Optimization of Attendance Monitoring System in the Employee Attendance Information System Application (Case Study: Department of Communication and Informatics, Bondowoso Regency)

Nurul Huda[a]
[a]*University of Muhammadiyah Jember, Faculty of Engineering, Informatics Engineering Study Program, Jember, Indonesia*
Corresponding Author:
[a]*kodesayap@gmail.com*

ABSTRACT
The discipline of civil servants (ASN) is a key factor in realizing effective governance, transparency, and high-quality public services. In Bondowoso Regency, the process of monitoring ASN discipline remains suboptimal due to limited availability of digital attendance systems. This study aims to develop a dashboard feature for monitoring ASN discipline within the SIPP (Employee Attendance Information System) application using the Agile Software Development Life Cycle (SDLC) methodology, which allows for flexible, incremental system development based on user needs. Data collection was conducted through literature studies, field observations, interviews with the Regional Civil Service and Human Resource Development Agency (BKPSDM) of Bondowoso Regency, and questionnaires distributed to departmental operators. The analysis results were used to design a real-time monitoring feature that integrates ASN attendance data. The system is developed using web-based technology and RestfulAPI to ensure compatibility, performance, and scalability. Testing results indicate the feature functions according to defined specifications. A survey of 300 active ASN operators showed that 98% agreed the feature facilitates attendance monitoring and enhances transparency and accountability. This innovation strengthens internal ASN supervision and supports the implementation of Smart Governance through digitized personnel services in Bondowoso Regency.

Keywords : ASN Discipline, Attendance Monitoring, SIPP Application

INTRODUCTION

The State Civil Apparatus (ASN) refers to civil servants and government employees under contractual agreements appointed by personnel supervisory officials and assigned to governmental or state duties. They receive salaries in accordance with statutory regulations. ASN plays a strategic role in realizing a law-abiding, democratic, just, prosperous, and morally upright civil society through equitable and high-quality public service delivery. According to Law Number 5 of 2014 concerning the State Civil Apparatus, Article 10 outlines three main functions of ASN: (1) implementer of public policy, (2) public servant, and (3) unifier of the nation. As public policy implementers, ASN is tasked with executing policies determined by

personnel supervisory officials in line with regulations; as public servants, they are expected to deliver professional and high-quality services; and as national unifiers, ASN is responsible for maintaining unity and integrity within the framework of the Unitary State of the Republic of Indonesia.

To carry out these functions professionally, ASN is required to adopt information technology in government management, public service delivery, and data-driven decision-making. This is an integral part of the strategy toward smart governance. Smart governance refers to a governance model that is fast, efficient, responsive, and innovative through the integration of information technology. Governments applying this concept are expected to manage bureaucracy and public services more concisely, effectively, communicatively, and in a time- and cost-efficient manner (Ramadhani, 2023; Susanto, 2019).

In this context, the Department of Communication and Informatics plays a vital role in supporting the digitalization of government governance. As the agency responsible for communication, informatics, cybersecurity, and statistics, the Department is expected to facilitate the development of information systems that are adaptive to various governmental challenges. The utilization of information systems in governance also significantly supports data-driven decision-making processes using timely and relevant actual data (Meo, 2020; Ramadhianti, 2023).

One strategic issue requiring attention is ASN discipline. According to Government Regulation Number 94 of 2021 on the Discipline of Civil Servants, Article 4 letter f states that every civil servant must report to work and comply with applicable working hours. Violations of this provision are subject to disciplinary sanctions ranging from mild to severe. Therefore, an accurate and real-time attendance monitoring system is crucial to ensure ASN discipline in carrying out governmental duties (Miftahudin, 2019; Timbuleng, 2023).

In Bondowoso Regency, the current ASN discipline monitoring system still faces significant challenges. The SINKA application (State Civil Apparatus Discipline Information System), managed by BKPSDM, can only monitor ASN attendance via fingerprint machines, while ASN in the education and health sectors still use manual paper-based attendance. These manual records are only submitted at the end of each month, making it difficult to conduct quick and efficient recapitulation and monitoring. As of January 22, 2025, only about 2,786 out of 7,856 ASN (35%) could be monitored directly through the system, while the remaining 65% were not yet integrated into the digital system (BKPSDM, 2025).

