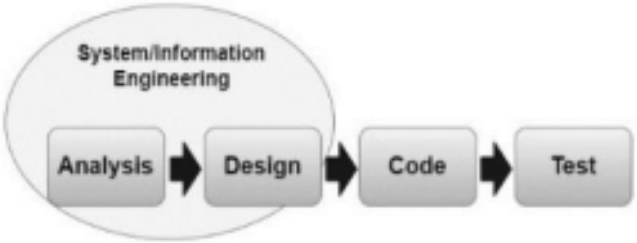

Figure 1. Waterfall Model

The Waterfall model utilizes a systematic and sequential approach to software development [6]. The development process in this study began with the analysis phase, which involved direct observation and interviews with coders at Prof. Dr. Margono Soekarjo Purwokerto Regional General Hospital. This was conducted to gain a comprehensive understanding of the system requirements and the workflow for auditing the completeness of inpatient medical records.

In the design phase, the gathered requirements were further analyzed and translated into visual representations, including Use Case Diagrams,

Class Diagrams, and interface mockups. These tools served to define the system's structure and user interactions more clearly.

The next stage, coding, involved implementing the design using Visual Studio Code and the JavaScript programming language. The application was developed as a web-based system, characterized by interconnected web pages and supported by a domain (URL) and hosting services to store and manage data [8] . Once development was complete, the system underwent the testing phase using the black-box testing method to ensure that all functionalities operated according to design specifications.

III. RESULT AND ANALYSIS

The application design in this study uses the Waterfall System Development Life Cycle (SDLC) model approach, which consists of the stages of Analysis, Design, implementation (Code), and Test.

a. Analysis

The needs analysis for designing the inpatient medical record completeness audit application encompasses three main aspects: functional needs, non-functional needs, and user needs. From a functional perspective, the system must offer user-friendly audit features, implement separate login systems for coders and auditors, allow data input via checklists that are not automatically filled, and generate recapitulation reports.

These reports should cover key indicators such as completeness, readability, and the timeliness of medical record documentation. In terms of non-functional requirements, the system is designed with a focus on data security through authentication mechanisms, improved audit process efficiency, and overall ease of use [9]. The user needs highlight the importance of an intuitive interface, mechanisms to prevent duplicate entries, and the ability to distinguish between audited and unaudited data.

The system is developed as a web-based application using the JavaScript programming language. It is accessible through internet browsers such as Google Chrome, Mozilla Firefox, and others.

b. Design

After knowing the needs of the medical record file completeness audit system based on the form currently used to design the system to be developed, the following is a description of the system design flow through a DFD chart is use to illustrated with a number of specific symbols to show the data movement that occurs within a business system [10] and describe the system as a network of functional processes connected to each other by data flow and , both manually and computerized:

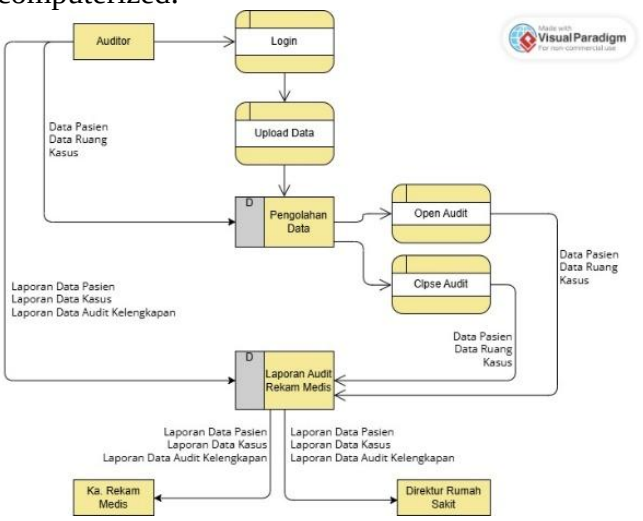

Figure 2. DFD Audit System

Based on the Data Flow Diagram (DFD) in Figure 2, the medical record audit system begins with the auditor logging in as the primary user. After logging in, the auditor uploads data related to patients, rooms, and cases.

Next, the auditor performs the audit process using two main features: Open Audit and Close Audit. The Open Audit feature is used to verify the completeness of newly entered patient data, while the Close Audit feature is used to finalize audits for patients who have been discharged. Both features are integrated with the data processing component, which generates a report covering key aspects such as completeness, readability, and timeliness of medical record documentation.

This report is then made accessible to the Head of Medical Records and the Hospital Director for the purpose of evaluating service quality. The system is designed to facilitate a structured and transparent audit process in accordance with applicable hospital accreditation standards.

