Ceddi Journal of Information System and Technology (JST)
Vol. 4 No. 1 April (2025)
https://doi.org/10.56134/jst.v4i1.123

ISSN: 2829-808X (print)
ISSN: 2829-6575 (online)

Development of Cash and Operational Expenditure Reconciliation Information System for Official Financial Management with Agile Methods

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Abstract

Government agencies often encounter challenges in enhancing the efficiency and accuracy of financial report management, particularly in the cash reconciliation process. This study, conducted at the Regional Financial and Asset Management Agency (BPKAD) of Mempawah Regency, addresses the inefficiencies of traditional reconciliation methods that require face-to-face interactions and up to two working days to complete. The research aims to develop the Official Cash and Operational Expenditure Information System (SIKASBON) using the Agile methodology, enabling a more responsive, flexible, and user-oriented financial data synchronization process. The system was developed through a structured approach involving requirement analysis, design, development, testing, deployment, and review. System evaluation using the System Usability Scale (SUS) yielded an impressive average score of 85.2, categorized as A+ (Best Imaginable). The findings demonstrate that SIKASBON significantly improves transparency and efficiency in managing cash and operational expenditures. Most notably, the time required for reconciliation was reduced from two working days to just 10 minutes. This research contributes to the digital transformation of public financial management by offering a scalable solution that aligns with user needs and promotes accountability in government operations.

Keywords: Financial Reconciliation; Agile Methodology; System Usability Scale (SUS); SIKASBON; Public Financial Management.

Received: 12 February 2025 Revised: 27 March 2025 Accepted: 15 April 2025

Introduction

In the era of digital transformation, various government agencies are required to improve efficiency and accuracy in financial management. Cash reconciliation is an important process in ensuring the accuracy of financial statements and transparency in the reporting of public funds(Pasaribu et al., 2023). This involves matching data between internal records and external reports to identify discrepancies or errors in financial transactions that could potentially harm the institution(Rokib et al., 2022). Effective reconciliation not only helps in maintaining the credibility of financial statements, but also supports the achievement of agency operational objectives through good budget management(Ananda et al., 2022).

The condition of BPKAD Mempawah Regency when conducting cash reconciliation takes up to three working days, because the cash reconciliation process between the treasurer and 31 OPDs (Regional Apparatus Organisations) is carried out face to face. Another obstacle faced is that the reconsolidation process is carried out per semester instead of per month, so there are often obstacles to underpayment of taxes or overpayment of taxes because they are not detected early. As a solution to facilitate the reconciliation process in BPKAD Mempawah Regency, a Cash and Operational Expenditure Information System (SIKASBON) is needed, specifically designed to assist in recording, monitoring, and reporting cash transactions in a structured and efficient manner(Sholeh Marifat & Ubaidillah, 2022). SIKASBON focuses on improving the cash reconciliation process that is transparent and accessible to various interested parties. This system has the potential to help identify balance differences in a timely manner, thereby increasing accuracy and efficiency in the management of operational funds.

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To achieve the goal of rapid and change-responsive system development, this study adopts the Agile Method. Agile is a software development approach designed to handle projects of high complexity and dynamic environments(Suhari et al., 2022). This approach prioritises flexibility in responding to changing needs, which is very relevant in the context of the public sector, which often undergoes changes in regulations and policies(Winata et al., 2023). Agile allows each iteration or sprint to produce a product that can be tested and evaluated by stakeholders, providing opportunities for rapid adjustments(Harmaja et al., 2022).

The Agile approach provides a special advantage in the development of public sector systems by allowing for closer collaboration between the developer team and the user, so that the final product is better suited to the real needs of the user(Suwartono, 2022). This collaboration also reduces misunderstandings and helps in quickly adapting the system according to the feedback received at each stage of development(Hilmi & Tawakal, 2021). For example, the use of Agile in the development of SIKASBON allows the team to integrate specific features required by the relevant agencies, such as daily cash statements, monthly reconciliation, and more transparent tracking of cash transactions(Manuputty et al., 2020).

