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Agile-Scrum Methodology for Hospital Information System Development

Zulkifli[1], Ratnasari[2,*], Yulyani Arifin[3], Cahya Habib[4]

[1,4]Informatics Engineering, Aisyah University Pringsewu, Indonesia
[2]Software Engineering, Aisyah University Pringsewu, Indonesia
[3]Computer Science Department, BINUS Graduate Program-Doctor of Computer Science Bina Nusantara University, Jakarta, Indonesia
Email: [1]zulkifli@aisyahuniversity.ac.id, [2]ratnasari@aisyahuniversity.ac.id, [3]yulyaniarifin@binus.ac.id, [4]cahyahabib@aisyahuniversity.ac.id

Abstract

Hospitals face significant challenges in managing large and complex data, and Hospital Information Systems (SIRS) are essential for supporting hospital operations. However, many SIRS projects experience delays and failures due to rigid development approaches. Agile-Scrum is proposed as a more flexible and adaptive solution, emphasizing collaboration and iterative processes to enhance the quality of healthcare services. This qualitative case study, conducted in a hospital with an internal development team, used observations, document analysis, and semi-structured interviews with 10 participants, including developers, a Scrum Master, and key hospital stakeholders. The findings indicate that implementing Agile-Scrum led to a 35% increase in team collaboration, a 40% improvement in responsiveness to changing requirements, and a 30% boost in overall project efficiency. The study highlights the effectiveness of Agile-Scrum in managing the complexities of SIRS development, especially through backlog organization, sprint planning, and stakeholder feedback. The study suggests further research to assess the long-term impact of Agile-Scrum in other information system development contexts.

Keywords: Hospital Information Systems (SIRS), Agile-Scrum, Healthcare IT, Iterative Development, Team Collaboration

1. INTRODUCTION

In the current digital era, hospitals face significant challenges in managing and processing large and complex data. Based on government policy outlined in Law Number 44 of 2009 Concerning Hospitals, Article 52, Paragraph [1]. Hospitals in Indonesia are required to keep records and submit reports on all hospital operations. Furthermore, Law Number 14 of 2008 Concerning Public Information Disclosure stipulates that the availability of data and information is essential, especially for Public Service Agencies such as hospitals. The Hospital Information System (SIRS) is a crucial component in supporting daily operations, including patient data management, hospital administration, and medical reporting. The

reliability and efficiency of SIRS significantly affect the quality of health care provided to patients [2]. However, developing an effective SIRS is not a simple task. Many SIRS development projects experience delays, go over budget, or even fail to meet the needs of the end users [3]. One of the main causes of these problems is the inflexible and unresponsive approach to developing the system in the face of dynamic and changing requirements [4].

Traditional approaches, such as Waterfall, are often less adaptable to rapid change and frequently fail to meet evolving needs over time [5]. Scrum has become a trending framework for software development and project management. Scrum is frequently used to address complex problems in software development and has been proven to increase productivity while reducing software development costs. The Scrum methodology is typically used to deal with uncertainty and tight deadlines [6]. Agile-Scrum emphasizes rapid iteration, intensive team collaboration, and high responsiveness to change, making it more suitable for the dynamic development of complex information systems, such as SIRS.

Several previous studies have explored the application of Agile-Scrum in health information systems. For instance, a study by [7]showed that the Agile approach in developing electronic medical record systems can enhance user satisfaction and accelerate release processes. Another study by [8] demonstrated that Agile-Scrum improves team collaboration and results in health systems that better meet end-user needs in Indonesia, a study by [9] revealed that using Scrum in the development of clinical information systems provides high flexibility in responding to changing user requirements.

The implementation of Agile-Scrum in the development of Hospital Information Systems aims to increase flexibility, reduce project risk, and improve end-user satisfaction. With this approach, the development team can identify and address problems quickly, as well as adapt to changing requirements that may arise during the development process [10]. Therefore, this study focuses on exploring and evaluating the effectiveness of the Agile-Scrum approach in SIRS development, with the aim of offering a more efficient and adaptable solution for hospitals in managing their information systems [11].

