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SCRUM AND ITIL-BASED SUPPORT SYSTEM DESIGN AND IMPLEMENTATION AT RAPHA THERESIA HOSPITAL

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Abstract—*This research addresses the challenges of manual IT service management at Rapha Theresia Hospital, where existing processes lacked systematic tracking and reporting, leading to operational inefficiencies. The purpose was to design and implement a web-based IT support system for systematic documentation of IT requests and repairs, integrating the Scrum agile development methodology with the ITIL framework, and enabling comprehensive IT performance reporting for management evaluation. The study employed a hybrid methodological approach, combining Scrum for iterative development and ITIL for robust service delivery. Research methods included problem identification, and iterative implementation across four sprints with defined Service Level Agreements (SLAs). Rigorous User Acceptance Testing (UAT) validated the system's functionality. Results show successful implementation of a centralized system managing IT requests, assets, and reports, significantly improving operational efficiency, service reliability, and fostering data-driven decision-making. The system enhanced coordination, transparency, and accelerated service resolution within the IT team.*

Keywords: *Agile, Healthcare, Itil, Scrum, Support System Design*

Intisari— *Penelitian ini mengatasi tantangan manajemen layanan TI manual di Rumah Sakit Rapha Theresia, di mana proses yang ada kurang pelacakan dan pelaporan sistematis, menyebabkan inefisiensi operasional. Tujuannya adalah merancang dan mengimplementasikan sistem dukungan TI berbasis web untuk dokumentasi sistematis permintaan dan perbaikan TI, mengintegrasikan metodologi pengembangan agile Scrum dengan kerangka kerja ITIL, serta memungkinkan pelaporan kinerja TI yang komprehensif untuk evaluasi manajemen. Studi ini menggunakan pendekatan metodologi hibrida, menggabungkan Scrum untuk pengembangan iteratif dan ITIL untuk penyampaian layanan yang kuat. Metode penelitian meliputi identifikasi masalah, dan implementasi iteratif melalui empat sprint dengan Service Level Agreement (SLA) yang terdefinisi. Pengujian Penerimaan Pengguna (UAT) yang ketat memvalidasi fungsionalitas sistem. Hasil menunjukkan keberhasilan implementasi sistem terpusat yang mengelola permintaan, aset, dan laporan TI, secara signifikan meningkatkan efisiensi operasional, keandalan layanan, dan mendorong pengambilan keputusan berbasis data. Sistem ini meningkatkan koordinasi, transparansi, dan mempercepat penyelesaian layanan dalam tim TI.*

Kata Kunci: *Agile (Lincah), Kesehatan, ITIL, Scrum, Perancangan Sistem Pendukung.*

INTRODUCTION

In our continuously evolving digital era, information technology (IT) has become a vital component in enhancing the efficiency, effectiveness, and quality of services across various sectors, including healthcare [1], [2], [3]. The Indonesian government actively supports the utilization of technology through regulations promoting digital transformation. Key regulations like Minister of Health Regulation (Permenkes) Number 24 of 2022 mandate healthcare facilities to

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implement Electronic Medical Records (EMR), while Permenkes Number 82 of 2013, Article 3 Paragraph 1, specifically requires all hospitals to use Hospital Management Information Systems (SIMRS) [2], [3]. These regulations underscore the government's commitment to accelerating the digitalization of healthcare services to improve patient care quality.

As digital transformation demands grow, managing organizational IT has become increasingly complex and strategic [4], [5]. The Information Technology Service Management (ITSM) approach is highly relevant as a method for IT service management that focuses on processes and service quality, rather than solely on the technical aspects of hardware and software. Unlike traditional approaches that view IT functions as cost centers, ITSM positions IT functions as strategic service providers supporting the overall achievement of organizational goals [5]. This is particularly crucial in healthcare, where the reliability and continuity of IT systems are essential for supporting critical medical services.