International Journal of Computer and Information System (IJCIS)
Peer Reviewed – International Journal
Vol : Vol. 06, Issue 03, August 2025
e-ISSN : 2745-9659
https://ijcis.net/index.php/ijcis/index

Furthermore, the flow illustrated in Figure 2 is elaborated through a Use Case Diagram, which visualizes the interactions between different user roles and the system. A Use Case Diagram, as defined in Unified Modeling Language (UML), is a tool used to represent the functional relationships between users (actors) and system functionalities.[11].

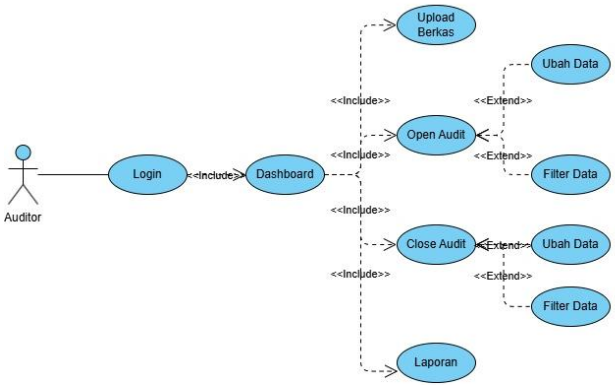

Figure 3. Auditor Usecase

The process begins with a login stage, where the auditor must authenticate to gain access to the system. Upon successful login, the auditor is directed to the Dashboard Menu, which serves as the central navigation hub of the application.

From the dashboard, the auditor can access several key features, including the Upload File, Open Audit Record, Close Audit, and Report menus. To initiate the audit process, the auditor must first upload documents related to the patient's medical record. This step is followed by data input, which involves entering essential information such as the patient's identity, treatment room, and the medical case to be audited.

Once the data is entered, the auditor can proceed with the Open Audit function. This feature is used to open an audit session for medical records uploaded the previous day, as audits are conducted the day after data entry. In contrast, the Close Audit function is used for patients discharged on the current day.

By following this structured process, the system enables auditors to conduct medical record audits more efficiently and accurately. It also supports the generation of informative reports, which play a critical role in evaluating the quality of medical records at Prof. Dr. Margono Soekarjo Regional General Hospital [12]. The results of the application design before implementation are as follows:

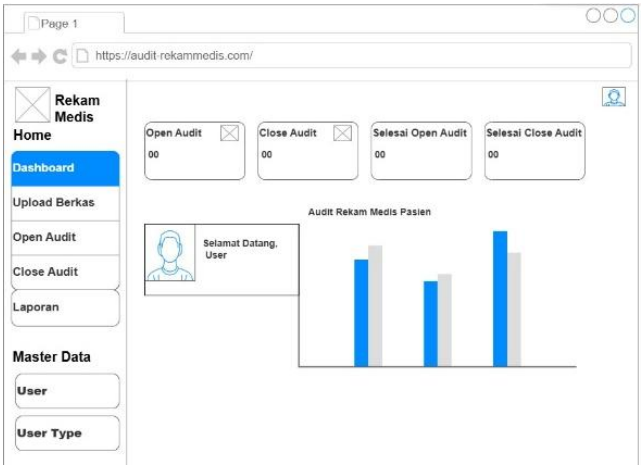

Figure 4. Application's Dashboard

Figure 4 shows an example of a dashboard design prototype for a web-based medical records audit application. This prototype, or mockup, served as the basis for creating the original design for the medical records audit application. The medical records audit application includes 10 prototype design forms: Login Page, Dashboard, Upload Page, Open Audit Page, Open Audit Form, Close Audit Page, Input Audit Page, Report Page, User Page, and User Type Page.

c. Code

After the Design System design phase is complete, the next step is to implement the design into program code. This process is a crucial step in information system development, where all interface components and system logic flows developed during the design phase are translated into a executable application.

The implementation process involves coding the website pages, setting up the database, and initial testing to ensure everything is working properly [13].

In this case, the previously designed prototype serves as a reference in the coding process, including page structure, button functions, data validation, and the information storage and processing mechanisms that occur on the system's backend. An example of this coding is shown in Figure 5 below.