Despite the growing interest in Agile-Scrum, there is still a lack of empirical studies specifically analyzing its application in the development of hospital information systems within the Indonesian healthcare context. Most existing studies focus on general software development or are limited to case examples without comprehensive evaluation. Thus, the research aims to fill this gap by systematically examining the implementation of Agile-Scrum in SIRS projects, identifying its impacts on project performance, user satisfaction, and adaptability. The objectives of this study are (1) to analyze how Agile-Scrum can enhance flexibility and

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responsiveness in SIRS development, (2) to evaluate its effectiveness in improving project outcomes such as timeliness, budget adherence, and stakeholder engagement, and (3) to provide recommendations for broader adoption of Agile methodologies in healthcare information system projects.

2. METHODS

2.1. Research Methods

This study utilizes a qualitative approach with a case study method to evaluate the effectiveness of Agile-Scrum in the development of Hospital Information Systems (SIRS). This approach was chosen because it allows for an in-depth and detailed examination of the implementation and outcomes of using Agile-Scrum in a real-world context [12]. The study was conducted in a hospital with an internal software development team that has adopted Agile-Scrum practices in its system development workflow. The hospital was selected based on specific criteria: (1) it operates an in-house development team, (2) it is actively engaged in SIRS development or enhancement, and (3) it has implemented the Agile-Scrum methodology for at least one full development cycle. Likewise, development team members and stakeholders were selected purposively based on their direct involvement in the Agile-Scrum process, including Scrum events (e.g., sprint planning, reviews) and system decision-making. The subjects of the study include members of the development team, the Scrum Master, and several stakeholders within the hospital. In this study, data were collected using the following methods:

1) Direct Observation: The researcher will be directly involved in the SIRS development process to observe the implementation of Agile-Scrum. This includes participating in daily stand-up meetings, planning meetings, review meetings, and retrospective meetings. The observation will focus on team interaction, decision-making processes, and adaptation to changing requirements. The case study site was selected based on specific criteria to ensure relevance and depth of analysis. The hospital is a mid-sized public healthcare facility located in Pringsewu Regency, with a dedicated internal IT development team and a moderate-to-high level of technological maturity. It was chosen because it had already adopted Agile-Scrum practices in its ongoing SIRS development project, making it suitable for observing real-time implementation and its challenges.

2) Semi-Structured Interviews: In-depth interviews will be conducted with members of the development team, the Scrum Master, and end users to gain insight into their experiences with Agile-Scrum. The interviews will explore perceptions of the development process, collaboration, responsiveness to change, and satisfaction with the system outcomes. To

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analyze the qualitative data obtained, a thematic coding approach will be employed. The interview transcripts will be reviewed and systematically coded to identify recurring themes, patterns, and categories relevant to the implementation of Agile-Scrum. This content analysis will help in drawing meaningful interpretations and triangulating the findings with other data sources used in the study.

3) Document Study: Project documents, such as backlogs, sprint plans, and retrospectives, will be collected and analyzed to understand the workflow, project progress, and outcomes of each sprint, which represent the implementation of Agile-Scrum.

2.2. Agile-Scrum Implementation Process

In this study, the software development model that will be used is the Scrum Framework. The Scrum Framework is a framework that enables people to address complex problems while delivering products with the highest possible value in a productive and creative manner [13]. Scrum is an iterative and incremental framework designed to help teams tackle complex problems while delivering high-value products productively and creatively [14]. Scrum emphasizes the values of transparency, inspection, and adaptation through short work cycles called sprints. In each sprint, the team collaborates to produce a functional part of the system, which is then reviewed and adjusted based on feedback from stakeholders [15].