To address these challenges, the SIPP (Employee Attendance Information System) was developed as a digital, Android-based attendance solution. Development began in February 2021, and it has been gradually implemented since November 2021 in more than 98 institutions. Despite its widespread use, the SIPP application does not yet offer integrated real-time attendance monitoring features. As a result, the government has not been able to comprehensively, swiftly, and accurately monitor ASN discipline using real-time data.

In response to this issue, the authors propose an innovative idea through the development of a monitoring dashboard feature in the SIPP application, titled *"Optimizing Attendance Monitoring Systems in the Employee Attendance Information System (SIPP)"*. This innovation is expected to support BKPSDM and the Bondowoso Regency Government in accelerating

comprehensive ASN discipline monitoring, improving data accuracy, and supporting data-driven policymaking in order to enhance the quality of public services.

METHODS

This study adopts a software engineering approach using the Software Development Life Cycle (SDLC) with the Agile development model. Agile was chosen due to its iterative and adaptive nature in responding to changing user requirements, allowing for flexible system development with active stakeholder involvement in each cycle (Indah Melyani, 2023). In the context of developing the attendance monitoring feature within the SIPP application, the Agile method is considered highly relevant to ensure the system is truly aligned with real-world field needs, particularly due to the involvement of multiple sectors and procedural dynamics in government institutions.

The system development process is carried out in several stages: planning, analysis, design, development, testing, and evaluation. The development team consists of one project manager, two backend developers, one frontend developer, one UI/UX designer, and one quality assurance engineer. The project is executed over several sprints, each with a duration of two weeks. At the end of each sprint, a review and retrospective session is conducted to evaluate the development outcomes and to prepare the next sprint backlog.

The planning stage involves identifying system requirements through discussions, interviews, and Q&A sessions with the BKPSDM team and attendance operators from regional work units (OPDs). Subsequently, the analysis stage is conducted by direct observation to map the current manual and digital attendance workflows and to identify key issues that hinder comprehensive monitoring of ASN discipline.

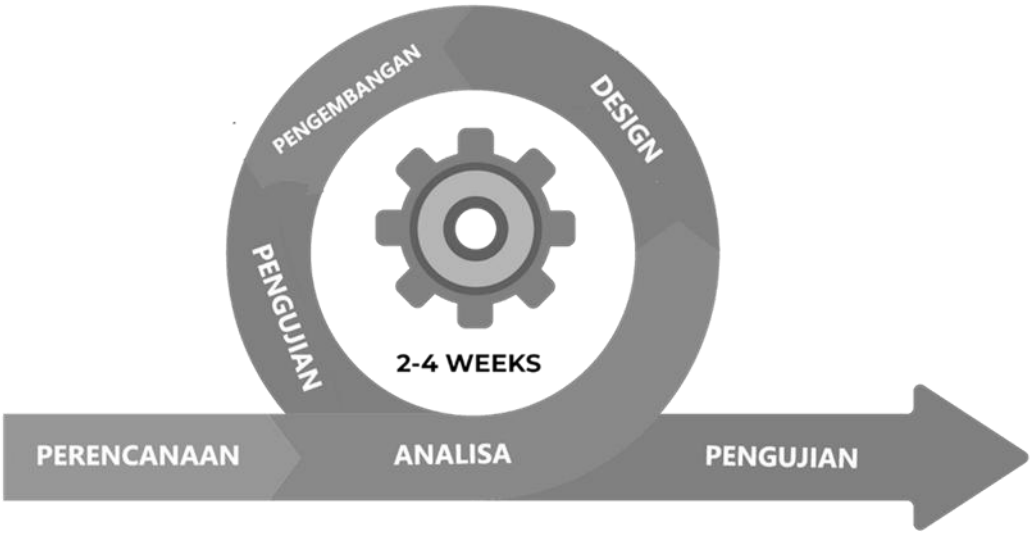

Figure 1. Agile Model

During the design stage, the user interface and system architecture for monitoring were developed using design tools such as Figma. This design accommodates integration with the existing SIPP system, which is already used by 98 regional government institutions. The dashboard design was based on principles of effective data visualization (Kaur & Singh, 2020)

and supports multi-level access needs through secure and structured user role management (Chowdhury et al., 2021).