International Journal of Computer and Information System (IJCIS)
Peer Reviewed – International Journal
Vol : Vol. 06, Issue 03, August 2025
e-ISSN : 2745-9659
https://ijcis.net/index.php/ijcis/index

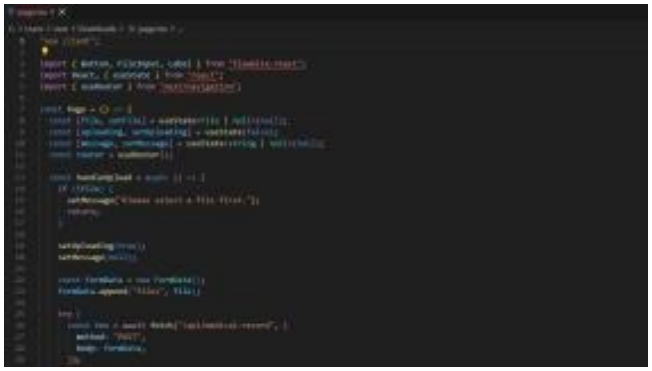

Figure 5. Code

d. Test

The testing phase is carried out to verify the functionality of the completed system and ensure that the written program code works according to the user's design expectations. This process is important to try and find out whether the system that has been designed is running properly according to plan[14]. Testing is conducted using blackbox testing techniques, Black box testing is a testing method carried out on software by observing the execution results through test data and checking the functionality of the software itself. So, black box testing focuses on evaluating the external appearance (interface), such as input and output[15]. The following are the results of the blackbox testing conducted by the author.

Table 1. Blackbox Testing

Tested Features	Test Scenarios	Input	Expected Output	Result
Login Page	Users access the system with authentication	Fill in the User and Password that have not been set	Login failed	Passed
Login Page	Users access the system with authentication	Fill in the User and Password that have been set	Login Successfully	Passed
Dashboard Page	Displays audit data summary	-	Open Audit, Close Audit data, activity graph appears	Passed
Upload CSV File	Uploading files in formats other than `.csv`	File `.jpg` / `.docx`	Upload Failed	Passed
Upload CSV File	Upload File CSV	file.csv	Upload Success	Passed
Open Audit Form	View the audit list of Upload files	-	Displays patient data table according to table format	Passed
Open Audit – Filter data	Filter by patient name / doctor / admission date	"CHAD MINAH" / "D231" / "13/02/2025	The table only displays data that matches the filter	Passed
Open Audit - Form	Select the checkbox in a specific row	Click a specific row	Data is saved when you click "Save"	Passed
Audit Close Audit	Show list of Discharged Patient Audits	-	Data with status `CLOSE_AUDIT` appears	Passed
Close Audit page	Access the user type page	Access the user type page	A list of User types appears.	Passed
Master Data – *User*	Access the User management page	-	User types appears.	Passed
Side Bar Navigation	Click on each menu (Dashboard, Open Audit, etc.)	Click Menu	The page moves according to the menu selected	Passed
Patient Audit Chart	Select the chart time range (dropdown)	-	The graph changes according to the selected period.	Passed
Save Audit Form	Partially fill out the form then click "Save"	Check several columns	Form remains partially saved	Passed
Audit Form Empty Validation	Blank form then click "Save"	Do not fill in any fields	A warning message appears or is rejected.	Passed

From the results of the tests carried out, all scenarios created to test the system all produced results as expected, namely all features ran well and according to the expected functions.

Analysis

After the application design process using the Waterfall model System Development Life Cycle (SDLC) approach, which consists of the stages of analysis (Analysis), design (Design), implementation (Code), and system testing (Testing) has been fulfilled, the website-based

inpatient medical record completeness audit application was successfully built with the following details:

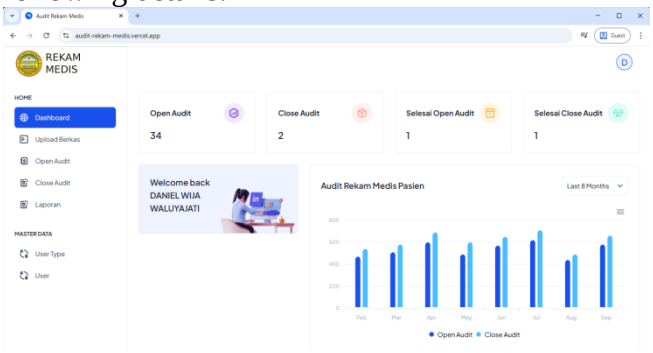

Figure 5. Dashboard Application

Figure 5 shows that the application has been created in accordance with the prototype or mockup design from the previous stage. The features are detailed as follows:

On the left side of the screen, there is a vertical navigation menu containing several key features: Dashboard, File Upload, Open Audit, Close Audit, Reports, and the Master Data menu, which consists of Users and User Types. This navigation menu provides easy user access to various important system functions.