Various studies have shown that implementing the Information Technology Infrastructure Library (ITIL) V.3 framework in IT service management can enhance service quality and effectiveness. For example, research titled "ITSM Strategy Using CSI on ITIL V.3 to Improve IT Services" reveals that designing a Service Improvement Plan (SIP) with a Continual Service Improvement (CSI) approach can be an effective strategy for improving IT services in higher education, highlighting the importance of analyzing Critical Success Factors (CSF), SWOT, and user satisfaction surveys as a basis for continuous improvement [4]. Another study, "ITSM Analysis using ITIL V3 in Service Operation in PT. Inovasi Tjaraka Buana," confirms that ITIL implementation can help companies maintain business continuity through structured and well-documented incident and problem management [6]. These findings reinforce ITIL's relevance as a framework capable of systematically and measurably improving IT service management. Correspondingly, the study "Agile software development approach for 'ad-hoc' IT projects" proves that adapting the Scrum framework for ad-hoc projects can also enhance the success of software projects in dynamic and uncertain work conditions [7]. This supports the importance of flexibility and adaptability in IT service management methods to achieve organizational efficiency and resilience in facing real-world challenges.

Rapha Theresia Hospital in Jambi, as a continuously developing healthcare institution, faces significant challenges in managing its increasingly complex and diverse Information Technology (IT) services. The role of IT within the hospital extends beyond managing computer networks to include the integration of hospital information system–based medical devices and the protection of sensitive patient data. As the number of patients and the complexity of operations grow, the demand for a structured, reliable, and responsive IT service management system becomes increasingly critical. The hospital's heavy reliance on information systems means that even minor technical disruptions can hinder medical and administrative processes, thereby affecting service quality and patient safety.

The first major issue identified is the absence of a structured system for recording and tracking IT incidents. Currently, most problem reporting is conducted manually through informal communication channels such as instant messages, phone calls, or direct verbal reports to IT personnel. This unstructured approach makes it difficult to monitor incident status, track resolution progress, and analyze recurring technical problems. Consequently, there is insufficient historical data to evaluate the performance and effectiveness of the IT support process. In addition, response times to technical issues are often delayed due to the lack of prioritization mechanisms based on the urgency or impact level of the incident. Critical problems that directly affect medical services are sometimes not addressed promptly, posing risks to operational continuity and patient care.

Furthermore, the documentation of IT problem resolutions remains fragmented and decentralized. Each IT staff member tends to keep their own notes or records without a unified repository that can serve as a shared knowledge base for future reference. This fragmentation leads to inconsistencies in problem-solving approaches and the recurrence of similar issues without sustainable solutions. The hospital also lacks standard operating procedures (SOPs) for IT incident management, resulting in varied handling methods and inconsistent service quality. These conditions collectively reduce operational efficiency and make it difficult to evaluate the performance of the IT department in a systematic manner.

Based on these challenges, it is evident that Rapha Theresia Hospital requires an integrated and well-documented IT service management system to support operational effectiveness and efficiency. Such a system should include structured mechanisms for incident reporting and tracking, clear prioritization based on incident impact, and centralized documentation of problem resolutions