The system development stage was carried out using HTML and PHP programming languages, with Yii2 as the backend framework. Data communication between system components was implemented using REST APIs developed in a modular fashion, in line with distributed system principles (Fielding, 2000). Git was used as the version control system, and GitLab CI/CD pipelines were implemented to accelerate deployment and enable automatic integration throughout development.

Testing was conducted iteratively at the end of each sprint using black-box testing to ensure that each feature functioned according to user requirements. In addition, technical tests such as load testing and API performance testing were conducted using Apache JMeter and Postman to evaluate system stability and performance under high-load conditions.

Usability evaluation was conducted using the System Usability Scale (SUS), a method for measuring users' perceptions of the system interface's quality and ease of use (Brooke, 1996; Bangor et al., 2009). The evaluation included aspects such as ease of use, interaction efficiency, and clarity in understanding dashboard functions (Lewis, 2018).

To support the development process, data were collected through direct observation in work units such as public health centers and schools that still use manual attendance systems, semi-structured interviews with technical officials from BKPSDM and attendance operators, as well as analysis of secondary documents such as ASN attendance reports. This data collection approach is based on user-centered design principles to ensure the system is developed in line with real user needs (Gould & Lewis, 1985) and supports the implementation of Smart Governance (Almalki et al., 2023).

The developed ASN attendance monitoring dashboard is dynamic and continuously adapted to technological advancements and evolving user needs. The final evaluation stage was conducted comprehensively using black-box testing to detect system errors and collect user feedback. In addition, SUS questionnaires were distributed to local government attendance operators to assess usability, effectiveness, ease of access, and the impact on employee work efficiency. SUS-based evaluation has been widely used in public sector application testing and has proven valid for measuring user satisfaction (Bangor et al., 2009; Mahmud et al., 2023). The results of the testing serve as a basis for future versions aimed at improving system service quality.

RESULT AND DISCUSSION

Result

During the planning stage of developing the ASN discipline monitoring system, the researchers collaborated directly with BKPSDM of Bondowoso Regency as the main stakeholder. The involvement of BKPSDM was essential for identifying specific system requirements, particularly those related to real-time attendance monitoring mechanisms and the challenges posed by manual recapitulation processes still used by some institutions such as public health centers and schools.

Based on interviews with the BKPSDM technical team, several key requirements were identified:

1. The availability of an integrated discipline monitoring dashboard.

2. A system capable of automatically retrieving daily attendance data.
3. Attendance reports that can be filtered by date, work unit, and attendance status.

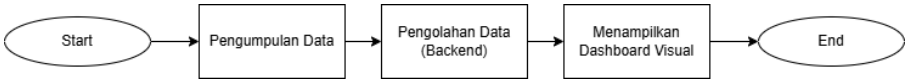

Figure 2. Monitoring Flowchart

This information served as the foundation for system analysis and design, including the development of the monitoring process flowchart (*Figure 2*) and the use case diagram illustrating the relationship between users (BKPSDM admin, OPD operator) and system features (*Table 1*).

Table 1. Access Roles for the ASN Discipline Monitoring Dashboard

MENU	ROLE		
	BKPSDM	OPERATOR	ASN
Recapitulation of attendance, absence, punctuality, and tardiness per ASN	✓	✓	✓
Recapitulation of attendance, absence, punctuality, and tardiness per OPD	✓	✓	
Recapitulation of attendance, absence, punctuality, and tardiness for all OPDs	✓		

There are three primary user roles in the ASN discipline monitoring dashboard: BKPSDM, Operator, and ASN. Each role has different access privileges according to their functions and responsibilities. BKPSDM has full access to all ASN data, both individual and cross-agency, to support data-driven policy making. OPD Operators can only access data for employees within their respective agencies, while ASN users can only view their own individual data.
During the system development phase, HTML5 and PHP were used along with the Yii2 framework. For data visualization, the ChartJS plugin was utilized to present information in an interactive graphical format that is easy to understand.