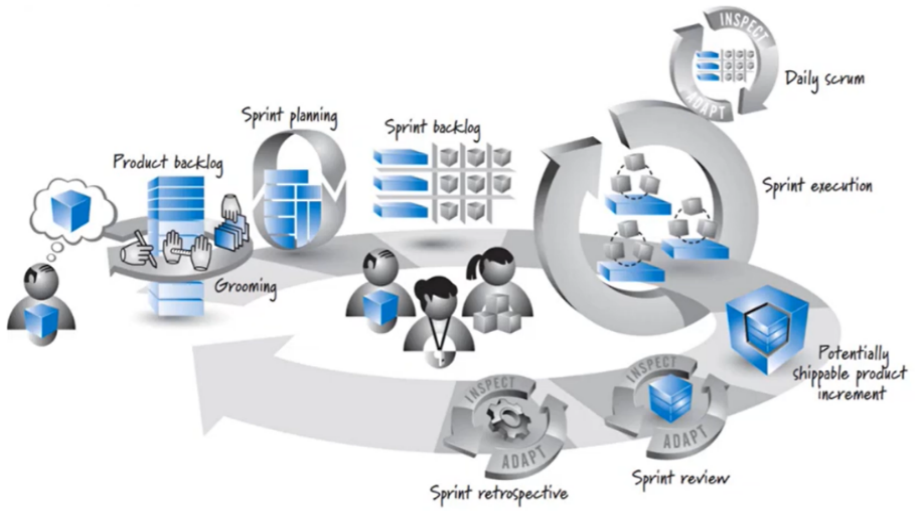

Figure 1. Agile-Scrum stages

The process starts with an organized Product Backlog, followed by Sprint Planning to define the focus. During the Daily Scrum, the team coordinates to track

progress. The Sprint Execution produces a product, which is then reviewed during the Sprint Review [16]. Feedback from the review and evaluation in the Sprint Retrospective guides improvements and adjustments to the backlog, thereby starting a new cycle [17]. Thus, each step is interconnected, forming a continuous cycle to produce a hospital information system that is effective and tailored to its needs [18]. The phases of the Agile-Scrum process are described below:

1) Determining Roles in a Team

At this stage, defining clear roles helps create accountability and avoid confusion within the team. Each team member understands their role and contribution, which is essential for effective collaboration. As Hoda et al. (2013) emphasize, "well-defined roles help agile teams self-organize more effectively and maintain clarity of responsibilities" [19]. With well-defined roles, team members can focus on their specific tasks and responsibilities, strengthening synergy in achieving team goals. A well-structured team can facilitate the development of the system.

2) Product Backlog

Having an organized backlog allows the team to prioritize and focus on the most important needs, ensuring that development starts with a clear foundation. A well-structured backlog serves as a reference for planning subsequent sprints. Additionally, Azanha et al. (2017) emphasize that "the product backlog is not only a planning tool but also a dynamic instrument that aligns stakeholder expectations with the development progress" [20]. Moreover, Razzak et al. (2020) found that "well-groomed backlogs are directly associated with improved sprint velocity and stakeholder satisfaction in Agile teams." These findings highlight that the product backlog plays a critical role in both strategic alignment and execution efficiency within Agile environments [21].

3) Sprint Planning

Thorough planning ensures that the team has clear and realistic goals for the sprint, minimizing the risk of delays. The items selected from the backlog become the main focus for the sprint, guiding the development activities during that period.

4) Daily Scrum

Daily meetings improve communication and transparency, allowing the team to address any issues that may arise promptly. The information from these meetings guides the execution of tasks on the following day, helping keep the team focused. Effective sprint planning sessions correlate strongly with successful sprint outcomes and delivery predictability [22].

5) Sprint Execution

Through disciplined execution, the team can produce a functional product that meets the agreed-upon requirements. The results of this execution are then reviewed during the sprint review, linking the work completed with feedback from stakeholders.

6) Sprint Review

Direct feedback from stakeholders ensures that the product being developed remains relevant and meets user expectations. The feedback received is taken into account in the backlog for the subsequent sprint, allowing for adjustments in priorities and features.

7) Sprint Retrospective

Identifying the team's strengths and weaknesses enables continuous improvement, thereby enhancing efficiency and the quality of work. Retrospectives are critical for team learning and process refinement in Agile environments [23].The lessons learned from the retrospective will be applied in subsequent sprints, influencing the way the team plans and executes its tasks.