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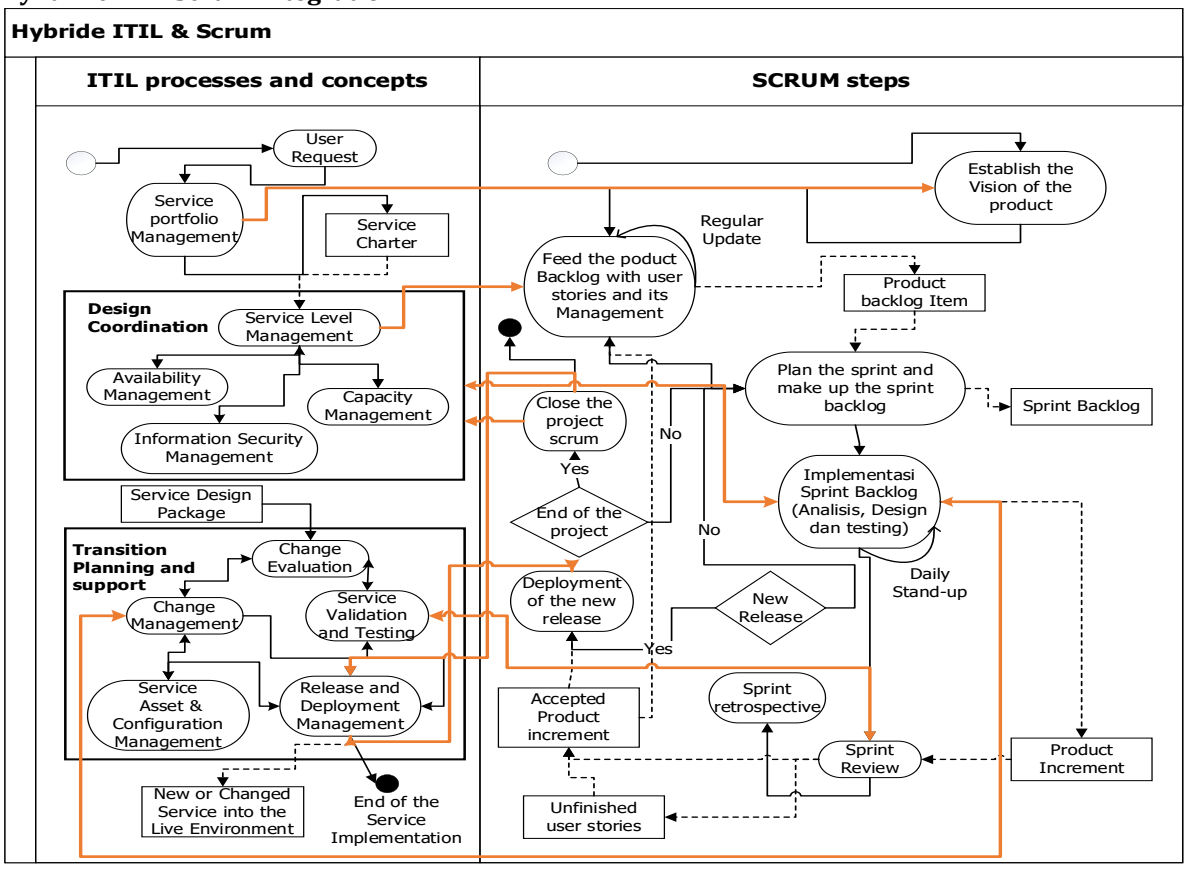
for continuous improvement. The implementation of a structured IT service management framework is expected to enhance IT infrastructure reliability, improve response times to technical issues, and ensure the continuity of medical and administrative services in the hospital environment. Therefore, this research aims to address these challenges by designing and implementing a Support System at Rapha Theresia Hospital, integrating the Scrum method and the ITIL framework. This integrated approach has proven effective in various applications, including IT service management and improving the efficiency of information system maintenance processes in public service institutions [4], [6], [7]. Specifically, this study seeks to develop a system capable of supporting IT problem recording, monitoring, and resolution processes in a structured and responsive manner within the hospital environment, ultimately enhancing operational efficiency, service quality, and user satisfaction. The approach used in this research involves combining the agile principles of Scrum for iterative and adaptive development with ITIL best practices for structured and quality-focused service management.

MATERIALS AND METHODS

The system was designed by integrating two primary frameworks: the Scrum method for iterative and adaptive software development, and the ITIL framework as a guide for IT service management to ensure alignment with best practices.

Dynamic ITIL-Scrum Integration



Source: (Research Results, 2025)

Figure 1. Integration ITIL and Scrum

The integration of the Information Technology Infrastructure Library (ITIL) framework with the Scrum methodology produces a hybrid model that balances service stability with agile adaptability. On the ITIL side, the process begins with Service Portfolio Management and Service Catalog Management, which establish the foundation for service planning and documentation. Subsequently, Service Design defines the technical and functional specifications of services, while Capacity Management ensures that infrastructure resources are sufficient to meet business demands [8]. Change Management governs modifications to minimize risks, supported by Service Asset and

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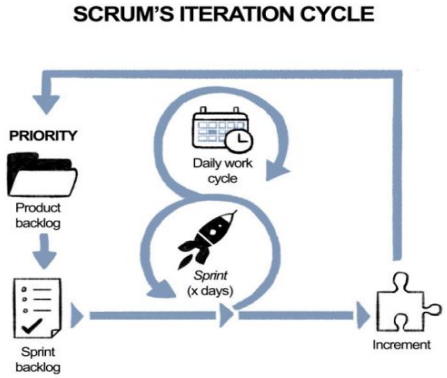
Configuration Management to maintain accurate records of assets and configurations. Approved changes are executed through Release and Deployment Management, while Incident and Problem Management handle disruptions and identify root causes to prevent recurrence. In parallel, Request Fulfillment manages standard user requests, ensuring that operational needs are systematically addressed. Collectively, these processes emphasize governance, documentation, and service quality [9].