Figure 3 Monitoring Dashboard Interface

ASN can view a monthly attendance summary, including the number of days present, absent, on time, and instances of lateness.

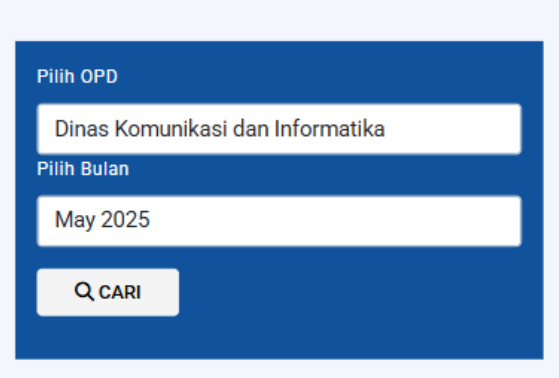

Figure 4 OPD Filter Menu

This figure displays the filter menu available for the Operator role. Each operator can select a specific month and year to view the recapitulation of attendance data for all employees within their respective institution.

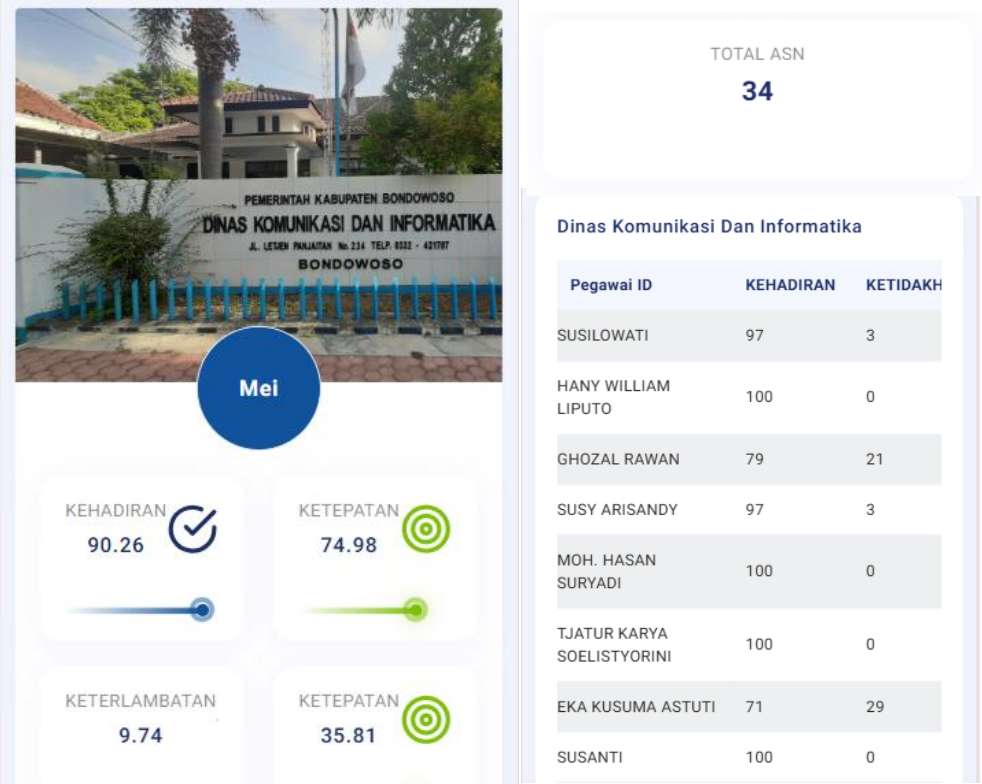

Figure 5 Recapitulation Menu (Operator Role)

As shown in Figure 5, Operators can view detailed summaries of discipline data for the regional work unit (OPD) where they are assigned. In addition to the total recapitulation, Operators also have access to detailed discipline records for each individual employee within their institution.