Above the main area, there are four information boxes presenting summary data: the number of Open Audits, Close Audits, Completed Open Audits, and Completed Close Audits, each with a value or data value processed in the system. This information presentation aims to provide a quick overview of the status and progress of ongoing audits. Below is a bar chart showing the medical record file report for the current month.

The results of the assessment of user understanding and satisfaction with the system were assessed by administering a questionnaire to 13 auditors. The results are as follows:

Table 2. User Understanding and Satisfaction Questionnaire

No	Statement	Score	Precentage
1	I understand the purpose of the implemented medical record audit system.	4.67	93.33%
2	This system is easy to understand even if you are new to it.	4.58	91.67%
3	I can use the features in the system without much difficulty.	4.50	90.00%
4	The instructions and guide to using the system are very clear and easy to follow.	4.67	93.33%
5	I am satisfied with the appearance and ease of navigation within the system.	4.58	91.67%
6	The system helps speed up the process of auditing patient medical records.	4.67	93.33%
7	The features in the system support my work needs.	4.75	95.00%

No	Statement	Score	Precentage
8	New and innovative style look	4.75	95.00%
9	Overall, I am satisfied with the implementation of this medical record audit system.	4.50	90.00%

The test of user understanding and satisfaction with the implementation of the Medical Record Audit Application at Prof. Dr. Margono Soekarjo Regional General Hospital was measured using a linkert scale, with a scale of 1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree. Based on the results obtained, the average score was 4.63 with a percentage of 92.59% of respondents being satisfied and understanding the Web-based Medical Record Audit Application.

The implementation of a web-based audit application system has proven to enhance the effectiveness and efficiency of the medical record documentation audit process. This system simplifies the monitoring of document completion, as auditors can assess each form based on specific parameters such as patient identity, legibility, authentication, and audit timing. The dashboard's graphical features also enable both auditors and management to observe monthly trends in documentation completeness, allowing for quicker corrective actions. Moreover, this application supports the hospital accreditation standards concerning the completion of medical records within 2x24 hours.

Trial results involving 13 respondents showed consistent completeness scores, as all data originated from the same source. A significant difference emerged in the duplication of data entries: in the Google Spreadsheet system, repeated data often occurred due to input errors and multiple saves. In contrast, the web-based application is programmed to retain only the latest saved entry, ensuring that the number of audited patients aligns with the actual number of inpatients, thereby improving data accuracy.

In terms of efficiency, the application reduces the auditors' workload through several key features. First, data uploads are now performed only once during patient admission (open audit), as the system automatically carries the data forward for the close audit stage. Second, checklist marks are retained even when the patient data is reopened, preventing duplicate entries. Third, forms filled out during the open audit phase automatically appear during the close audit, eliminating the need for re-entry. Overall, the use of this application saves time in data uploads, reduces the risk of duplicate input, accelerates form completion, and generates automated reports. The average time required for open audit entry was reduced from 1 minute 10 seconds to 1 minute 6 seconds, and for close audit from 2 minutes 30 seconds to 1 minute 36 seconds. These results demonstrate that the web-based application significantly improves auditor performance while minimizing data duplication and delays in the audit process.

VI. CONCLUSION

A web-based inpatient medical record audit application has been successfully developed and implemented at Prof. Dr. Margono Soekarjo Regional General Hospital using the Waterfall model, and has been adapted to align with the workflow of medical coders. The application is equipped with features that enhance audit efficiency, has passed black-box testing, and received positive responses from users for its ease of use and relevant functionalities. This system enables accurate and automated monitoring of medical record completeness. Based on the questionnaire results, the application achieved an auditor satisfaction level of 92.59%, with an average score of 4.63. These findings indicate that the application functions effectively and is suitable for implementation at Prof. Dr. Margono Soekarjo Regional General Hospital, supporting efforts to meet medical record quality indicators in accordance with accreditation standards. Accreditation bodies evaluate the quality of healthcare services based on the accuracy and completeness of medical documentation. One critical indicator is the percentage of documentation completed within 24 hours after patient discharge, with an ideal target of 100%.

REFERENCES

[1] M. S. Lubis and M. A. Pratama, "Peran Teknologi Informasi dalam Peningkatan Kualitas Pelayanan Kesehatan," Jurnal Pendidikan Tambusai, vol. 9, pp. 8052–8060, Jan. 2025.

[2] Sugeng, D. Herawati, and M. F. Salim, "Audit Rekam Medis dalam Upaya Peningkatan Kualitas Pengisian Rekam Medis di RSUD Sleman," Jurnal Ilmiah Perekam dan Informasi Kesehatan Imelda (JIPIKI), vol. 9, no. 1, pp. 38–48, 2024, doi: 10.52943/jipiki.v9i1.1402.