In contrast, Scrum introduces an iterative and adaptive approach through stages such as Product Backlog Creation, Product Backlog Refinement, Sprint Planning, Sprint Execution, Sprint Review, and Sprint Retrospective. The backlog functions as a dynamic repository of requirements, while sprints deliver incremental value in short cycles. Integration with ITIL occurs when service requirements from Service Design are translated into backlog items, approved changes are incorporated into Sprint Planning, and completed sprint outputs are managed through Release and Deployment Management. Furthermore, recurring incidents or problems can be added to the backlog as improvement items, and standard service requests may be prioritized within sprint execution. Importantly, the hybrid model establishes a feedback-rich loop in which insights gained during sprint activities such as analysis, design, and testing are formally reintegrated into ITIL's Service Design. This mechanism transforms the process from a rigid sequence into a dynamic, iterative cycle that fosters continuous improvement [10].

Conceptually, the hybridization of ITIL and Scrum provides a structured yet flexible framework for modern organizations [9]. ITIL ensures compliance, service continuity, and operational stability, while Scrum accelerates development and enables rapid responsiveness to evolving business needs. The synergy between these two approaches creates a sustainable cycle of service delivery and innovation, ensuring that information technology services remain both reliable and adaptive. This hybrid model is therefore highly relevant for organizations seeking to align robust service management practices with agile development principles in order to achieve long-term competitiveness and value creation.

This two-way flow, particularly from implementation back to design, fosters a learning organization. Practical experience continuously refines and improves the foundational service design, preventing rigid adherence to initial plans and ensuring the ITIL framework remains relevant and adaptable to real-world development and operations. This approach directly supports the goal of creating flexible systems aligned with best service practices.



Source : (Marta Palacio, 2022)
Figure 2. SCRUM's Iteration Cycle

Within the Scrum method, development was divided into four sprints, each focusing on specific objectives:

Table 1. Sprint Phases

Sprint	Goal Sprint	Item Sprint Backlog	Result Sprint
1	System and Interface Design	Designing the ticket input interface, Dveloping the status tracking page, Conducting UI/UX design, Preparing the ITIL Service Catalog.	The process involved creating system interface mockups, developing use case and activity diagrams to model user interactions and workflows, and compiling a comprehensive system design document as a reference for implementation.
2	Ticket and Notification Feature Development	Developing the ticket input module, Storing data in the database, Sending notifications to the IT team, Automating date and time entries.	The ticket input feature was successfully implemented, with data being reliably stored in the database and notifications delivered accurately to the IT team.
3	Testing and Dashboard and Reporting	Displaying ticket status, Implementing report filters (by date, location, and priority),	The reporting module allows users to export reports in Excel or PDF formats and includes performance charts to support data-driven

Sprint	Goal Sprint	Item Sprint Backlog	Result Sprint
		Enabling report export functionality, Visualizing team performance.	evaluation of team effectiveness.
4	Testing and User Acceptance Testing (UAT)	Conducting User Acceptance Testing (UAT), Collecting user feedback, Fixing minor bugs, Documenting the testing process.	The system was tested directly by end users, and any identified bugs were promptly addressed. As a result, the system is now ready for operational deployment.

Source : (Research Result, 2025)

Scrum artifacts utilized included the Product Backlog (a comprehensive list of system requirements and features), Sprint Backlog (a list of tasks for each sprint), and Increment (the functional outcome of each sprint)[11].

Scrum activities such as Sprint Planning Meeting, Sprint Review, and Scrum Retrospective were applied for planning, evaluation, and continuous improvement.

Source : (Al-Ashmoery, *et.al* , 2021)[10]
Figure 2. ITIL Service Value System

The determination of incident priorities in information technology (IT) services is a critical aspect of maintaining organizational operational continuity, particularly in the healthcare sector, which heavily relies on the availability of reliable information systems. Incidents classified as Cito (Critical/Emergency) are defined as disruptions that cause a complete halt of core services or have a direct impact on patient safety.

The High Impact category refers to incidents that significantly affect operations, although core services remain functional. If not addressed promptly, such incidents have the potential to escalate into critical conditions.

The Medium Impact category encompasses incidents with limited impact that do not directly disrupt core services but still require resolution within a reasonable timeframe.

The Low Impact category includes non-critical incidents or service requests that do not directly affect primary operations and can be addressed according to a predefined schedule.

The ITIL framework is applied with a focus on Incident Management, Service Desk Management, and Service Level Agreement (SLA). The results of the needs analysis are then used to formulate a Product Backlog aligned with ITIL principles, in which incident categories and SLAs are defined based on the urgency level of IT service requests [8], [12]. Thus, the implementation of ITIL not only provides measurable standards for incident handling but also ensures that each incident category receives appropriate prioritization according to its impact on organizational services.

