Journal of Information Technology and Cyber Security 2(2) July 2024: 95-110 EISSN 2987-386X | PISSN 2987-3878
DOI: 10.30996/jitcs.12248

The Waterfall Model in the Implementation of a Room Reservation Information System: A Case Study at a University

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Received: 29 November 2024
Accepted: 13 December 2024
Revised: 13 December 2024
Available online: 15 December 2024

To cite this article: Setiawan, A. B., & Rizaldi, T. (2024). The Waterfall Model in the Implementation of a Room Reservation Information System: A Case Study at a University. *Journal of Information Technology and Cyber Security*. 2(2), 95-110. https://doi.org/10.30996/jitcs.12248

Abstract

Politeknik Negeri Jember (National State of Jember Polytechnic), Indonesia, fully understand that infrastructure is one among various key factors to enhance the quality of the university. However, in the department of Information Technology, infrastructure management is a prominent issue. The primary cause of the issue appears to be a manual arrangement of room reservations, as room usage often crashes due to the scheduling mismatch. To tackle this issue, this study focuses on the development of a room reservation information system, known as "Sistem Informasi Peminjaman Ruangan dan Sarana Pembelajaran (SIPRu)". The system is developed as an additional feature in the department website. It is developed using the Waterfall method, beginning with the requirements analysis (i.e., an identification of functional and non-functional requirements) and architectural processes design processes (i.e., the development of use case diagram, flowchart, flowmap, and database design). In this study, Laravel is used for the implementation, and black box testing is used to verify compliance with the functional requirements. During the testing process, 42 department stakeholders participated to validate the requirements and conduct user experience testing. The results indicated that the stakeholders have found the website to be sufficiently responsive to their needs. Furthermore, it is revealed that SIPRu is effective at assisting users in reserving rooms at the Department of Information Technology, National State of Jember Polytechnic.

Keywords: requirements validation, room reservations information system, software development, Technology Acceptance Model, waterfall.

1. Introduction

Accreditation of higher education institutions and study programs is a major factor influencing prospective students' choice of higher education institution. This accreditation is important because it is often the main requirement for applying for jobs, for example in government institutions such as civil servants (Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia, 2024), as well as to access various scholarship programs, including the Smart Indonesia Card (KIP) (Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia, 2024). The Information Technology Department (JTI) organized by the Jember State Polytechnic (Polije) is located in East Java, Indonesia, the province with the second-largest number of higher education institutions in Indonesia (Badan Pusat Statistik, 2023). The high number of higher education institutions creates increasingly tight competition between institutions, thus encouraging Polije to continue improving the quality of services to attract prospective students. In the context of accreditation assessment, especially by the Independent Accreditation Institute for Informatics and Computers (LAM INFOKOM) (LAM INFOKOM, 2022), one of the important aspects assessed is the quality of facilities and infrastructure, which includes availability, accessibility, and utilization in supporting the implementation of the Tridharma of higher education.

JTI Polije faces problems in managing the reservation of facilities and infrastructure which is still done manually. Each borrower must seek information on room availability by meeting directly with the head of the room unit or the head of the laboratory, depending on the type of room they want to borrow. After that,

borrowers are required to fill out a form on paper, which is prone to damage or loss (Basir, Buckmaster, Raturi, & Zhang, 2024), inefficient, and prone to errors (Mangla, Ojasvi, Singh, & Dubey, 2024). The borrower's difficult-to-read handwriting is also often an obstacle in the data identification process. The verification process is carried out manually, namely by obtaining signatures from the lecturer in charge of the course, the research supervisor, the head of the laboratory (for laboratory rooms), or the head of the room (for non-laboratory rooms). In addition, the letter management system at JTI still uses a local server. This requires borrowers to come to campus to print and fill out forms manually. This manual process is not only time-consuming but also often hinders academic activities. For example, when it is necessary to reserve a room to change the lecture schedule, this lengthy procedure can cause delays, thus impacting the effectiveness of the learning process.

The student internship management information system has easy-to-use internship registration and reporting features that can be accessed from anywhere, as well as integrated internship data management features. The results of this study indicate that the development of a student internship information system using the Laravel framework can provide convenience in registering and reporting internship results for students, as well as assisting agencies in managing internship data. Similar problems occur in the student internship information system at the Indorama Engineering Polytechnic, Purwakarta, West Java, Indonesia (Nugraha, Setiawan, Fathi, & Baginda, 2023). Internship management, from registration to reporting, is still done manually, so it is not effective and efficient. Students are required to meet directly with the internship coordinator to fill out the registration form and collect documents physically. The process of reporting and submitting internship results has also not been computerized. On the other hand, internship management faces challenges in managing data, such as document validation, activity monitoring, assessment, and reporting, which are carried out conventionally using physical files. This method is at risk of data loss, storage errors, and limited accessibility and requires large storage space over time. As a solution, Nugraha, Setiawan, Fathi, & Baginda (2023) proposed the development of a web-based internship information system using the Laravel framework with the Software Development Life Cycle (SDLC) method. The stages carried out include literature studies, needs analysis, system design, testing, and evaluation. The Laravel framework was chosen because of its reliable performance, ease of use, and features that support system development (Nugraha, Setiawan, Fathi, & Baginda, 2023). The results of the study showed that the proposed information system was able to simplify the process of registering and reporting student internships, while also assisting agencies in managing integrated internship data, which can be accessed anytime, and from anywhere.

Rahma & Samsudin (2024) also addressed similar issues in the sports facility rental process at the North Sumatra Provincial Youth and Sports Agency (Disporasu), Indonesia. Previously, the rental process was carried out manually, which often caused inefficiency. As a solution, Rahma & Samsudin (2024) developed an Android-based e-Booking application using the Waterfall method, one of the classic SDLC methods suitable for small-scale projects (Pargaonkar, 2023). In the design stage, Rahma & Samsudin (2024) used the Unified Modeling Language (UML), such as use case diagrams, to map user interactions with the system (Acharya, 2022). The application was developed using the Dart programming language with the Flutter framework, while Firebase was used as the database. As a result, this application was able to increase efficiency and ease in the sports facility rental process. Wahyudi & Utomo (2020) also adopted the Waterfall method in developing an Android-based information system at the Population and Civil Registration Service of Malang Regency, Indonesia. One of the crucial stages in system development is design, which involves creating flowcharts, use case diagrams, and Data Flow Diagrams (DFD). DFDs are used to describe the data flow that connects various processes in the system.