[3] F. Al Wafi and S. Wahab, "Tinjauan Transisi Rekam Medis Manual Menuju Elektronik Guna Menunjang Efektivitas Rekam Medis di Rumah Sakit Edelweiss Bandung," PREPOTIF: Jurnal Kesehatan Masyarakat, vol. 8, no. 3, pp. 4862–4867, Dec. 2024, doi: 10.31004/prepotif.v8i3.33727.

[4] N. S. Rubiyanti, "Penerapan Rekam Medis Elektronik di Rumah Sakit di Indonesia: Kajian Yuridis," ALADALAH: Jurnal Politik, Sosial, Hukum dan Humaniora, vol. 1, no. 1, pp. 179–187, Jan. 2023, doi: 10.59246/aladalah.v1i1.163.

[5] R. P. S. Mileni, A. L. B. Rina, and K. Rurniawati, "Perancangan Sistem Informasi Kelengkapan Berkas Rekam Medis Menggunakan Microsoft Visual Studio 2010 di RSAU Dr. M. Salamun," Jurnal INSTEK (Informatika Sains dan Teknologi), vol. 7, no. 2, pp. 220–229, 2022, doi: 10.24252/instek.v7i2.31654.

[6] Z. S. Mahbubah and K. P. Ningsih, "Kelengkapan Rekam Medis di Rumah Sakit: Literature Review," Indonesian Journal of Health Information Management, vol. 1, no. 2, 2021, doi: 10.54877/ijhim.v1i2.16.

[7] S. Muharni, Analisa dan Perancangan Sistem Informasi, vol. 1. Yogyakarta: Bintang Pustaka Madani, 2021.

[8] Elgamar, Konsep Dasar Pemrograman Website dengan PHP, 1st ed., vol. 1. Malang: CV. Multimedia Edukasi, 2020.

[9] F. R. Cahyadi and M. A. Sutisna, "Perbandingan Model Waterfall dengan RAD Berbasis Website," Jurnal Ilmiah Metadata, vol. 5, no. 1, pp. 19–26, Jan. 2023, doi: 10.47652/metadata.v5i1.308.

[10] M. Muliadi, M. Andriani, and H. Irawan, "Perancangan Sistem Informasi Pemesanan Kamar Hotel Berbasis Website (Web) Menggunakan Data Flow Diagram (DFD)," JISI: Jurnal Integrasi Sistem Industri, vol. 7, no. 2, pp. 111–118, Sep. 2020, doi: 10.24853/jisi.7.2.111-122.

[11] E. Arribe, R. Hafsari, A. A. Subekti, and A. H. Aragati, "Perancangan Sistem Informasi Manajemen Inventory pada Retail PT. Stars Internasional," Prosisko: Jurnal Pengembangan Sistem Komputer dan Informatika, vol. 10, no. 2, pp. 103–110, 2023, doi: 10.30656/prosisko.v10i2.6933.

[12] G. A. A. Wijaya, A. Ikhwan, and R. A. Putri, "Sistem Informasi Manajemen Aset Tetap Menggunakan Metode Waterfall," RESOLUSI: Rekayasa Teknik Informatika dan Informasi, vol. 3, no. 6, pp. 287–296, Jul. 2023, doi: 10.30865/resolusi.v3i6.992.

[13] Y. Anis, A. B. Mukti, and A. N. Rosyid, "Penerapan Model Waterfall dalam Pengembangan Sistem Informasi Aset Destinasi Wisata Berbasis Website," KLIK: Kajian Ilmiah Informatika dan Komputer, vol. 4, no. 2, pp. 1134–1142, Oct. 2023, doi: 10.30865/klik.v4i2.1287.

[14] W. T. S. Nugraha, F. R. Saputra, R. D. Pratama, and N. T. Lestari, "Pengembangan Website Interaktif untuk Memfasilitasi Minat Kebersihan Kelas di Kalangan Siswa Menengah Pertama," JIKO: Jurnal

Informatika dan Komputer, vol. 9, no. 2, pp. 251–258, Jun. 2025, doi: 10.26798/jiko.v9i2.1340.

[15] Yustiyanto and E. S. Budi, "Perancangan Sistem Pendaftaran Peserta Didik Baru Berbasis Web Menggunakan Metode Prototype atau Skalabilitas," RESOLUSI: Rekayasa Teknik Informatika dan Informasi, vol. 4, no. 1, pp. 84–91, 2023, doi: 10.30865/resolusi.v4i1.12.