The application of Agile in the public sector shows that this method is able to increase efficiency in the use of budgets and increase accountability due to better documentation and reporting in each iteration(Nugraha et al., 2021). In its implementation, Agile allows various agencies to more easily comply with existing regulations while responding quickly to policy changes (Mustopa et al., 2020). In addition, active collaboration driven by Agile is able to improve the effectiveness of communication between development team members and end-users, making the developed system more adaptive to evolving needs and challenges (Naufal Faruq & Maryam, 2024).

A user satisfaction-oriented method, Agile ensures that each iteration of the SIKASBON system can provide significant added value in improving the efficiency of public budget management (Alexsander et al., 2020). A previous study showed that information systems developed with Agile in government agencies have the potential to increase the transparency and openness of public financial information (Arsyad et al., 2022). So that in this study, SIKASBON is expected not only to function as a cash reconciliation tool in accordance with the needs of BPKAD Mempawah Regency, but to be able to solve existing problems so as to improve performance effectively as shown by the previous reconciliation process of three working days to 10-15 minutes and reports of excess and underpayment of taxes can be known per month instead of per semester.

Method

This research uses the Agile method in the development of the Official Cash and Operational Expenditure Information System (SIKASBON). Agile allows for the development of systems that are flexible and iterative, and able to adapt to changing user needs (Maulidi & Kusuma, 2023). The Agile development process consists of several stages that focus on collaboration between developers and users to produce prototypes that can be tested and improved on an ongoing basis.



Figure 1. Agile Method

In the first stage, the needs of the system are identified through interviews, discussions, and observations of the user's work process in the relevant agency. A comprehensive requirements gathering process is essential to ensure the success of system development, especially in understanding specific cash reconciliation and operational expenditure workflows (Tuunanen et al., 2023). This stage results in an initial backlog containing a list of required features, such as daily

transaction logging, automatic reconciliation, and report generation, which will be developed gradually in each sprint (Albuquerque et al., 2020).

In the second stage, based on the needs that have been identified, the system design and user interface (UI) are created with a focus on simplicity and ease of use. Good design should include an intuitive interface and an easy-to-understand system architecture so that users can access features efficiently (Wu, 2023). In the Agile approach, this design is iterative, where each sprint allows for adjustments based on user feedback and testing conducted during development (Sandu et al., 2022). In the third stage, system development is carried out in two- to four-week sprint cycles, with each sprint focusing on a subset of functionality in the backlog. This iterative development method allows the development team to quickly adapt the system based on changes in needs that may arise (Alami et al., 2022). Each sprint produces a prototype that is tested internally to ensure conformity to user needs before being passed on to further testing stages.

In the fourth stage, an ongoing testing process needs to be carried out to obtain feedback, in order to avoid unnatural risks in software launches. The scope of the test should include not only the test cases, but also the requirements that must be met to ensure the validation of the objectives of the development of the architecture and behaviour of the product. If a requirement violation is found after testing has been performed, developers should review the implementation and analyse the failed test cases (Salameh & Bass, 2022).

In the fifth stage, the development of the SIKASBON system is carried out using PHP with the CodeIgniter framework and the MySQL database, which allows the development of a more structured system with the Model-View-Controller (MVC) pattern (Wulansari et al., 2022). Key features such as login, dashboard, employee data, submissions, digital signatures, and general cash book (BKU) are developed gradually, with progress monitored through a Burn-Down Chart to ensure each sprint runs as planned. The integration of the digital signature feature utilises cryptographic technology to ensure the authenticity of electronic submission documents, increasing efficiency and security. After the development is complete, the system is tested and prepared for implementation in the service environment (Suci Indah Luqmani & M. Husni Tamrin, 2022). Training is provided to users to ensure an optimal understanding of the system's features, thus supporting a smooth transition from the old system to the new system.