Rachman, Gumilang, & Adi (2015) solved the problem of car rental management by developing a crowdsourcing-based web application. This application is designed to integrate rental car information from various service providers into a single centralized platform. The development was carried out using the Laravel framework with the Model-View-Controller (MVC) architecture, supported by the PHP programming language and a MySQL database. In testing, they implemented black-box testing to ensure that all functions run properly without errors. This application makes it easy for customers to search and book rental cars from various providers simultaneously, and allows for convenient payment confirmation. Additionally, customers can quickly share information via social media, which also helps service providers promote their cars effectively. Building on this background, this study proposes the development of a Learning Room and Facility Reservation Information System (SIPRu) within the JTI Polije environment. This system is designed using the Waterfall method, where the design phase includes the creation of use case diagrams, flowcharts, flow maps, and databases. System development is carried out using the Laravel framework, while testing is conducted through black-box testing. Furthermore, the system is evaluated using the Technology Accep-

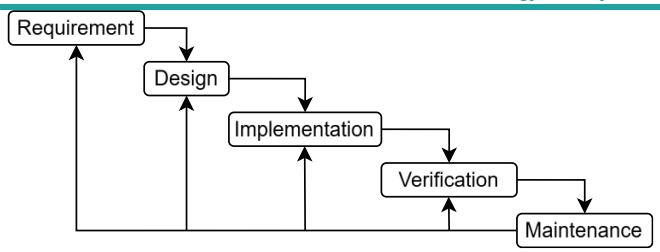


Fig. 1. Waterfall model (Rochmawati, Buditjahjanto, Putra, & Wicaksono, 2018).

tance Model (TAM) to assess user acceptance of the proposed system (Sayekti & Putarta, 2016). SIPRu is designed to manage reservations for two types of rooms: laboratory and non-laboratory rooms. The system involves three verifiers for each category. Verification of laboratory rooms is carried out in stages by lecturers, heads of laboratories, and department heads to ensure that the room is used optimally for activities requiring special facilities. For non-laboratory rooms, verification involves lecturers, department secretaries, and department heads. This verification model provides greater flexibility and accuracy, ensuring that the rooms are used according to established procedures. With this system, the efficiency and effectiveness of the room reservation process at JTI Polije are expected to increase.

2. Methods

This study uses the Waterfall method, also known as the sequential linear model (Sharma & Hasteer, 2016). The Waterfall method was chosen because of its linear-sequential approach, where each stage begins only after the previous stage is completed (Despa, 2015). This approach is predictable and emphasizes the importance of strict software planning and well-structured architecture, which allows for better quality control at each stage of software development. The Waterfall model provides a linear and sequential structured software development flow, starting from the requirements, design, implementation, and verification to maintenance stages, as depicted in Fig. 1 (Rochmawati, Buditjahjanto, Putra, & Wicaksono, 2018).

2.1. Requirement

This stage is carried out by collecting data and business processes, which are then analyzed to obtain functional and non-functional requirements. Data and business processes are collected through observation, study of conventional system documents to be developed, and interviews. The development of this system is also based on various literature, such as books, research reports, journals, conference notes, and other official sources. The interview method used is flexible but still does not deviate from the interview objectives that have been set. Interviews were conducted with Laboratory Technicians, the Head of the Laboratory, and the Secretary of JTI Polije. The results of this stage are in the form of room capacity data in the JTI Polije environment, which are presented in Table 1.

2.2. Design

This stage is carried out by designing based on the conventional system business process to be developed and the business process of the system to be developed (SIPRu) in order to improve the conventional system business process, and based on the functional needs of the system illustrated in the design of use case diagrams, flowcharts, DFDs, roadmaps, and database designs.

This stage involves designing based on the business processes of the conventional system to be developed, as well as the business processes of the new system, with the aim of improving the conventional system's business process. The design is also based on the functional requirements of the system, which are illustrated through a use case diagram in Fig. 2, a flowchart in Fig. 3, a DFD in Fig. 4, a roadmap in Fig. 5, and the database design in Fig. 6.

In Fig. 2, the use case diagram in SIPRu involves four actors, namely Students, Lecturers, the Head of the Laboratory, the Secretary of the Department, and the Head of the Department. Each actor has different access rights in the system, which are explained as follows:

a. Students can access the system to check room availability, create an account, and log in. After successfully logging in, students are required to update their profile by uploading a photo and digital signature. To apply for a room loan, students must fill out the digital form provided. The application verification process is carried out in stages by the authorities, depending on the type of room requested. For laboratory rooms, the verification process is initiated by the Lecturer based on the related course, continued by the Head of the Laboratory, and completed by the Head of the Department. This multi-level verification model is applied to ensure optimal utilization of laboratory spa-

Table 1
Room data for the Department of Information Technology.

No.	Code	Room Name	Capacity
1	F1.10	JTI Innovation Lounge	9
2	F1.12	Examination Room 1	5
3	F1.13	Examination Room 2	5
4	F1.09	Examination Room 3	
5	F1.08	Examination Room 4	5
6	F1.16	Examination Room 5	5
7	F1.17	Examination Room 6	
8	F1.18	Reading Room	9
9	F1.19	Meeting Room	36
10	F2.14	AJK Lab. 1	30
11	F2.15	AJK Lab. 2	30
12	F2.12	KSI Lab. 1	30
13	F2.13	KSI Lab. 2	30
14	F2.5	RSI Lab.	30
15	F2.1	SKK Lab. 1	0
16	F2.2	SKK Lab .2	30
17	F2.11	RPL Lab.	30
18	F2.16	MMC Lab.	30
19	F3.1	Classroom 3.1	30
20	F3.2	Classroom 3.2	30
21	F3.3	Classroom 3.3	120
22	F3.4	Classroom 3.4	120
23	F3.5	Classroom 3.5	30
24	F3.6	Classroom 3.6	30
25	F3.7	Classroom 3.7	30
26	F3.8	Classroom 3.8	60
27	F3.9	Classroom 3.9	60
28	F3.10	Classroom 3.10	60
29	F3.11	Classroom 3.11	60
30	F4.1	Auditorium	200

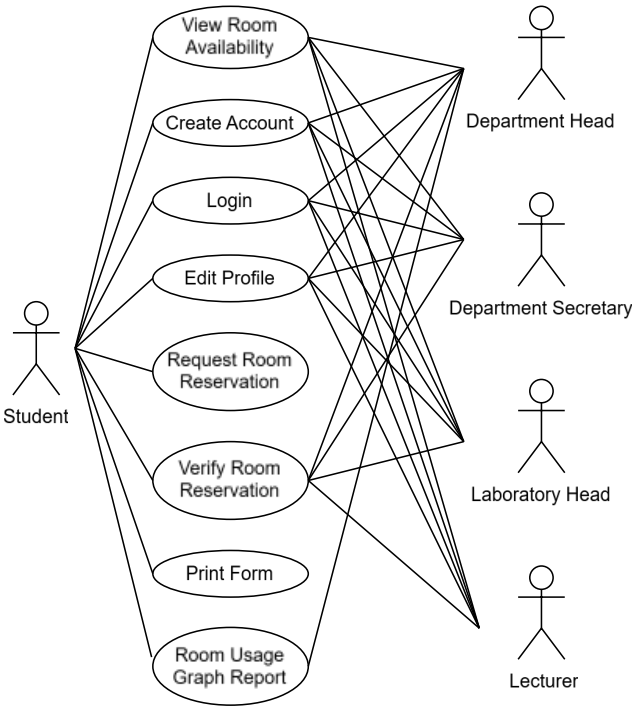


Fig. 2. Use case diagram SIPRu.

ces that require special facilities. Meanwhile, for non-laboratory rooms, verification is carried out sequentially by the Lecturer, Secretary of the Department, and Head of the Department. After the

application is finally verified by the Head of the Department, students can print proof of the room loan application that has been approved by the relevant party and show the document to the Head of the Class Service Unit.

b. Lecturers can access the system to see room availability, create an account, log in, and update their profile by uploading a digital signature. The signature will be used in the verification process for room loan applications by students, according to the courses or activities taught by the lecturer concerned.
c. Admins who serve as Head of the Laboratory have access to view room availability, create accounts, log in, and edit profiles, including uploading digital signatures. The uploaded digital signature will be automatically affixed to the verification document when the Head of the Laboratory approves the application for reservation a laboratory room submitted by a student. The verification process is carried out according to the Head of Laboratory's responsibility for the room under his/her authority. Previously, the loan application must obtain initial approval from the Lecturer Teaching the course or the person in charge of non-lecture activities.
d. Admins who act as Secretary of the Department have access to view room availability, create accounts, log in, and edit profiles, including uploading digital signatures. The digital signature uploaded by the Secretary of the Department will be automatically affixed to the verification document when the Secretary of the Department approves the application for reservation a non-laboratory room. The verification process is carried out after the application receives initial approval from the Lecturer Teaching the course or the person in charge of non-lecture activities.
e. Admins who act as Heads of Departments have access to view room availability, create accounts, log in, and edit profiles, including uploading digital signatures. The digital signature uploaded by the Head of Department will be used in the verification document when the Head of Department approves the room loan application by the student, after verification by the Lecturer, Head of Laboratory, or Secretary of the Department. In addition, the Head of Department can also access a graphic report on room usage. This report is useful for monitoring overall room usage.