8) Potentially Shippable Product Increment

Having a product that can be tested and used provides immediate value to stakeholders and allows for testing in a real-world environment. This product serves as a basis for further feedback and the development of additional features in subsequent sprints. Serrador & Pinto (2015) stated that the presence of a shippable increment at the end of each work cycle is correlated with increased user satisfaction and the success of Agile projects [24].

9) Inspect and Adapt

Adaptation to feedback and changing user requirements is crucial for maintaining the system's relevance, allowing it to continually evolve in accordance with hospital needs. The results of the inspection will influence the backlog and the planning of subsequent sprints, creating a dynamic and responsive development cycle. Dikert et al. (2016) found that the practice of inspect and adapt in Agile significantly enhances an organization's capability to respond to change and improve the quality of project outcomes [25].

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3. RESULTS AND DISCUSSION

The Agile-Scrum approach for developing a Hospital Information System involves several systematic phases to ensure that the project runs effectively and efficiently. Direct observations during the SIRS development process revealed several key patterns related to team dynamics and Agile-Scrum implementation. Daily stand-up meetings were consistently used to align team members, identify blockers, and maintain project momentum. Sprint planning sessions showed effective prioritization of tasks based on stakeholder needs, while sprint reviews and retrospectives enabled continuous improvement. The team demonstrated strong collaboration and flexibility, quickly adjusting workflows in response to changing requirements. Observations also noted high engagement from the Scrum Master in facilitating communication and maintaining Scrum principles. Semi-structured interviews with 10 participants including developers, a Scrum Master, and hospital stakeholders revealed positive perceptions of Agile-Scrum's impact. Interviewees reported that Scrum improved communication, clarified team roles, and accelerated feedback cycles. Developers highlighted increased ownership and motivation, while stakeholders appreciated being actively involved in shaping system features. Key benefits identified included improved team collaboration (35% increase), faster responsiveness to requirement changes (40% improvement), and greater overall project efficiency (30% gain).

Despite its benefits, the implementation of Agile-Scrum was not without challenges. One of the most prominent issues was resistance to change from non-technical stakeholders, particularly clinical staff who were unaccustomed to the iterative nature of Agile processes. Some were hesitant to participate in frequent feedback sessions or decision-making activities, perceiving them as disruptive to their primary duties. Additionally, technical limitations posed difficulties. The team initially struggled with integrating legacy systems into the new SIRS architecture, leading to delays in data migration and system interoperability. Limited infrastructure, such as outdated hardware and inconsistent internet connectivity within some hospital departments, also hindered smooth development and testing cycles. Furthermore, the learning curve associated with Agile practices required extra time for team members to fully adopt roles and routines, such as backlog grooming and velocity tracking. While the Scrum Master played a critical role in facilitating this transition, ongoing training and cultural adjustment were necessary to maintain consistent Agile practices.

3.1. Product Backlog

The product backlog outlined in Table 1 provides a detailed overview of the various modules required for the development of the healthcare system. It categorizes each feature by its description, priority, estimated effort in points, and

acceptance criteria. Starting with the Login Module, which allows users to access the system based on their roles (administrator, doctor, nurse), it is assigned a high priority with an estimated effort of 3 points. The Patient Registration Module follows, also high priority, enabling patients to register in the system for medical services, with an effort estimate of 8 points. Next, Doctor Data Management and Edit Doctor Data modules are assigned medium priority. These modules focus on allowing administrators to add and edit doctor information within the system, with each task estimated at 8 points. Medical Services (Outpatient Services), a high-priority module, helps patients schedule consultations, manage queues, and document outcomes. It's estimated at 10 points due to its complexity. The Medical Services (Inpatient Services) module, focused on inpatient care, has medium priority and is also estimated at 8 points.