Table 2. Service Level Agreement (SLA)

Priority	Response Time	Resolution Time	Case Descriptions
Cito (Critical/ Emergency)	≤ 15 minute	≤ 2 hour	1. Failure of connectivity to the main servers (e.g., SIMRS, Data Bank, BPJS). 2. Disruption of the hospital's primary internet network affecting all units. 3. Maintenance or replacement of equipment impacting server operations and power systems. 4. Server downtime caused by hardware failure, software malfunction, or system overload. 5. Malfunction of the internal communication system (PABX/telephone) halting organizational communication.
High	≤ 30 minute	≤ 4 hour	1. Malfunction of printing devices in service units. 2. Inoperability of the online queuing display system. 3. Decreased performance of workstations (PCs, Mini PCs, or laptops). 4. System failure at service unit computers (e.g., system crash).

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Priority	Repon se Time	Resolu tion Time	Case Descriptions
			5. Disconnection of internet access in specific units, disrupting operational activities.
Medium	≤ 2 hour	≤ 8 hour work (1 day work)	1. Requests for password reset. 2. Addition of user profiles in applications (SIMRS, MCU, and others). 3. Replacement of damaged display devices (monitors). 4. Installation of additional network devices (access points or range extenders). 5. Software updates to improve system performance.
Low	≤ 4 hour	≤ 3 day work	1. Requests for additional workstation outlets. 2. Creation or updating of user accounts for new or transferred employees. 3. Deletion of accounts for employees who are no longer active. 4. Labeling of LAN cables connected to switch hubs. 5. Inventory and documentation of IT assets to support maintenance systems.

Source : (Research Result, 2025)

The database design utilized MySQL with a comprehensive table structure to manage user data, locations, categories, SLAs, assets, tickets, comments, and attachments. The analysis and requirements gathering phase, including activities such as interviews and observations, was conducted during the initial stage of the project (pre-sprint). The following table, however, only presents the Sprint phases focused on the system design and implementation process. Through this sprint breakdown, the researcher demonstrates how the Scrum methodology can be integrated with ITIL to support the development of an IT support system in a hospital environment.

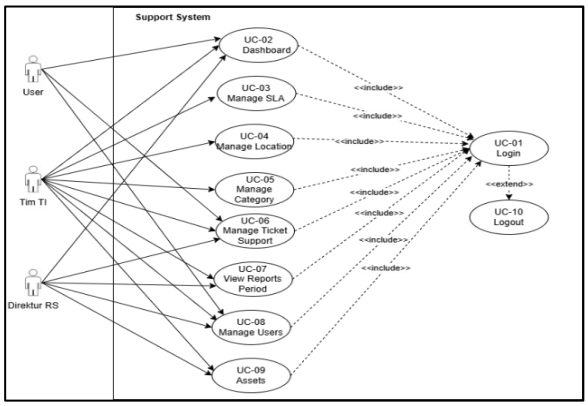
RESULTS AND DISCUSSION

Prior to the implementation of the new Support System, the IT service management process at Rapha Theresia Hospital was largely manual and lacked systematic documentation and tracking. The workflow, as depicted in the analysis of the running system , involved two primary actors: the User (IT Service Requester) and the IT Team.

Current Workflow Deficiencies

Analysis of the existing IT service management system at Rapha Theresia Hospital revealed several significant weaknesses. The IT service request process was entirely manual, from informal user initiation via phone or chat, leading to a lack of standardization and potential miscommunication. Requests were manually recorded by the IT Team in physical logbooks or spreadsheets, which was prone to errors, inconsistencies, and hindered information centralization. Furthermore, there was no systematic tracking of request statuses, leaving users without real-time updates and the IT Team without a centralized overview of ongoing issues. Resolution confirmations were also informal, resulting in no digital record or audit trail. Consequently, the entire process lacked a centralized digital service history or a systematic reporting mechanism, impeding management's ability to monitor IT performance, identify recurring problems, or make data-driven decisions.

Overall, this manual and reactive workflow led to slow response times, escalation bottlenecks, and a critical lack of transparency and accountability in IT service delivery within the dynamic hospital environment.