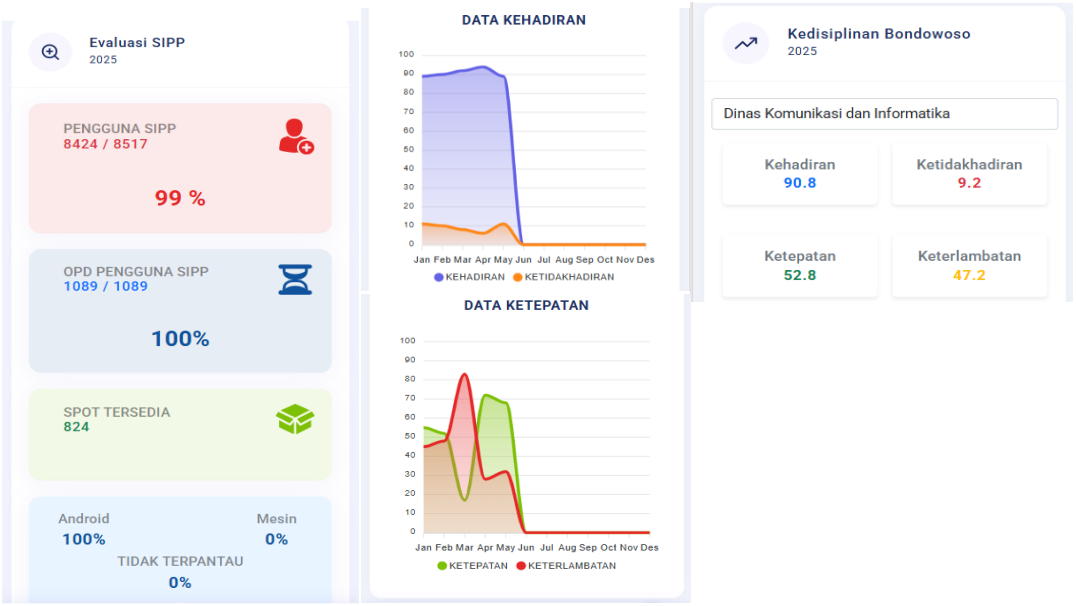

Figure 6 Recapitulation Menu (BKPSDM Role)

BKPSDM role has access to all regional work units (OPDs) within Bondowoso Regency, as illustrated in Figure 6. This allows centralized monitoring and comprehensive evaluation of ASN discipline across all government institutions.

The next stage involved system testing, which was conducted using the **black-box testing** method to ensure that the system functions as expected and meets user requirements. The following table summarizes the results of the testing:

Table 2. Black-Box Testing Results

No.	Test Scenario	Expected Outcome	Test Result
1	Login as ASN	Successfully log in and access the ASN menu	Passed
2	Login as Operator	Successfully log in and access the Operator menu	Passed
3	Login as BKPSDM	Successfully log in and access the BKPSDM menu	Passed
4	Displaying attendance recapitulation in the ASN menu	Able to display the attendance summary of the respective ASN	Passed
5	Operator displays discipline recapitulation by regional work unit (OPD)	Able to display the recapitulation for one OPD along with all ASN within it	Passed

6	BKPSDM displays discipline recapitulation across all regional work units	Able to display the recapitulation for all OPDs	Passed

To measure the effectiveness and efficiency of the dashboard, a survey was conducted involving 500 respondents from various backgrounds, including ASN personnel, Operators, and technical officials. The evaluation used a 4-point Likert scale as follows:

- SS = Strongly Agree
- S = Agree
- CS = Somewhat Agree
- KS = Disagree

Table 1. Survey Results on the Effectiveness and Efficiency of the ASN Discipline Monitoring Dashboard