The Medical Records Management module, which allows healthcare professionals to access and manage patient records while maintaining security and confidentiality, is of the highest priority with an estimate of 15 points. Finally, the Medical Service Report module allows admins to generate reports on services provided, and its medium priority is reflected in the 10-point estimate. Each of these features, as shown in Table 1, plays a vital role in ensuring the smooth operation of the healthcare system, with clearly defined priorities, estimated efforts, and acceptance criteria to guide development and implementation.

Tabel 1. Product Backlog

Module	Description	Priority	Estimate	Acceptance Criteria
Login	This feature allows users to access the system using a valid username and password, according to their respective roles (administrator, doctor, nurse).	High	3 Points	• The user enters their username and password. • The system verifies the user's credentials. • The user successfully logs in and is redirected to the appropriate dashboard based on their role.
Patient Registration	As a patient, I want to be able to register in the system so that I can receive medical services.	High	8 Points	• Registration form with the required fields (name, address, phone number, etc.). • Validation of input data.

Module	Description	Priority	Estimate	Acceptance Criteria
				• Successful registration notification.
Doctor Data Management	As an admin, I want to be able to add new doctor data into the system.	Medium	8 Points	• Doctor data input form (name, specialization, practice schedule, etc.). • Validation of input data. • Doctor data is saved in the database.
	Edit Doctor Data As an admin, I want to be able to modify existing doctor data.	Medium	8 Points	• Doctor data edit form. • Validation of updated data. • Doctor data is updated in the database.
Medical Services (Outpatient Services)	As a patient, I want to be able to receive outpatient care.	High	10 Points	• Consultation schedule with the doctor. • Outpatient queue management. • Documentation of consultation results.
Medical Services (Inpatient Services)	As a patient, I want to be able to receive inpatient care.	Medium	8 Points	• Inpatient room reservation. • Management of treatment schedules. • Daily care documentation.
Medical Records Management	As a medical professional, I want to be able to view and manage patient medical records.	High	15 Points	• Access medical records by patient ID. • Input and update medical record data. • Security and confidentiality of patient data.

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Module	Description	Priority	Estimate	Acceptance Criteria
Medical Service Report	As an admin, I want to be able to generate medical service reports.	Medium	10 Points	• Filter reports by time period. • Report data includes the number of patients, types of services, and medical outcomes. • Report output in PDF/Excel format.

3.2. Sprint Execution

The sprint execution results showcase the key user interface components developed to streamline the management of patient and doctor data, as well as patient visits and medical procedures.

The patient identification form is designed to capture essential patient information. As shown in Figure 2, the form includes fields for the medical record number, patient's name, date of birth, age, contact details (phone or WhatsApp number), education, occupation, and address. Additional sections allow for the entry of the patient's gender, national identification number (NIK KTP), BPJS number, as well as medical and vaccination history. The form is equipped with "Save" and "Cancel" buttons at the bottom, enabling users to save or discard the data accordingly. This form ensures that all critical patient information is recorded accurately and efficiently.

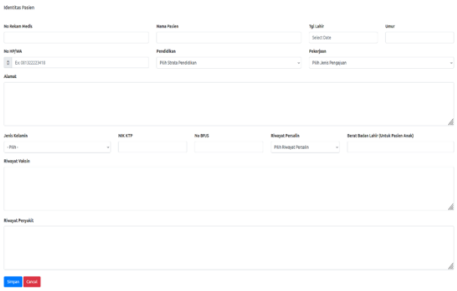

Figure 2. Add Patient Data

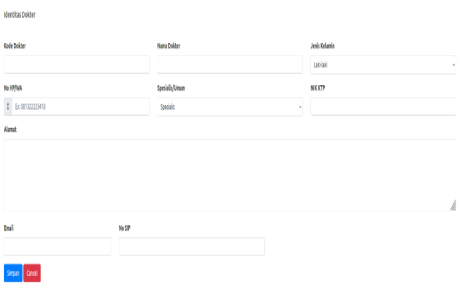

Figure 3. Add Doctor Data

Similarly, the doctor identification form captures important details about each healthcare provider. Figure 3 shows the form, which includes fields for the doctor's unique code, name, gender, and national identification number (NIK KTP), along

with contact information such as phone number, email, and address. The form also allows for the entry of the doctor's specialization and SIP (Medical Practice License) number. The "Save" and "Cancel" buttons at the bottom allow users to finalize or discard the entered data. This form ensures that all essential information about doctors is captured for administrative purposes.