Source : (Research Result, 2025)

Figure 3. Use Case Diagram Support System In Rapha Theresia Hospital

Proposed Solution: The New Support System

To address the aforementioned challenges, a new web-based Support System was designed and implemented, integrating the iterative development principles of Scrum with the robust service management guidelines of the ITIL framework. The

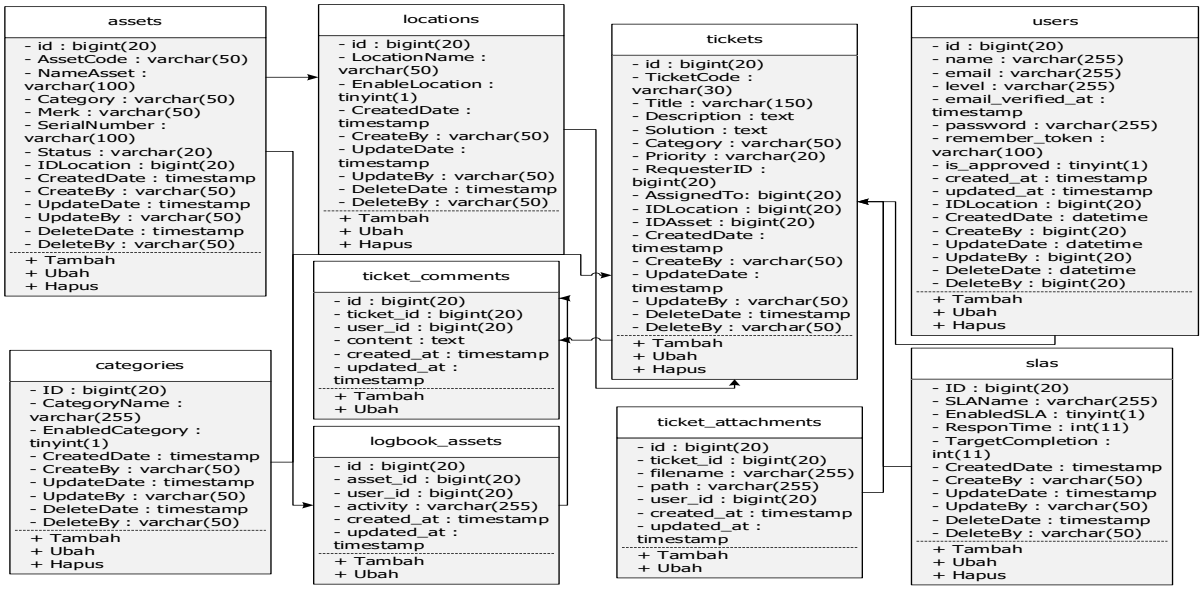
system's functionalities, as illustrated in the Use Case Diagram (Figure 3) , provide a comprehensive solution for IT service management[13].

Key Functionalities and Their Solutions to Existing Problems

The newly designed and implemented Support System addresses the challenges of the manual system through the following key functionalities:

a) Login (UC-01) & Logout (UC-10): The system introduces a secure login mechanism for Users, IT Team, and Hospital Directors, replacing informal communication with structured access and ensuring secure session termination.
b) Dashboard (UC-02): Provides a real-time summary of IT service status, including total tickets and performance statistics, directly addressing the previous lack of systematic tracking and offering immediate operational visibility.
c) Manage SLA (UC-03): Integrates ITIL's Service Level Agreement (SLA) principles, allowing the IT Team to define and manage SLAs based on problem priority. This ensures IT service responses and resolutions adhere to predefined timeframes and includes escalation rules.
d) Manage Location (UC-04) & Manage Category (UC-05): These modules enable the IT Team to manage master data for locations and problem categories, facilitating efficient ticket classification and routing, thereby supporting ITIL's Service Desk and Incident Management practices.
e) Manage Ticket Support (UC-06): This core module enables formal ticket submission by users and allows the IT Team to manage, update status, and document solutions. It replaces manual request initiation and recording, providing systematic documentation, real-time status tracking, and a digital service history, aligning with ITIL's Incident Management.
f) View Reports Period (UC-07): Generates measurable and documented IT service performance reports based on selected time periods. This provides crucial data for management evaluation and supports ITIL's Continual Service Improvement (CSI) principle.
g) Manage Users (UC-08): Enables the IT Team to manage user accounts (add, edit, delete, reset passwords), while users can change their own passwords, ensuring proper user management and security.
h) Manage Assets (UC-09): Allows the IT Team to record, update, and delete IT asset data, providing a centralized inventory for monitoring and maintenance, including a history of asset repairs.