In the last stage, after the system is implemented, a review is carried out using the System Usability Scale (SUS) method to evaluate the usability and benefits of the SIKASBON system. This method involves respondents who give an assessment of the system through 10 questions on the Likert scale, which is then calculated into a SUS score to assess the level of user satisfaction (Suwarno & Kristianti, 2022). The results of this review not only ensure that the system meets the operational needs of users but also identify opportunities for feature improvements and adjustments based on user feedback. With the SUS method, the assessment becomes measurable, transparent, and user satisfaction-oriented, while providing insights to plan for the development of additional relevant features in the future.

Table 1 SUS Question

No	Question (Q)
Q1	I feel comfortable using the SIKASBON application.
Q2	I feel that the SIKASBON app is too complicated to use.
Q3	The features in the SIKASBON app meet my needs.
Q4	I feel that there is an inconsistency in the appearance or functionality of the SIKASBON app.
Q5	I find the functions of the SIKASBON application easy to understand.
Q6	I need help from others to understand some parts of the SIKASBON app.
Q7	I feel confident when using the SIKASBON application.
Q8	I feel that the SIKASBON app is too complex in some features.
Q9	I feel that the experience of using the SIKASBON application is very satisfying.
Q10	I feel that there are too many unnecessary steps in using the SIKASBON application.

Results and Discussion

Result

The system development process consists of several stages, namely Requirements, Design, Development, Testing, Deployment, and Review. Each stage in the Agile methodology provides specific results, which will be described in the following sub-sections, including tables and figures to clarify the explanation. The initial stage in the development of

the SIKASBON application is the identification of needs, which is carried out by collecting data through interviews, discussions, and direct observation of users in the relevant agencies. The result of this stage is an initial backlog that contains a list of key features required by users, including daily transaction recording, automatic reconciliation, and financial reporting. This requirements gathering process aims to understand specific workflows and operational challenges so that system development can target the right problems.

Table 2. Requirement System

Main features	Description
Login	Allows users (administrators, officers, and leaders) to access the system with secure authentication.
Filing	A feature that allows users to submit cash or operational expenses as needed.
Signing	Features to carry out the digital signing process or approval from the authorities for submissions made.
Budget Spending	Allows users to record and manage operational spending data, including expenditures required by related agencies.
BKU Pengeluaran	Provide a General Cash Book (BKU) to record and manage all cash expenditures in a structured manner.
Bendahara Pengeluaran	Special features for the treasurer to manage official expenses, including recording transactions made.
Dashboard	Provides a summary of cash and operational expenditure data in the form of visualisations or up-to-date information for users for quick monitoring.
Employee	Allows administrators to manage user or staff data related to agency operations.
Position	Provides features to manage job title information in the service, including setting access rights based on position.
Log	Record all activities or changes that occur in the system as part of trail and security audits.
Leadership Validation	A feature for the digital signature process of leaders as part of the approval or validation of submission documents.

The next stage focuses on iterative and adaptive development to meet user needs. Design includes creating interfaces, system architecture, and database design to ensure that the system can function effectively according to a predetermined workflow. The design stage includes designing use cases and Entity Relationship Diagrams (ERDs) to describe the data structure.

This Use Case diagram illustrates the interaction between three main users in the Official Cash Expenditure and Operations Information System (SIKASBON): Administrators, Officers, and Leaders, each of whom has a role according to their duties. Administrators have full access to manage employee data, job titles, and activity logs, as well as monitor information through dashboards. The Administrator also handles the management of submissions submitted by the Officer. Officers are in charge of making cash or operational expenditure submissions, recording expenses at the Expenditure BKU, and interacting with the signing feature for the approval process. All submissions from the Officer must be approved by the Leader. The Leader acts as the final approver on the submission, using the Leader's Signature feature to provide a digital signature as an official authorisation. Each user must first log in to access the features according to their access rights. The system ensures an efficient workflow in cash and operational expenditure management, with transparency and accountability maintained through logging of activities.