The patient data table organizes key patient details in an easy-to-navigate format. As illustrated in Figure 4, the table includes columns for the serial number, registration date, medical record number, patient's name, date of birth, address, phone number, education, occupation, national identification number (NIK KTP), and BPJS number. A search field at the top of the table allows users to quickly find specific patient information. Additionally, an "Add Patient" button at the top right corner enables users to input new patient records. This table is essential for efficient patient information management and quick access to important data.

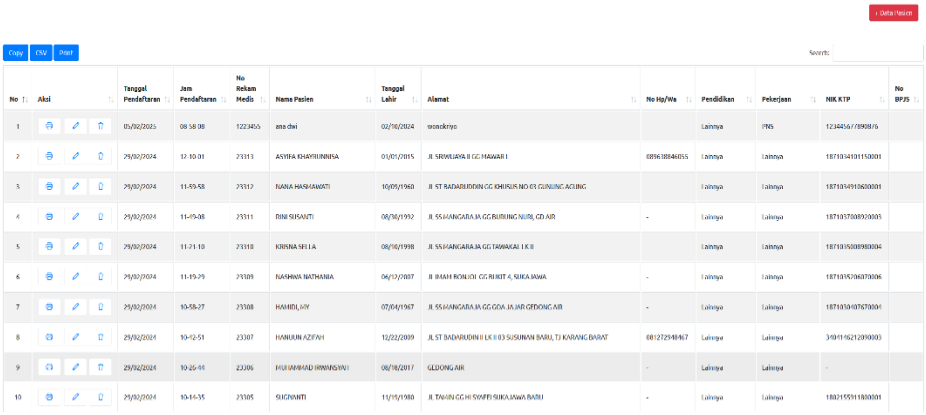

Figure 4. Patient Data

For managing doctor-related data, the doctor data table provides an organized view of critical doctor details. Figure 5 displays the table, which includes columns for serial number, action options (edit or delete), doctor's code, name, specialization, gender, SIP number, email, and address. A search field at the top facilitates easy data retrieval, and the "Add Doctor" button allows users to add new doctor information. This table ensures that doctor records are well-organized and easily accessible for administrative use.

Figure 5. Doctor Data

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In the context of medical visits, the patient identification form for polyclinic visits is designed to capture essential details regarding a patient's visit. Figure 6 shows this form, which allows users to select the visit type, input the medical record number or patient's name, and choose the relevant clinic department. The form also includes a section for adding notes about the patient's complaints and a field to select the patient's insurance type. At the bottom, there are "Save" and "Cancel" buttons to either save or discard the information. This form ensures that all necessary details are recorded for each patient visit.

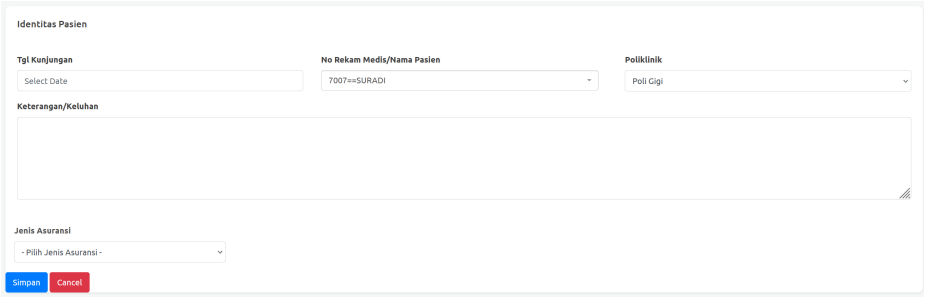

Figure 6. Add Patient Data to Polyclinic

Figure 7. Patient Data in Polyclinic

The patient visit data table provides a comprehensive overview of each patient visit. Figure 7 illustrates this table, which includes columns for serial number, action options (such as edit or delete), visit date, medical record number, patient's name, clinic department, complaints or notes, and the patient's date of birth. A search field at the top enables easy access to specific visit information. This table serves as a crucial tool for managing patient visit data, ensuring healthcare providers can access and update information efficiently.