Fig. 3 shows the flowchart, while Fig. 4 shows the flowmap of SIPRu that will be developed. The diagram structurally describes the flow of activities of the five main actors in this system, namely Students, Lecturers, Head of Laboratory, Secretary of Department, and Head of Department. The following explanation describes the detailed steps taken by each actor in carrying out the related process:

a. Students
   - Registration and Login: Students start by registering and logging into the system.
   - Access Verification: After logging in, the system verifies the student's access. If the access is valid, students can edit their profile.
   - Room Loan Request: After the profile is updated, students can submit a room loan request.
   - Verification and Confirmation: The system verifies the submitted room loan request. If approved, students receive a loan confirmation.
   - Logout: After the process is complete, students log out and end the session.
b. Lecturers
   - Registration and Login: Lecturers start by registering and logging into the system.
   - Access Verification: After logging in, the system verifies the lecturer's access. If valid, the lecturer can edit their profile.
   - Verify Loan Request: Lecturers are tasked with verifying room loan requests submitted by students.
   - Logout: After verification is complete, the lecturer can log out and end the session.
c. Head of Laboratory
   - Registration and Login: The Head of the Laboratory registers and logs into the system.
   - Access Verification: After logging in, the system verifies the Head of Laboratory's access. If valid, the Head of the Laboratory can edit their profile.
   - Room Usage Verification: The Head of the Laboratory verifies the use of laboratory rooms submitted by students or other related parties.
   - Room Loan Management: The Head of the Laboratory is also responsible for managing the loan of laboratory rooms.
   - Logout: After completing the management, the Head of the Laboratory logs out and ends the session.
d. Department Secretary
   - Registration and Login: The Secretary of the Department begins by registering and logging into the system.

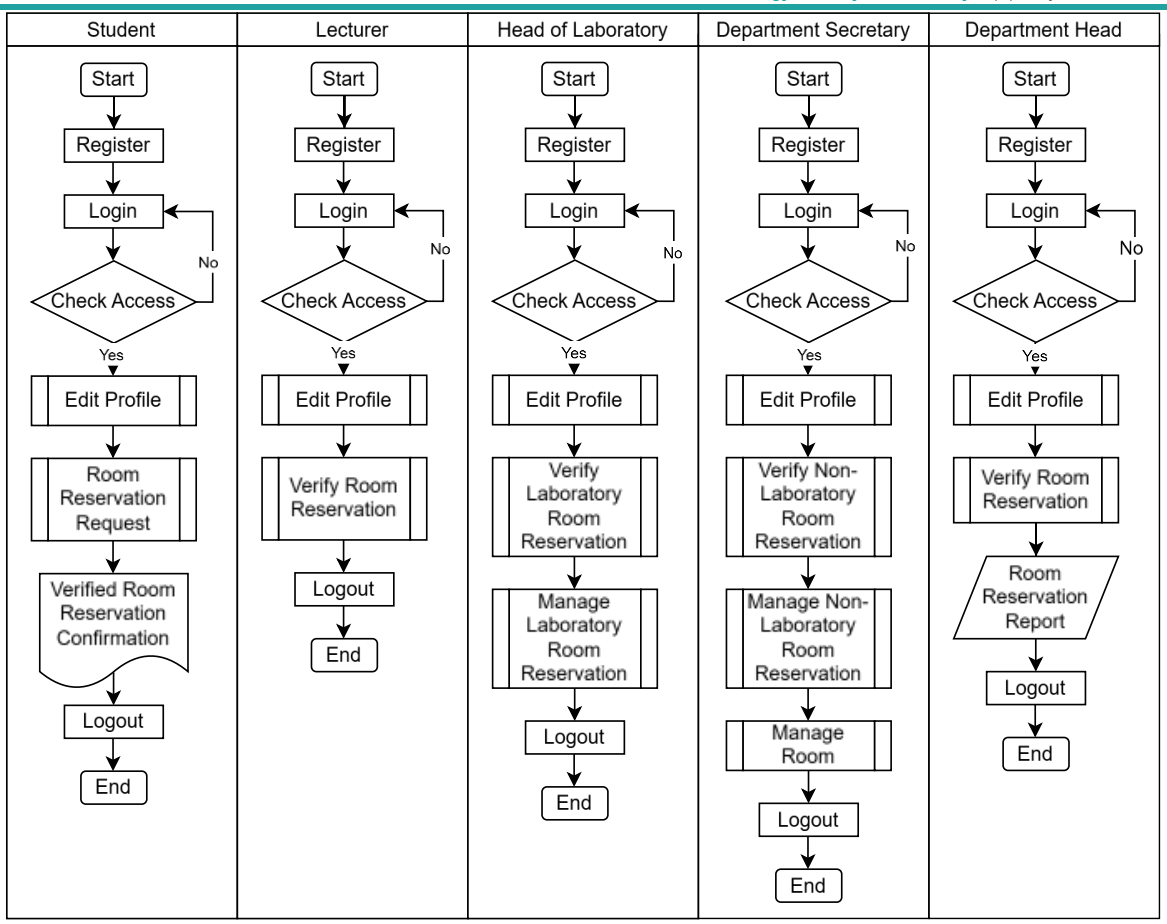


Fig. 3. Flowchart of actors in the SIPRu.

- Access Verification: After logging in, the system verifies the Secretary of the Department's access. If valid, the Secretary of the Department can edit their profile.
- Non-Laboratory Room Loan Verification: The Secretary of the Department is responsible for verifying the loan of non-laboratory rooms submitted by students.
- Room Management: The Department Secretary can also add room data, both for laboratories and non-laboratories, as well as manage non-laboratory room reservation.
- Logout: After the process is complete, the Department Secretary logs out and ends the session.

e. Head of Department

- Registration and Login: The Head of Department registers and logs into the system.
- Access Verification: After logging in, the system verifies the Head of Department's access. If valid, the Head of Department can edit their profile.
- Room Loan Verification: The Head of Department verifies room reservations that have been approved by the Lecturer, Head of Laboratory, or Secretary of the Department.
- Report Preparation: The Head of the Department is also responsible for generating reports on room reservations.
- Logout: Once completed, the Head of Department logs out and ends the session.