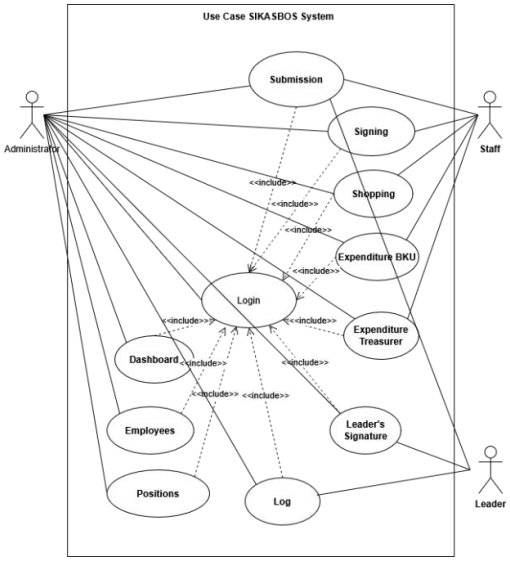


Figure 2. Use Case Diagram

The Entity Relationship Diagram (ERD) for the Office Cash Expenditure and Operational Information System (SIKASBON) describes the structure and relationships between key entities in the system to support efficient cash and expenditure management. The User entity contains data about system users, including Administrators, Officers, and Leaders, who have access to various features such as submissions and activity logs. The Filing Entity stores information regarding cash or operational expenditure requests submitted by the Officer and requires approval from the Leadership through the signing process. Each submission can include multiple expense items recorded in the Spend entity, while the Expense BKU records a summary of all cash expense transactions for easy tracking. The Job Title entity stores data about the user's position in the organisation, which is connected to the Employee entity as information for staff using the system. In addition, Logs record all user activities in the system, serving as an audit trail to monitor and secure activities in the system. This ERD structure ensures that each entity is well-connected, allows for integrated data management, and supports optimal cash and expenditure operations within the service.