By implementing these functionalities through an iterative Scrum approach, the hospital's IT service management has transitioned from a reactive, manual process to a proactive, structured, and transparent system. This integration of Scrum and ITIL ensures efficient software development and robust IT service delivery, significantly enhancing the overall quality and accountability of IT services at Rapha Theresia Hospital[14].



Source : (Reasearch Result, 2025)

Figure 4. Class Diagram Support System In Rapha Theresia Hospital

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This diagram meticulously details the main classes, their attributes, and the relationships between objects, forming the foundational data architecture of the system and ensuring that every functionality outlined in the use cases has a robust and organized structural representation[13].

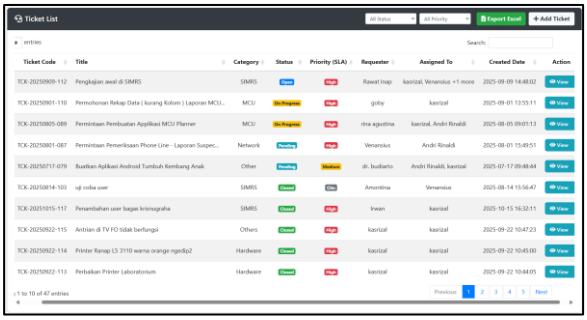
Implementation and Testing System

This section details the implementation of the key user interfaces of the Support System, demonstrating how the design specifications were translated into functional modules.

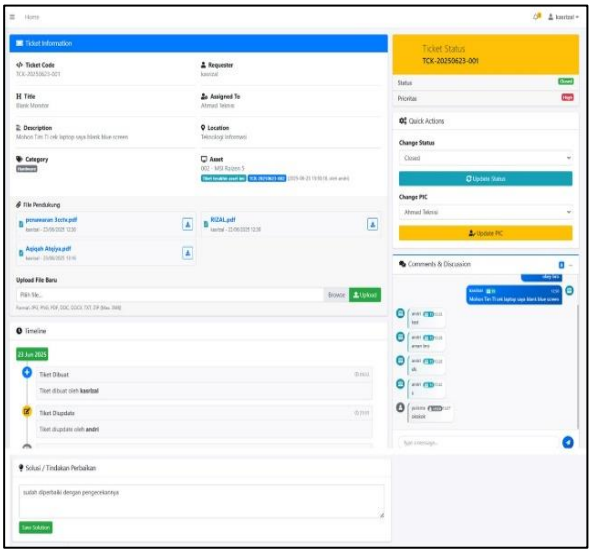
Ticket Support Interface

The implementation of an ITIL-based ticketing and incident management system has contributed significantly to improving the structure and professionalism of incident handling within the organization. However, enhancements are still required in several areas, including Standard Operating Procedures (SOPs), documentation of Service Level Agreements (SLAs), and internal integration. These improvements are essential to achieve a higher level of ITIL maturity and to support greater operational efficiency and user satisfaction in IT service delivery[9].

The Ticket Support interface is presented in two views. Ticket Support-1 (Figure 4) provides an interactive table listing support tickets with key information (Ticket Code, Title, Category, Status, Priority, Requester, Assigned To, Date Created). It includes search, status/priority filters, Excel export, and options to view ticket details or add new tickets. Ticket Support-2 (Figure 5) offers comprehensive details for selected tickets, including problem description, location, associated assets, file upload, and an activity timeline. It also features ticket status, quick actions (status change, PIC reassignment), interactive comments, and a "Solution / Corrective Action" field with a "Save Solution" button for effective problem resolution documentation.



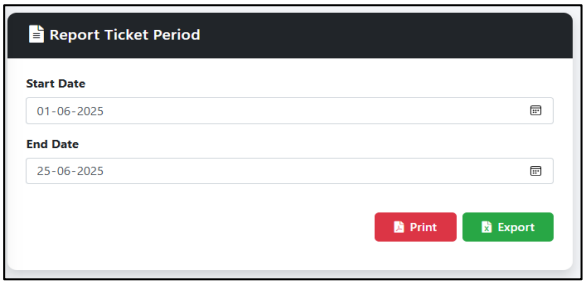
Source : (Reasearch Result, 2025)
Figure 4. Ticket Support-1