Fig. 5 shows the SIPRu database design consisting of six main tables, namely administrator, admin_room, room, reservation, lecturer, and student. The admin's table is used to store administrator data who have the authority to manage many rooms. However, in the implementation using PHP, the following restrictions will be applied:

- The Secretary of the Department has the right to add room data and create a room manager relationship between the Secretary of the Department and the Head of the Laboratory.
- Meanwhile, the Head of the Laboratory only has access to select room management that is within the scope of the laboratory.
- Each room can be managed by more than one administrator. Administrators, which include the Head of the Laboratory, Secretary of the Department, and Head of the Department, have the autho-

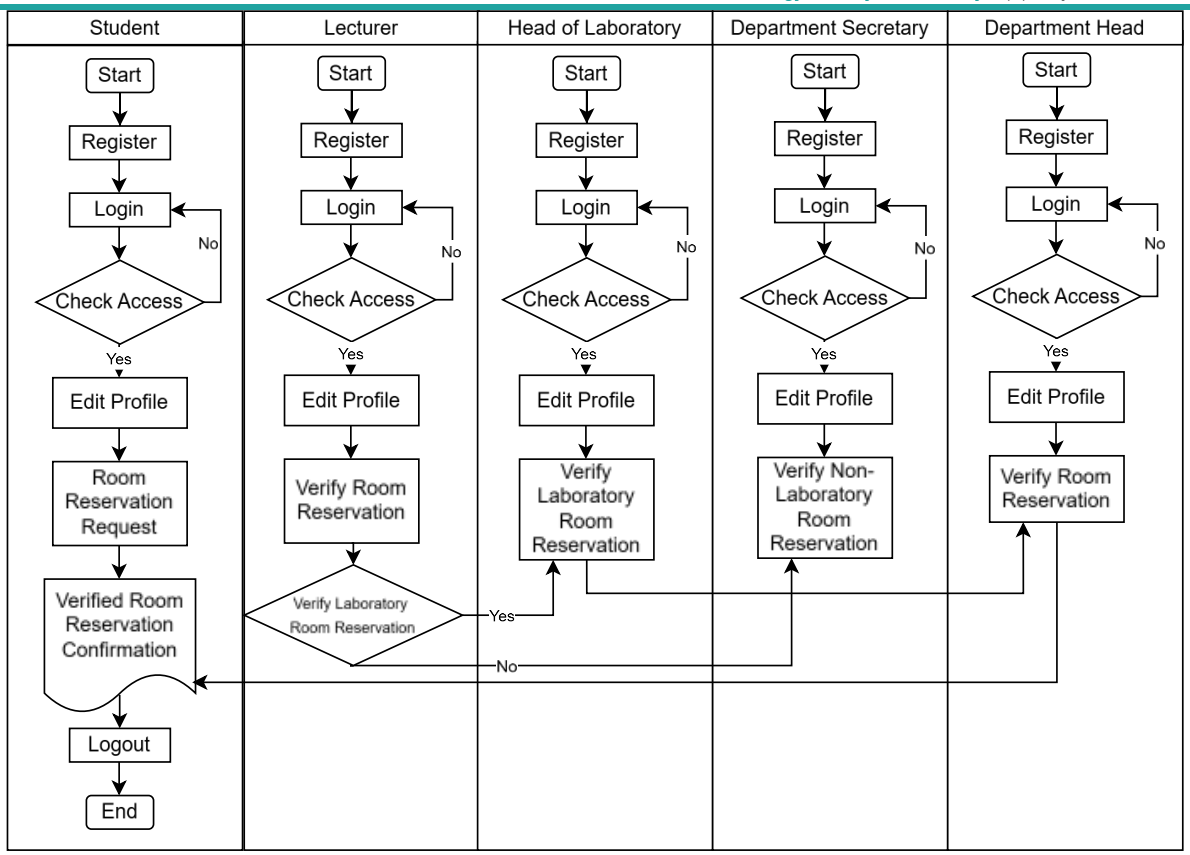


Fig. 4. SIPRu flowmap.

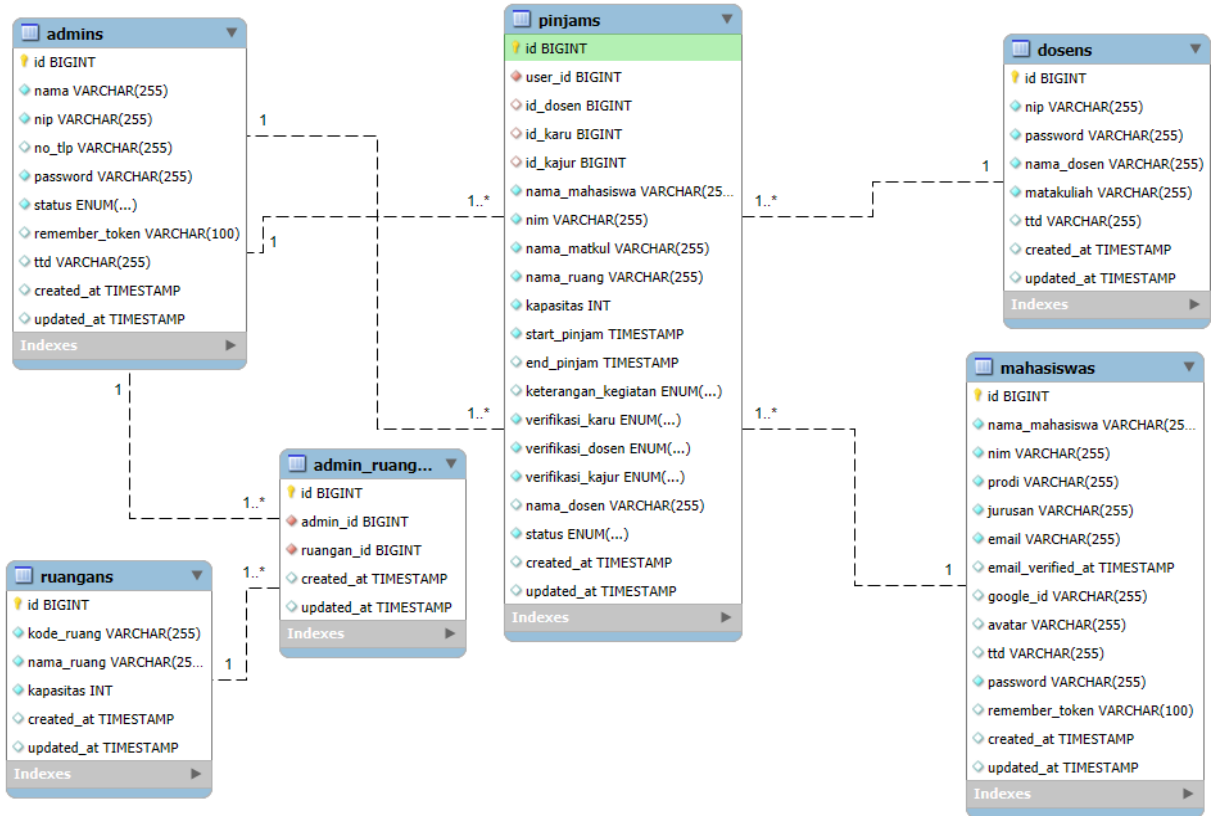


Fig. 5. SIPRu's database.

rity to verify multiple reservations.

Table 2
Likert scale categories.

Score Range	Satisfaction Level
1.00 – 1.80	Strongly Disagree
1.81 – 2.60	Disagree
2.61 – 3.40	Neutral
3.41 – 4.20	Agree
4.21 – 5.00	Strongly Agree

- In addition, a lecturer also has the right to verify multiple reservations.
- Meanwhile, a student can apply for multiple reservations.