Question	SS	S	CS	KS
Does the discipline monitoring dashboard make it easier for you to monitor ASN attendance?	24,2%	58,1%	11,5%	6,2%
Do the recapitulation features (present, absent, late) help in evaluating employee performance?	22,6%	56,9%	13,1%	7,4%
Has the dashboard shortened the time required for attendance recapitulation compared to the previous manual process?	23,8%	54,6%	12,2%	9,4%
Is the dashboard interface easy to understand for users from various backgrounds?	20,7%	59,3%	13,6%	6,4%
Is the dashboard effective for use across all OPDs within a single integrated system?	21,5%	55,2%	15,1%	8,2%
Does the dashboard facilitate decision-making regarding ASN disciplinary violations?	19,6%	57,9%	14,4%	8,1%
Do the filter features (by date/OPD/employee) help make data searching more efficient?	22,2%	53,6%	15,8%	8,4%
Do you find this dashboard more efficient compared to the previous system?	20,4%	56,3%	13,9%	9,4%
Are you satisfied with the current performance of the monitoring dashboard?	21,8%	54,1%	15,0%	9,1%

Descriptif Statistic:

- Average percentage of respondents who agreed (S and SS): 77.5%
- Average respondent satisfaction (Question 9): 75.9%

- Average System Usability Scale (SUS) score: 76.8 (*Good – Acceptable*)
- Median SUS score: 77.5
- Highest individual question score: 80.0% (*dashboard interface is easy to understand*)

Based on a survey conducted among 500 respondents—including OPD operators, technical officers, and ASN users—it was found that 58.1% of respondents agreed that the discipline monitoring dashboard makes it easier for them to track ASN attendance. Additionally, 56.9% of respondents agreed that the recapitulation features, such as attendance, absence, punctuality, and tardiness, contribute to a more efficient and structured employee evaluation process.

Furthermore, 54.6% of the respondents agreed that the dashboard reduces the time required for attendance recapitulation compared to previous manual methods. In terms of interface usability, 59.3% stated that the dashboard was easy to understand—even for users with non-technical backgrounds. A total of 55.2% agreed that the dashboard is effective for use across all OPDs within an integrated system, improving cross-agency coordination.

Moreover, 57.9% of respondents indicated that the dashboard supports better decision-making regarding ASN disciplinary actions. Additionally, 53.6% agreed that the filter features (by date, OPD, and individual) greatly enhance the efficiency of data retrieval. In terms of overall efficiency, 56.3% agreed that the dashboard is more efficient than the previous system, and 54.1% expressed satisfaction with the current performance of the dashboard.

However, a small proportion of respondents—particularly ASN aged over 50—were less favorable toward the use of the dashboard, citing difficulties in operating technology-based systems. To address this issue, the researchers, in collaboration with BKPSDM of Bondowoso Regency, plan to implement a staged socialization and technical training program (*bimtek*), particularly targeting ASN who face challenges in using the dashboard or digital tools in general.

DISCUSSION

The development of a digital-based ASN disciplinary monitoring dashboard in Bondowoso Regency has emerged as a solution to long-standing challenges faced by various government agencies, such as delays in attendance recapitulation and reliance on error-prone manual systems. The integration of this dashboard within the SIPP system is a strategic step aligned with the principles of *Smart Governance*—a data-driven and information technology-based governance model that emphasizes efficiency, transparency, and public participation (Mandasari, 2023).

Active collaboration with the Bondowoso BKPSDM successfully identified and accommodated the primary needs of users, including:

- Integrated attendance recapitulation features,
- Automation of daily attendance data retrieval,
- Flexible filtering based on work unit, date, and attendance status,
- Role-based access control (BKPSDM, Operator, and ASN roles).
- Black-box testing results demonstrated that all core system functions operated as expected, from role-specific login to the presentation of individual and OPD-level ASN attendance recaps. These results indicate the system is operationally ready, having met the minimum functional requirements.