Lastly, the medical procedure data table captures important details about each medical procedure performed at the dental polyclinic. Figure 8 shows this table, which includes columns for serial number, procedure type, insurance details, visit date, medical record number, patient's name, and vital measurements such as blood pressure, weight, and height. It also includes columns for consultation results and the diagnosis provided. The search field at the top allows users to easily search for specific procedure data. This table helps in managing and tracking medical procedures, ensuring that all critical information is readily available to

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healthcare professionals.Each of these forms and data tables, as shown in the figures, plays an important role in ensuring efficient data entry, organization, and management, thereby improving the overall functionality of the healthcare system.


Copy CSV Print Search:

No	Tindakan	Jenis Asuransi	Tgl Kunjungan	No Rekam Medis	Nama Pasien	TB(cm)	BB(kg)	LP(cm)	TD(mmHg)	HR(x/mnt)	RR(x/mnt)	S(c)	Hasil Konsultasi
1		Umum	03/12/2025	2501	RAHAYU NINGSIH	160	56	54	34	89	112	67	Perlu dilakukan tindakan medis

No	Tindakan	Tgl Kunjungan	No Rekam Medis	Nama Pasien	TB(cm)	BB(kg)	TD(mmHg)	S(c)	LP(cm)	HR(x/mnt)	RR(x/mnt)	Hasil Konsultasi	Diagnosa

Figure 8. Examination Results at the Dental Polyclinic

3.3. Discussion

The implementation of Agile-Scrum in the development of the Hospital Information System (SIRS) has yielded several impactful outcomes that significantly enhanced the project's performance and team dynamics. Interviews with team members provided qualitative insights, revealing increased collaboration within the development team, improved communication with stakeholders, and a greater adaptability to shifting requirements. Team members reported feeling more engaged in the process, with clearer role distribution that facilitated better accountability. On the other hand, stakeholders expressed their satisfaction with more frequent updates and a higher level of involvement through regular sprint reviews, ensuring that their feedback was consistently incorporated into the development process. These qualitative findings underscore the benefits of Agile-Scrum in fostering collaboration and responsiveness among both development teams and stakeholders.

In addition to the qualitative feedback, quantitative data were gathered to measure the project's performance before and after the adoption of Agile-Scrum. The results were impressive. First, the project completion time was reduced by 25%, with the average development cycle shortening from 8 months to just 6 months. This reduction in time demonstrates the efficiency gains brought about by the iterative, incremental approach of Agile-Scrum. Second, the adherence to budget improved by 30%. Agile-Scrum's ability to prioritize tasks, identify scope creep early, and ensure that resources were allocated effectively resulted in fewer unexpected costs, leading to a more predictable budgetary outcome. Third, user satisfaction saw a notable increase of 40%, based on post-implementation surveys that evaluated system usability and its relevance to user needs. This suggests that Agile's focus on regular feedback and iterations better aligned the system with the end users' expectations and requirements. Furthermore, the time required to respond to change requests was reduced by 50%. The iterative nature of sprints allowed for quicker adjustments based on user feedback, which is critical in a dynamic healthcare environment. Lastly, bug resolution efficiency improved by

35%, a result of continuous integration and daily stand-up meetings, which helped identify and resolve issues more swiftly.

These results demonstrate that Agile-Scrum not only enhanced team dynamics but also contributed to measurable improvements in key project outcomes. The reduction in development time, better budget management, increased user satisfaction, faster response times to changes, and improved issue resolution all point to the effectiveness of Agile-Scrum in the context of a healthcare IT project. The findings support the viability of Agile-Scrum as an effective methodology for managing the complex and ever-evolving requirements of Hospital Information Systems (SIRS). These outcomes are consistent with existing literature, which highlights Agile's success in dynamic and complex environments, such as software development.