The relationship between the tables is as follows:

- Relationship between admins and admin_room.
- This relationship allows administrators with certain status (Secretary of Department, Head of Laboratory, or Head of Department) to manage access to certain rooms.
- Reservation relationships with admins, lecturers, and students.
  This relationship describes the flow of the reservation process as follows:
  - Students submit reservation applications that are stored in the reservation table.
  - The reservation process is verified in stages by lecturers and administrators according to certain statuses.
- Relation between rooms and admin_room.
  This relationship connects room data with the administrator in charge. The purpose of this relationship is to facilitate efficient room management.

2.3. Implementation

This stage involves the coding process using the Laravel framework, which is carried out based on the results of data collection, functional requirements analysis, non-functional requirements analysis, and all designs that have been prepared in the previous stage.

2.4. Verification

Black-box testing was conducted on the developed system to ensure that its functionality aligns with the specified requirements. Additionally, an analysis of user acceptance of SIPRu was carried out by distributing a questionnaire adapted from the Technology Acceptance Model (TAM) framework. The results of the evaluation using TAM include Perceived Ease of Use and Perceived Usefulness (Wicaksono, 2022). Perceived Usefulness, or the perception of the benefits of technology, is a key factor that influences users' intentions and behaviors in utilizing technology. The greater the individual's perception of the benefits, the higher the likelihood that the individual will intend to use the system. Meanwhile, Perceived Ease of Use measures the extent to which users find the system easy to use. The user acceptance assessment of SIPRu was conducted using a five-point Likert scale, as detailed in Table 2, with reference to Lubis (2014).

2.5. Maintenance

The debugging process is carried out to identify and fix errors or bugs in the system. This step aims to ensure that the application functions according to the specifications and expectations that have been set.

3. Results and Discussion

Fig. 6 to Fig. 16 illustrate the proposed SIPRu in this study. Fig. 6 displays the homepage that presents room availability information. This page can be accessed by all users without having to log in. All users have the option to register an account, with an illustration of the account registration page as a student presented in Fig. 7.

Users who already have an account can access SIPRu by logging in via the login page (Fig. 8, example for students). After successfully logging in, users are directed to the SIPRu dashboard page. All users are required to edit their profiles after logging in. Students must upload a photo and signature, while lecturers, the Head of the Laboratory, the Secretary of the Department, and the Head of the Department are only required to upload a signature. On the student dashboard (Fig. 9), a history of room reservations that have been made is displayed. To borrow, students can select the Reservation Facilities and Infrastructure menu, which will direct them to the Request for Room Loan page (Fig. 10). On this page, students are asked to fill out a reservation form with data such as the name of the activity, the name of the lecturer in charge, the name of the room, the number of participants, the start and end times of the reserva tion, and additional information. After the form is submitted, students can wait for the approval process as

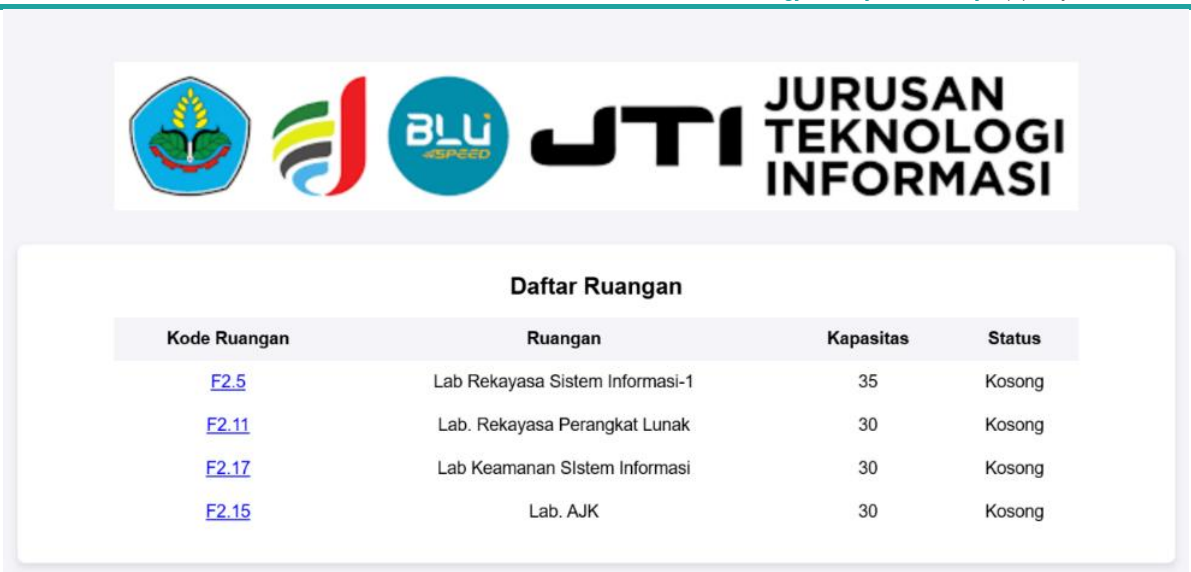


Fig. 6. SIPRu-JTI Homepage.

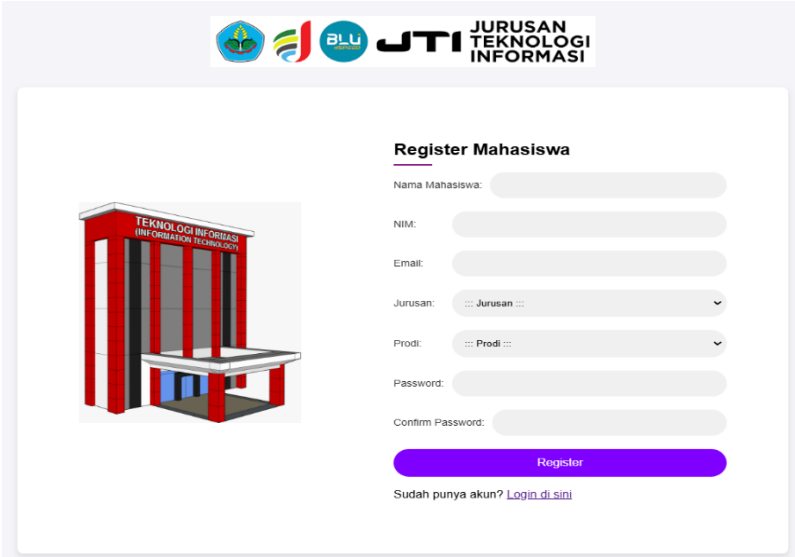


Fig. 7. Student registration form.

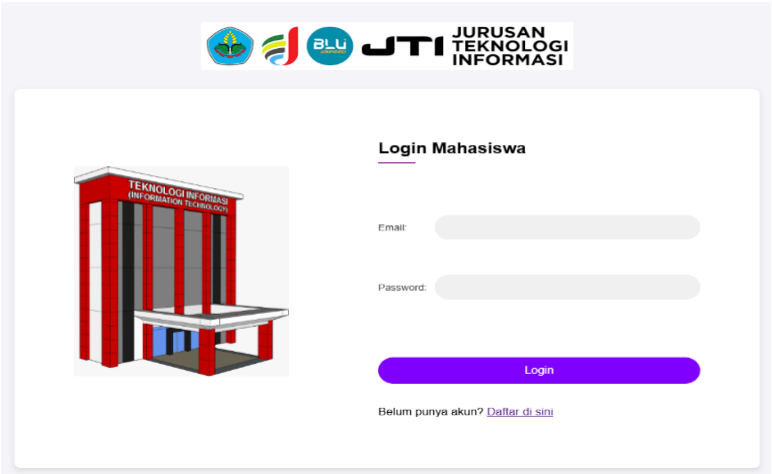


Fig. 8. Student login page.

shown in Fig. 11.