- A survey involving 500 respondents revealed a highly favorable reception of the system. On average, **77.5%** of respondents agreed that the dashboard helps support their daily work. The average System Usability Scale (SUS) score was **76.8**, placing the system in the "good" and "acceptable" category (Brooke, 1996; Bangor et al., 2009). Its intuitive interface design has proven accessible even to ASN personnel with non-technical backgrounds.
- However, digital literacy gaps remain a concern, particularly among ASN aged over 50. This issue requires serious attention, as it may hinder equitable utilization of the system. In response, BKPSDM is committed to conducting gradual technical training (*bimtek*) and outreach programs to ensure that all users can adapt effectively to the dashboard and associated digital tools.
- In the context of developing a digital system that processes ASN data, information security and personal data protection are critical. The SIPP system manages sensitive information such as full names, employee identification numbers (NIP), work units, attendance history, and user location. Therefore, potential risks—such as data breaches, unauthorized access, and data manipulation—must be mitigated through the implementation of the following security measures:
- Role-based authentication to limit access according to user privilege levels,
- Encryption of sensitive data**,** both at rest and in transit (e.g., using TLS and AES-256),
- User activity audit logs to trace system access and changes,
- Input validation and protection against common attacks such as SQL Injection and Cross-Site Scripting (XSS),
- Regular data backups and a disaster recovery plan to ensure service continuity.

Ongoing system security evaluations are also essential and should include penetration testing conducted by independent third parties to ensure the system remains resilient against emerging vulnerabilities. Comparative analysis shows that other regions in Indonesia have developed similar systems. For instance:

- Sleman Regency with its "Presensiku" application, which uses GPS and face recognition for ASN daily attendance,
- Jember Regency**,** which developed "SIKEREN JEMBER," an Android-based system integrating face recognition and geolocation maps.
- Compared to these systems, the SIPP system in Bondowoso Regency offers distinct advantages, particularly in its multi-agency dashboard integration, structured user role access, and informative, adaptive data visualization. Moreover, its user-centered design approach makes the system more responsive to real-world user needs.
- In conclusion, the ASN disciplinary monitoring dashboard in Bondowoso Regency addresses not only technical needs in attendance management but also serves as a model for data-driven HR transformation. The system demonstrates strong potential for replication in other regions, especially through collaborative development, needs-based design, and strengthened focus on security and long-term sustainability.

CONCLUSION

The development of the ASN disciplinary monitoring dashboard within the SIPP application in Bondowoso Regency has successfully delivered a more efficient, accurate, and integrated attendance monitoring system. Using the Agile model of the Software Development Life Cycle (SDLC), development was carried out iteratively through close collaboration between the development team, the Civil Service Agency (BKPSDM), and regional agency operators. The result is a system that accommodates real user needs in the field and supports more systematic and data-driven supervision of ASN discipline.

The dashboard provides role-based access for three main user levels: BKPSDM, OPD operators, and ASN staff. Features such as attendance recap, flexible data filters, and informative visualizations have improved monitoring effectiveness. Testing results showed that all functions performed well technically, and survey responses from more than 500 users indicated a high level of satisfaction with the system's ease of use and its contribution to performance support.

However, challenges remain among certain user groups, particularly ASN aged over 50, who require additional training. This will be addressed through a planned series of technical guidance (bimtek) activities and regular assistance to improve digital literacy and ensure equitable system utilization.

Long-term implementation plans include further integration with other personnel systems, enhancement of API performance to support larger scales, and development of AI-based disciplinary analytics features to detect absenteeism patterns. Additionally, the dashboard is designed as a dynamic platform that can be expanded in line with regulatory developments and institutional needs.

Given the successful implementation in Bondowoso Regency, this system has high potential to be replicated in other regions by adapting to local organizational structures and policies. The modular architecture enables rapid adoption by other local governments facing similar challenges in monitoring ASN discipline. Therefore, this dashboard not only serves as a technical solution but also as a strategic initiative to drive digital government transformation and strengthen transparent and accountable governance practices.

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