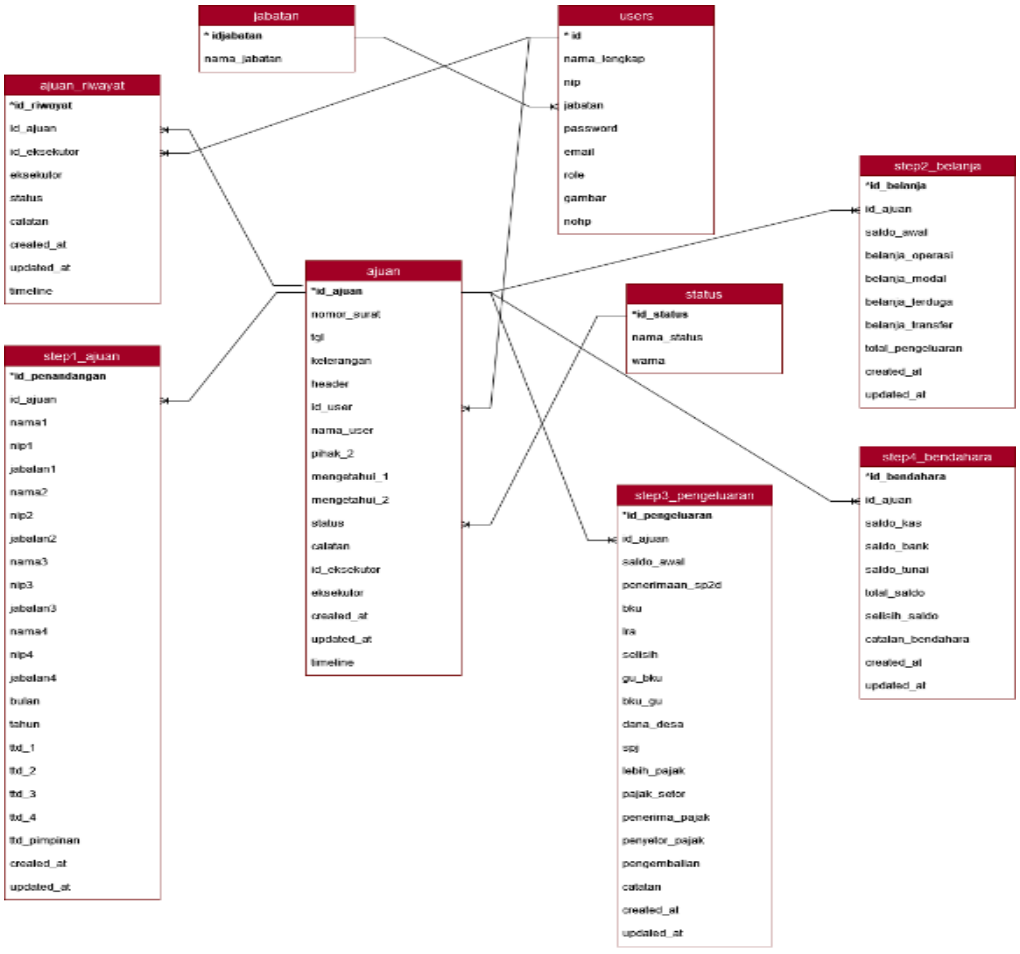


Figure 3. Entity-Relationship Diagram

The SIKASBON system is developed using the PHP programming language with the CodeIgniter framework and the MySQL database. CodeIgniter is an open-source PHP-based web development framework that is well-known for its lightweight size, ease of management, and implementation. CodeIgniter supports the Model-View-Controller (MVC) pattern that separates the application logic from the user interface, allowing for more structured system development and easy maintenance. By using CodeIgniter, SIKASBON development becomes more flexible and efficient, making it easier to add features according to user needs.

SIKASBON also supports the implementation of digital signatures that are directly integrated into the system. This digital signature feature allows authorised parties, such as leaders or treasurers, to sign application or approval

documents electronically, without the need to print physical documents. This digital signature utilises cryptographic technology to ensure the authenticity and integrity of the signed document, so that the document remains safe and valid.

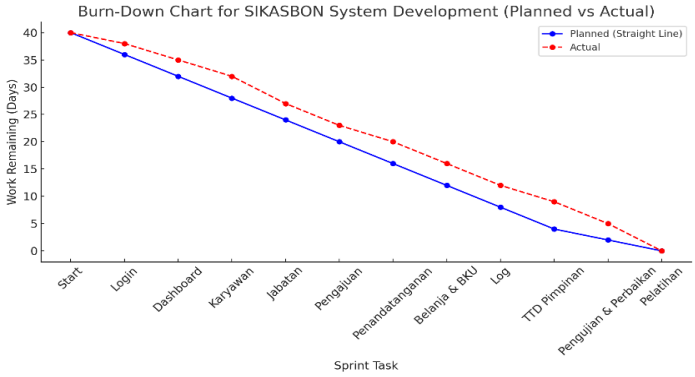


Figure 4. *Burn-Down Chart*

A solid blue line indicates an ideal work plan, while a dotted red line with dots depicts more varied actual progress. The dots on each line provide an indication of the remaining work at each stage, from Login, Dashboard, Employee, to Training, helping to monitor progress and identify differences between the plan and realisation. Table 3 presents the results of the SIKASBON application review based on user feedback on the main features that have been implemented. The assessment was carried out by involving five respondents (R1 to R5) who gave a score on a scale of 1-5 for each feature tested. The average score is calculated to evaluate the overall level of user satisfaction and identify areas that need improvement.

Table 3 presents the results of the SIKASBON application review

No	Feature Tested	User Feedback	Adjustments Made	R1	R2	R3	R4	R5	Avg
1	Login	The login system is working well, but the loading time needs to be optimised.	Optimisation of login page loading speed.	4	4	4	5	3	4.0
2	Filing	The dashboard information is comprehensive, but it needs to add data filters.	Added data filters to the dashboard.	4	5	4	4	4	4.2
3	Signing	Employee data performs well, but additional data validation is required.	Added data validation to ensure accuracy.	4	4	5	4	4	4.2
4	Budget Spending	Job title information is clear, but it needs more granular access for certain levels.	Adjustment of access to job title features.	3	4	3	5	4	3.8
5	BKU Pengeluaran	The application process is easy to do, but final confirmation needs to be added.	Addition of a confirmation process before finalisation.	4	4	5	4	3	4.0
6	Bendahara Pengeluaran	The feature works well but requires additional security for authentication.	Improved security of digital authentication.	4	3	4	5	4	4.0
7	Dashboard	Recording expenses is very useful; it is necessary to add monthly reports.	Addition of monthly reports to the BKU module.	5	5	4	4	4	4.4
8	Employee	Activity logs look complete, but they need to be tailored to the user's permissions.	Restrict log viewing according to user access rights.	4	5	4	5	4	4.4
9	Position	The digital signature feature runs smoothly, but it needs additional authenticity information.	Addition of authenticity information to the signature.	4	4	5	4	4	4.2
								Average	4.13