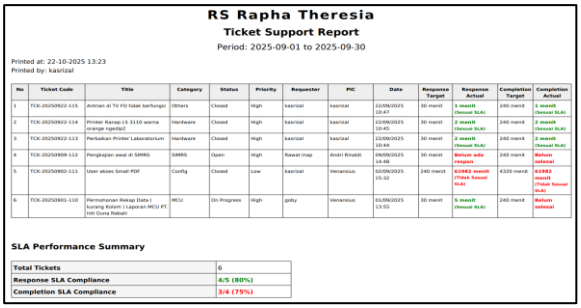
Source : (Reasearch Result, 2025)
Figure 5. Ticket Support-2

Report Period Interface

The Report Period interface (Figure 14) allows users to generate reports by selecting a specific date range, with "Print" and "Export" (to Excel) buttons for output. The Report Period Results interface (Figure 6) then displays the formatted ticket support report for the chosen period, including relevant ticket details and printing information.



Source : (Reasearch Result, 2025)
Figure 6. Report Period



Source : (Reasearch Result, 2025)
Figure 7. Report Period Result

Following the detailed implementation of the system's key user interfaces, the subsequent section focuses on System Testing. This crucial phase aims to verify that all implemented functionalities operate as expected and meet user requirements, ensuring the system is ready for operational deployment at Rapha Theresia Hospital[15].

Table 3. User Acceptance Test for System

Function	Scenario	Result
Authentication and Account Management	Register a new account with valid data	[ok]
	Login using valid username and password	[ok]
	Login with incorrect password (negative test case)	[ok]
	Change password with valid data	[ok]
Dashboard Access	Access the dashboard and verify displayed information	[ok]
Category Management	Create a category with valid data	[ok]
	Update an existing category	[ok]
	Delete an existing category	[ok]
	View category list	[ok]
Location Management	Create a location with valid data	[ok]
	Update an existing location	[ok]
	Delete an existing location	[ok]
	View location list	[ok]
SLA Management	Create SLA with valid data	[ok]
	Update an existing SLA	[ok]
	Delete an existing SLA	[ok]
	View SLA list	[ok]
Asset Management	Create an asset with valid data	[ok]
	Update an existing asset	[ok]
	Delete an existing asset	[ok]
	View asset list	[ok]
User Management	Create a user with valid data	[ok]
	Update an existing user	[ok]
	Delete an existing user	[ok]
	View user list	[ok]
Ticket Management	Create a ticket with valid data	[ok]
	Update ticket PIC (Person in Charge)	[ok]
	Update ticket status	[ok]
	Add solution note to ticket	[ok]
	View ticket timeline	[ok]
	Add comments and discussions	[ok]
	Attach supporting files	[ok]
Report Generation	Generate periodic report in PDF format	[ok]
	Generate periodic report in Excel format	[ok]
Asset Maintenance History	View asset repair history list	[ok]
Logout	Logout from the Support System	[ok]

Source : (Reasearch Result, 2025)

CONCLUSION

This research successfully designed and implemented a web-based Support System at Rapha Theresia Hospital, effectively addressing the challenges of manual IT service management through the integrated application of Scrum and ITIL frameworks. Firstly, the developed system provides a robust platform for systematically documenting all IT service requests, incident reports, and their resolutions. This significantly streamlines the process for the IT team, enabling more efficient recording, monitoring, and follow-up of service requests and repairs.

Secondly, the study demonstrates the successful implementation of both Scrum and ITIL frameworks in the development and management of IT services within the hospital. The synergistic combination of Scrum principles such as iterative sprints, a well-defined product backlog, and regular daily meetings with ITIL processes, including Incident Management, Request Fulfillment, and Service Desk, has positively impacted IT service responsiveness and ensured adherence to sound IT service governance practices. Thirdly, the implemented system delivers measurable and documented IT service performance reports. These reports serve as a crucial foundation for the hospital's management to conduct evaluations, make informed decisions, and drive continuous improvement initiatives in IT services, thereby fostering an effective, transparent, and accountable IT environment.

Finally, beyond operational enhancements, the implementation of this Scrum and ITIL-based Support System has fostered a more collaborative work culture within the IT team at Rapha Theresia Hospital. This is evidenced by improved coordination, increased process transparency, and accelerated service resolution, all of which contribute positively to the overall reliability of the hospital's IT services. In summary, the integrated approach of Scrum and ITIL has proven highly

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effective in transforming IT service management at Rapha Theresia Hospital, providing a structured, adaptive, and collaborative solution that enhances efficiency, quality, and accountability in a critical healthcare setting.

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