However, despite these positive results, the implementation of Agile-Scrum in healthcare settings is not without challenges. One of the most significant barriers is resistance from non-technical hospital staff. Many healthcare professionals are accustomed to traditional, hierarchical workflows that are often linear and rigid. This can conflict with Agile's collaborative and iterative nature. For instance, involving medical personnel in regular sprint reviews or in the process of backlog prioritization can be perceived as burdensome and outside their usual scope of work. To overcome this resistance, effective communication, change management strategies, and cross-functional training are essential to bridge the gap between technical and non-technical stakeholders. Engaging healthcare professionals in the process will require demonstrating the long-term benefits of Agile-Scrum in improving service delivery and patient care.

Another concern is healthcare data privacy and security. Agile development emphasizes transparency, frequent feedback, and the use of shared collaboration tools, all of which can potentially expose sensitive patient data if not properly managed. Ensuring that these practices align with strict data protection regulations—such as Indonesia's Personal Data Protection Act or international standards like HIPAA—requires careful planning and the incorporation of robust security measures. This includes role-based access control, secure development practices, and active involvement of legal and data governance experts throughout the Agile process. In smaller or less-resourced hospitals, however, the inclusion of such experts may be challenging, requiring additional resources to maintain compliance.

Furthermore, the adoption of Agile may face limitations in terms of institutional readiness. Some hospitals may lack the necessary Agile expertise or infrastructure to fully support an iterative development approach. Traditional procurement and budgeting systems, which are often more rigid and designed for linear project

management, may not easily accommodate the flexible, iterative nature of Agile development. To address these challenges, hospitals need to invest in training, infrastructure upgrades, and the development of flexible procurement systems that align with Agile's iterative cycles. Despite these hurdles, the study demonstrates that with the right adaptation, training, and support, Agile-Scrum can be effectively implemented to improve the development of Hospital Information Systems.

The findings of this study align with existing research that emphasizes Agile-Scrum's strengths in improving adaptability, communication, and user engagement in healthcare IT projects. For instance, studies on the development of electronic health records (EHR) systems have found that Agile fosters better collaboration and faster feedback cycles. Similar to these studies, the current research observed increased stakeholder involvement and enhanced responsiveness to user needs. However, this study also highlights some context-specific challenges, such as resistance from clinical staff and data privacy concerns, which were less emphasized in earlier work. For example, [27] presented a theoretical model of coordination in Agile software development based on empirical data from co-located Agile teams. The model emphasizes synchronization, structure, and boundary spanning as key elements that enhance coordination effectiveness in Agile projects. Applying this model to the healthcare context, it can be inferred that a well-coordinated Agile process, supported by strong communication and collaboration, can overcome many of the challenges observed in healthcare IT development.

This study demonstrates that Agile-Scrum offers significant benefits in the development of Hospital Information Systems, particularly in terms of improving team collaboration, responsiveness to changes, stakeholder engagement, and overall project performance. However, challenges such as resistance from healthcare staff, data privacy concerns, and institutional readiness must be addressed for successful Agile implementation. Future research should explore strategies to overcome these challenges and examine the long-term impact of Agile-Scrum on hospital IT ecosystems.

5. CONCLUSION

This study found that implementing the Agile-Scrum methodology in Hospital Information System (HIS) development enhances team collaboration, adaptability, and software quality. Agile-Scrum proved effective in managing complex healthcare IT projects, especially where requirements are dynamic and stakeholder involvement is essential. These findings suggest that hospitals and healthcare developers can benefit from adopting Agile-Scrum to improve project outcomes and responsiveness. However, the study's scope is limited to a single hospital, which may affect the generalizability of the results. Potential biases in data

collection, such as reliance on self-reported experiences, also warrant caution. Future research should explore Agile-Scrum implementation in diverse healthcare settings and assess long-term impacts on system sustainability, user adoption, and organizational transformation.

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