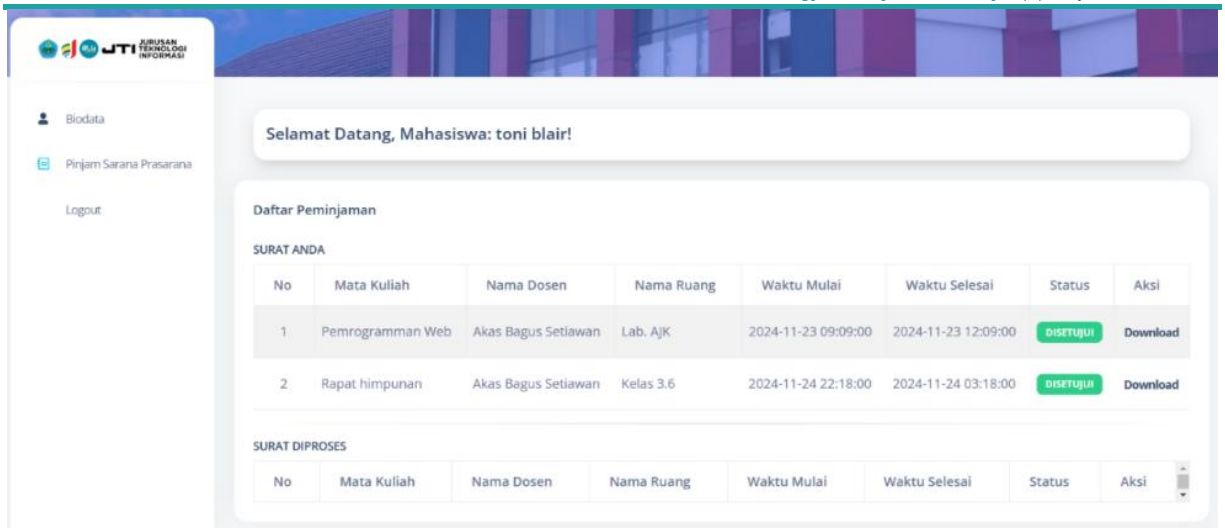


Fig. 9. Student dashboard.

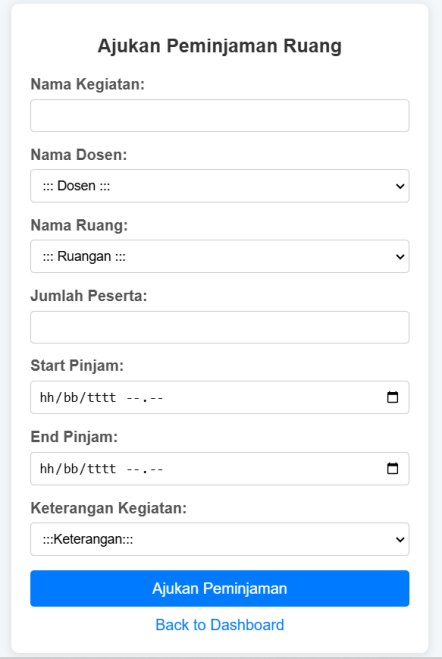


Fig. 10. Student room reservation form.

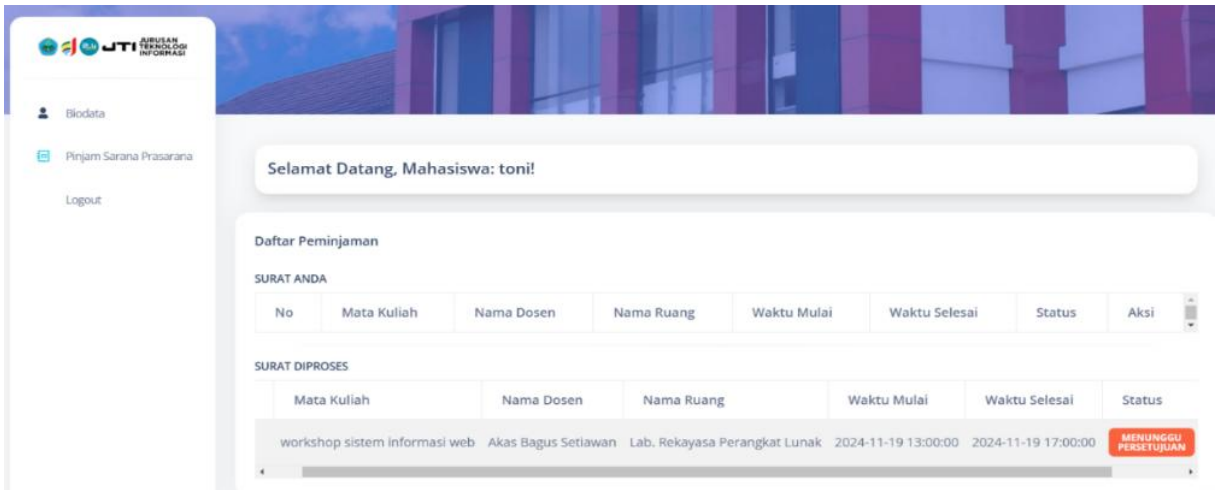


Fig. 11. Student dashboard with room booking status monitoring.

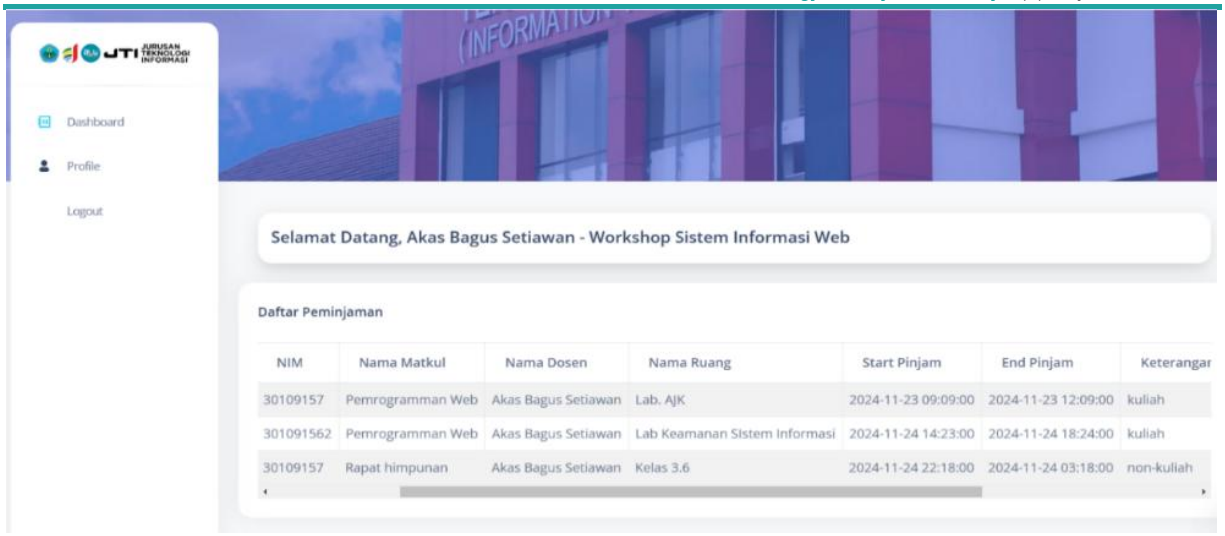


Fig. 12. Lecturer dashboard.