The results of the evaluation show that most of the features have worked well according to the user's needs, with an average overall score of 4.13. Some features, such as Shopping & BKU and Logs, received the highest scores (4.4),

indicating that these features are very useful and meet user expectations. However, some features, such as Job Title, received a lower score (3.8), which indicates the need for further customisation, especially regarding detailed access for certain levels. The adjustments that have been made, such as optimising the loading time in the Login feature, adding filters to the Dashboard, and improving the security of digital authentication in Signing, aim to improve the user experience. The feedback obtained from this review became the basis for continuous improvement, ensuring that the system is increasingly responsive and relevant to the operational needs of the agency.

The Employee Information System application is deployed on a Virtual Private Server (VPS) environment with 2 CPU cores and 2GB of RAM, ensuring sufficient capacity to support application performance. Using Docker, all application components are containerized, including web service and database components, to create an isolated and secure environment. Docker allows each container to run a separate process, ensuring stability and avoiding environmental conflicts that may occur in traditional deployment processes. In addition, the use of Docker also makes it easy to maintain and scale as each component can be set up and modified independently.

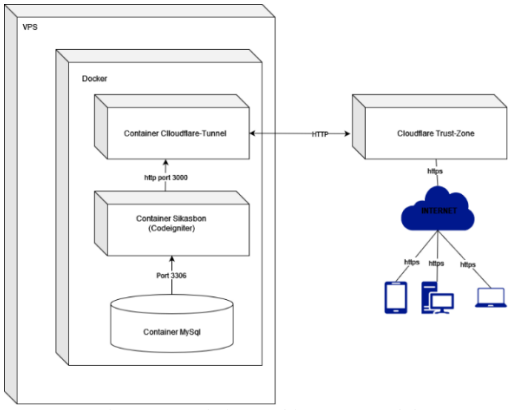


Figure 5. Website Architecture Model

SIKASBON's website is designed to be responsive and user-friendly, with intuitive navigation menus for managing cash data, operational spending, and financial reports. This website is optimised for access via desktop and mobile devices, ensuring ease of use and efficiency in the operational management of BPKAD Mempawah Regency. By being able to access the internet channel, each OPD can conduct cash reconciliation without face-to-face interaction, so that in 10 minutes, the results are obtained. The results of the SIKASBON website display are as follows:

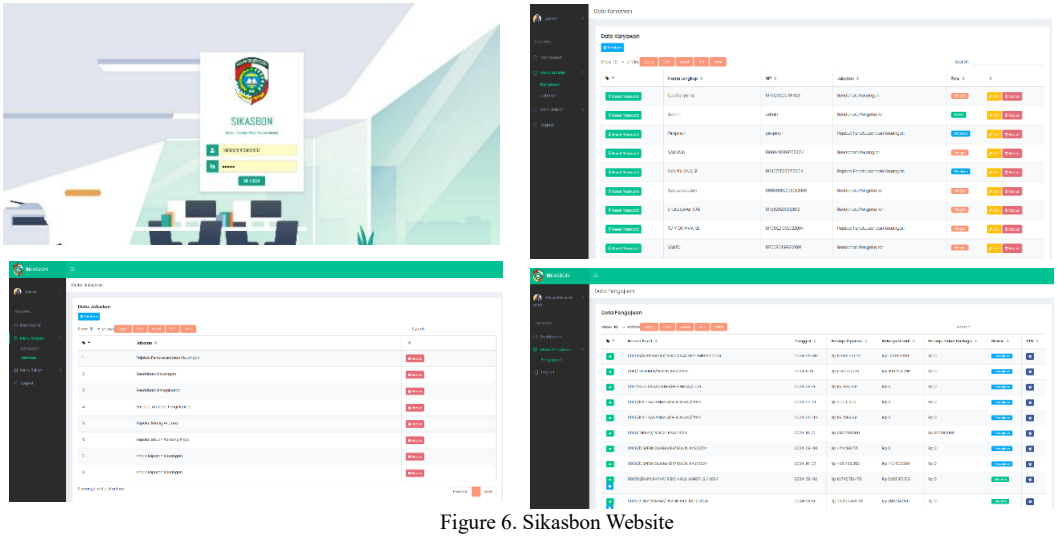


Figure 6. Sikasbon Website

The Submission feature in the SIKASBON application is equipped with a menu tab that makes it easier to manage the entire submission process in a structured manner. There is a Signer menu tab that can display a list of which parties are responsible for signing the document, while the Shopping menu tab contains details of the shopping items along with their amounts and total costs. For financial records, the Expenditure BKU tab provides General Cash Book details related to expenses, and the Expenditure Treasurer tab displays the approval from the treasurer for the submission documents. Finally, the signature menu tab of the Leader that the document will be validated by the leader through the electronic signature of the leader as part of the final approval, while the Log tab presents the activity history on the submission to ensure transparency at each stage. All of these tabs are designed so that users can access and manage data easily and efficiently.

Discussion

This research succeeded in designing and implementing a web-based Cash and Operational Expenditure Reconciliation Information System (SIKASBON) for BPKAD Mempawah Regency, which is able to overcome the main challenges in cash reconciliation and tax reporting. This system increases the efficiency of the reconciliation process and increases the accuracy of real-time recording of regional cash and operational expenditures. Switching from manual methods, which are often inefficient and prone to errors, to automated systems significantly reduces the risk of data loss, speeds up decision making and facilitates tax underpayments or overpayments. This progress is in line with broader digitalization trends, particularly in supporting government agencies.

The results of this research support previous research on cash reconciliation, which is an important process in ensuring the accuracy of financial reports and transparency in reporting public funds (Pasaribu et al., 2023). With the ease of the Sikasbon application, the process of matching data between internal records and external reports to identify differences or errors in financial transactions that have the potential to harm the institution in previous research (Rokib et al., 2022) can be avoided so that an effective reconciliation process not only helps maintain the credibility of financial reports, but also supports the achievement of the institution's operational goals through good budget management (Ananda et al., 2022).

Conclusions and Suggestions

Conclusions

The development of the Office Cash Expenditure and Operational Information System (SIKASBON) using the Agile methodology has succeeded in achieving the main goal, which is to create a system that is responsive, structured, and in accordance with user needs. The development process is carried out through systematic stages, including needs identification, design, development, testing, and deployment. The results of the evaluation using the System Usability Scale (SUS) method showed an average score of 85.2, which was in the A+ (Best Imaginable) category. This shows that the system has met user expectations with a very high level of usability. This system is considered easy to use, relevant, and supports the efficiency of cash management and operational spending.

Suggestions

Based on this research, we would like to provide several suggestions that can help BPKAD Mempawah Regency in implementing the SIKASBON application:

1. System Usability Scale (SUS): The SIKASBON application has been measured and obtained very good results from respondents who use the application. However, of course, the scope of this system may not necessarily be able to be used with other related agencies/departments.
2. Choose the Right Server: Choose the right server system that suits the needs and operations of the Sikasbon Application. Different PHP versions on the server will affect the smooth use of the application.
3. User Training: Provide adequate training for OPD staff who will use SIKASBON. Ensure they understand the functionality of the system and can optimize its use in reconciling cash and operational expenditure.
4. Maintenance and Updates: Perform routine maintenance and system updates. Ensure the system always runs well, data security is maintained, and supports the operational needs of BPKAD Mempawah Regency, which is increasingly developing.

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