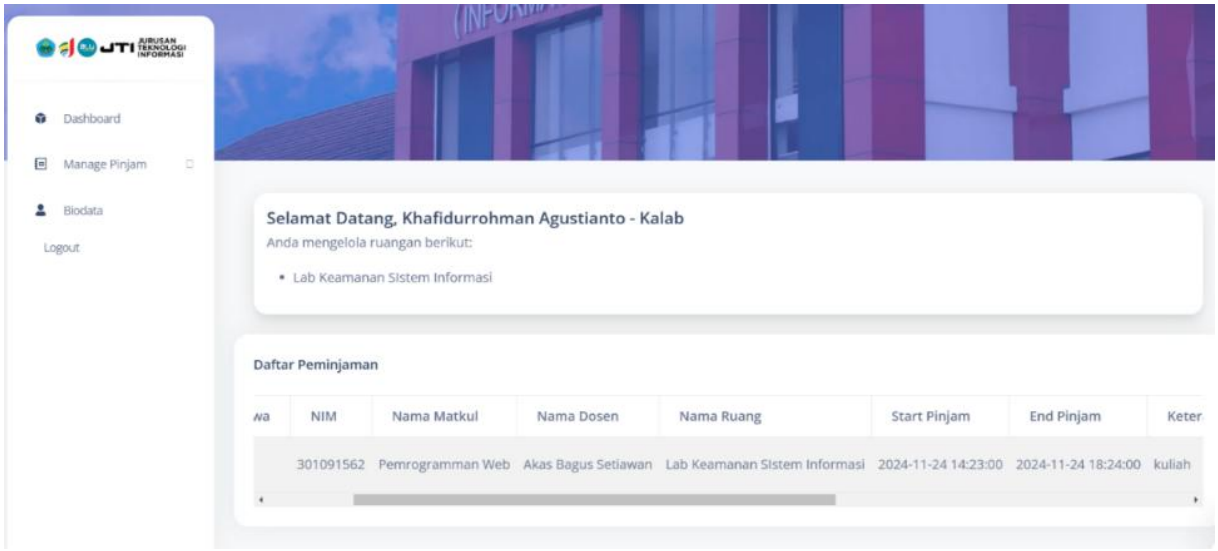


Fig. 13. Admin dashboard as laboratory head.

Fig. 14. Department head dashboard.

Fig. 12, Fig. 13, and Fig. 14 each display the dashboard pages for lecturers, the Head of the Labora-

Table 3
Black box testing summary.

No.	Activity	Actor				
		Student	Lecturer	Laboratory Head	Department Secretary	Department Head
1	Check room availability	✓	✓	✓	✓	✓
2	Registration	✓	✓	✓	✓	✓
3	Login	✓	✓	✓	✓	✓
4	Edit profile	✓	✓	✓	✓	✓
5	Add room data	×	×	×	✓	×
6	Submit room booking request	✓	×	✓	✓	×
7	Verification	×	✓	✓	✓	✓
8	Print room booking confirmation	✓	×	×	×	×
9	View room usage summary chart	×	×	×	×	✓

Note: '✓' indicates 'Available and operational,' while '×' indicates 'Not available.'

tory, and the Head of the Department, which contain the reservation history and a list of room reservations that are being processed or awaiting verification. The Head of Department dashboard page (Fig. 14) is used to perform final verification of the room reservation application, after approval has been given by the lecturer, Head of Laboratory, or Secretary of Department, according to the type of room submitted.

If the student's room reservation application is approved, a special page will be displayed (Fig. 15). On this page, students can print the document as proof of the application that has been approved by the relevant party. The document can then be submitted to the Head of Class Service Unit as proof of validation of the reservation.

After the development of SIPRu, black-box testing was conducted to evaluate the system's output based on the input provided, without checking its internal code. This testing aims to ensure that all developed features, such as room and facility reservations, function according to user needs, predetermined requirements, and meet the specified standards. The test results are presented in Table 3. Based on the black-box test results in Table 3, it can be concluded that the developed SIPRu meets the expected functional requirements and is effective in addressing the problems faced by JTI Polije. In this study, an analysis of respondents' perceptions of the SIPRu application was conducted by distributing questionnaires using Google Forms. The questionnaire was adapted from the Technology Acceptance Model (TAM) and used a Likert scale (Table 2). The list of questions can be seen in Table 4. A total of 42 respondents, consisting of lecturers, students, and heads of laboratories, filled out the questionnaire. All respondents had accessed SIPRu and applied for room reservations through the application. The results of the questionnaire distribution are shown in Figure 16. Descriptive statistical analysis was performed to understand the general characteristics of the data obtained in this study, using the average (Wicaksono, 2022), as shown in Table 4. Overall, all questions received responses in the "Strongly Agree" category, indicating that the SIPRu prototype has been well received by users. The following are some key points from the results:

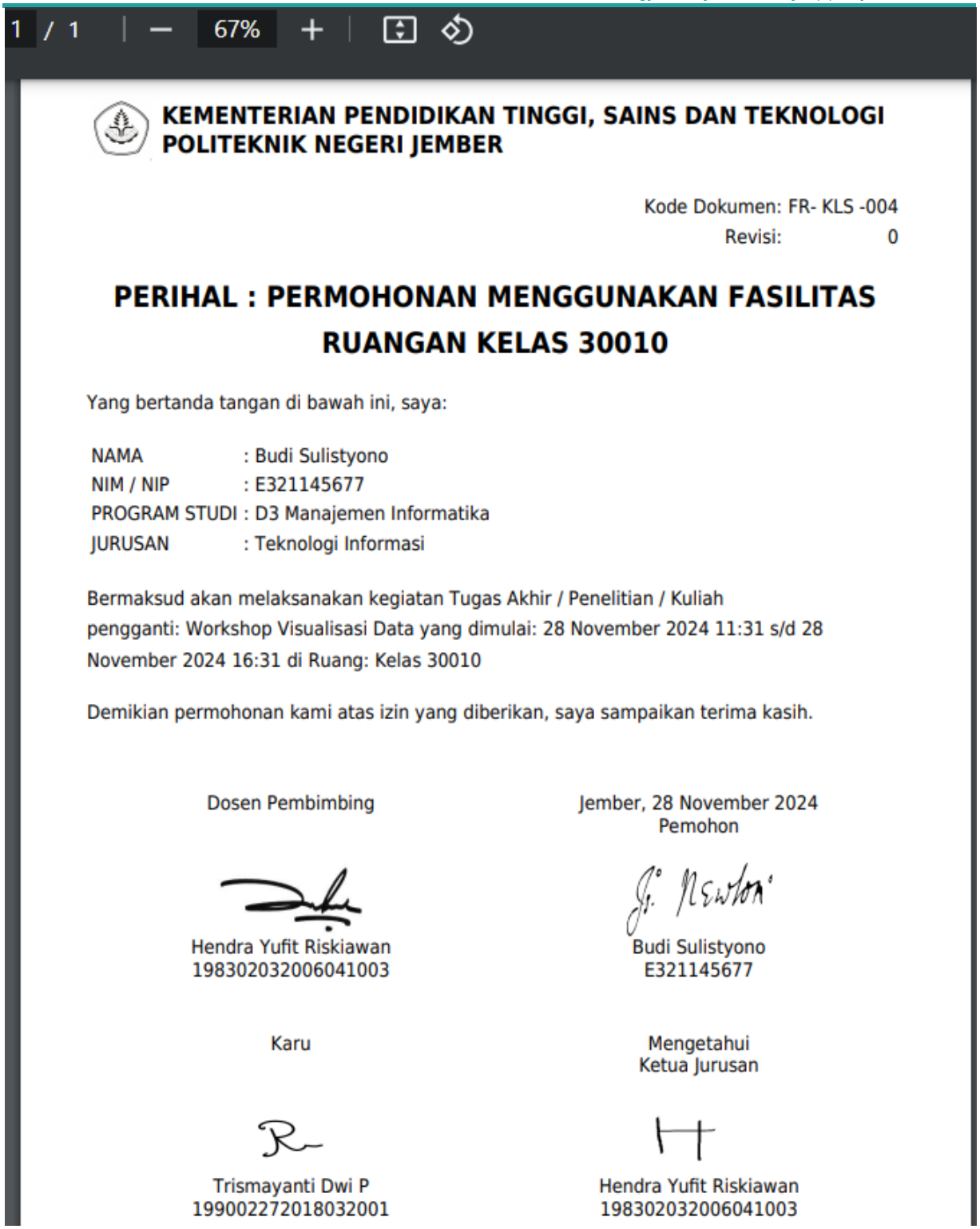
a. Main Advantages
   - Page loading speed and compatibility across devices received the highest score (4.74), indicating that the website is functioning well from a technical standpoint.
   - Users feel very satisfied using the website for administrative needs of renting rooms (4.81).
   - The process of applying for renting rooms is considered very helpful (4.79).

b. Potential Improvement
   - Although the visual design and layout aspects scored quite high (4.64), there is still a little room for further improvement to make it look more attractive and structured.

The SIPRu prototype successfully meets user needs in terms of convenience, ease of navigation, design, and technical efficiency. Overall, users feel Strongly Agree (4.79 average for overall experience).

4. Conclusions

The research on the SIPRu system produced several significant conclusions. First, the system successfully provided features for room reservations and learning facilities with an easy-to-use interface, supporting the efficiency of the reservation process for students, lecturers, and education personnel. Second, the results of functional tests using the Black Box method showed that all the features developed



1 / 1 — 67% +

KEMENTERIAN PENDIDIKAN TINGGI, SAINS DAN TEKNOLOGI
POLITEKNIK NEGERI JEMBER

Kode Dokumen: FR- KLS -004
Revisi: 0

PERIHAL : PERMOHONAN MENGGUNAKAN FASILITAS RUANGAN KELAS 30010

Yang bertanda tangan di bawah ini, saya:

NAMA	: Budi Sulistyono
NIM / NIP	: E321145677
PROGRAM STUDI	: D3 Manajemen Informatika
JURUSAN	: Teknologi Informasi

Bermaksud akan melaksanakan kegiatan Tugas Akhir / Penelitian / Kuliah pengganti: Workshop Visualisasi Data yang dimulai: 28 November 2024 11:31 s/d 28 November 2024 16:31 di Ruang: Kelas 30010

Demikian permohonan kami atas izin yang diberikan, saya sampaikan terima kasih.

Dosen Pembimbing	Jember, 28 November 2024 Pemohon
Hendra Yufit Riskiawan 198302032006041003	Budi Sulistyono E321145677
Karu	Mengetahui Ketua Jurusan
Trismayanti Dwi P 199002272018032001	Hendra Yufit Riskiawan 198302032006041003

Fig. 15. Application output for students: Room booking request letter.

functioned well according to the requirements that had been set, including the verification process and management of reservation data. The main findings of this study concluded that the implementation of SIPRu had a positive impact on increasing the efficiency of facility and infrastructure management at JTI Polije. This system not only increases productivity but is also in line with the organizational values of Smart, Innovative, and Professional (SIP). Thus, SIPRu has great potential to be widely implemented, providing convenience, comfort, and speed in supporting the smooth running of academic activities with similar room reservation application procedures. Development suggestions in terms of visual design and layout.

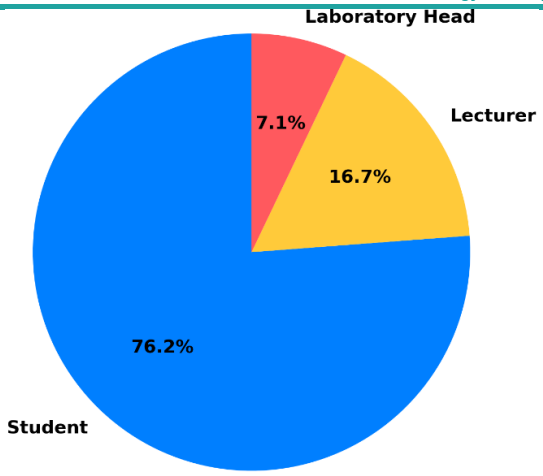


Fig. 16. Distribution of respondents.

Table 4
Questionnaire item list.

No.	Variable	Question	Average
1	Ease of Use (SIPRu)	The menu structure of the SIPRu website prototype is easy to understand.	4.71
2		Navigation between pages in the SIPRu website prototype operates smoothly.	4.69
3		The layout of elements on the pages of the SIPRu website prototype is well-organized.	4.64
4		The colors and fonts used in the SIPRu website prototype are visually comfortable.	4.67
5		The SIPRu website prototype loads pages quickly.	4.74
6	Usefulness (SIPRu)	I am satisfied with using the SIPRu website prototype for administrative needs related to room booking in the Department of Information Technology at the Main Campus of Politeknik Negeri Jember.	4.81
7		The SIPRu website prototype helps me in the room booking application process in the Department of Information Technology at the Main Campus of Politeknik Negeri Jember.	4.79
8	Acceptance	The design of the SIPRu website prototype is visually appealing.	4.64
9	(SIPRu)	The SIPRu website prototype is compatible across various devices (computers, tablets, smartphones).	4.74
10		Overall, my experience using the SIPRu website prototype is very satisfying.	4.79

5. CRediT Authorship Contribution Statement

Akas Bagus Setiawan: Conceptualization, Investigation, Methodology, Software, Visualization, Writing – Original Draft, and Writing – Review & Editing. **Taufiq Rizaldi:** Validation and Writing – review & editing.

6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

7. Acknowledgments

The authors express their deepest gratitude to the Department of Information Technology, Politeknik Negeri Jember, Indonesia, for providing the opportunity to conduct research and develop the room reservation information system. Special thanks are extended to the Head of Department, Mr. Hendra Yufit Riskiawan, S.Kom., M.Cs., for his support and guidance throughout this research, and to the Secretary of Department, Ms. Trismayanti Dwi P., S.Kom., M.Cs., for her assistance in providing the necessary data and

information. The authors also extend their appreciation to the Laboratory Heads for facilitating the analysis of issues and the understanding of business processes within the laboratory environment. It is hoped that this research will contribute significantly to improving the management of facilities in the Department of Information Technology, Politeknik Negeri Jember.

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