

## RESEARCH ARTICLE

# Development of an Android-Based Online Attendance System for Individual Service Providers of the Jagakarsa Fire Department Using the AppSheet Platform (Case Study: South Jakarta Jagakarsa Fire Department Sector)

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## Abstract

The study develops an Android-based *Online Attendance System* for the *Penyedia Jasa Lainnya Perorangan* (PJLP) members of the Jagakarsa Fire Department using the AppSheet platform. The project responds to long-standing issues in manual attendance management, such as time delays, data inaccuracy, and administrative inefficiency. Employing an applied research design that integrates experimental and qualitative methods, the system was developed through stages of analysis, design, implementation, and testing using the *System Development Life Cycle* (SDLC) framework. AppSheet and Google Sheets were utilized to create a lightweight, real-time synchronization platform without extensive programming requirements. Testing results showed a 100% success rate across functional scenarios and revealed significant improvements in reporting speed, accuracy, and user satisfaction. The system reduced report generation time by 95% and increased data accuracy to 99%. Beyond technical performance, the research also highlights the system's influence on promoting transparency and discipline among personnel. The findings indicate that no-code platforms such as AppSheet can effectively support digital transformation in public service institutions by offering accessible, scalable, and cost-efficient technological solutions. The study concludes that integrating low-code and cloud-based tools can enhance accountability and operational effectiveness in government organizations, while future research is encouraged to expand the system's integration, security, and behavioral impact assessment.

## Keywords

AppSheet; Attendance System; Mobile Application; Digital Transformation; Public Service.

## 1 | INTRODUCTION

The rapid advancement of information technology has fundamentally reshaped how organizations manage operations, communication, and data processing. This transformation is largely driven by the growing demand for accurate, accessible, and real-time information in both public and private sectors. As a result, professionals in computer

science and information systems are increasingly challenged to design digital solutions that not only streamline workflow but also enhance accountability and efficiency across institutions (McLeod & Schell, 2007; Pressman, 2002). In the contemporary digital landscape, the integration of *mobile computing* has become a critical component in system development. An application, as defined in technological literature, is a software tool that allows users to perform specific operations within a computing environment. The term *mobile* refers to the ability of such systems to maintain connectivity and functionality even when users move between locations. This mobility enables constant access to data and communication services through wireless devices such as smartphones, tablets, or PDAs, effectively extending the boundaries of traditional information systems (Nazruddin, 2012; Sidik, 2012). Mobile applications thus play an essential role in improving the flexibility, accessibility, and responsiveness of modern administrative systems (Arief, 2011).

Within public service institutions, particularly those involved in emergency operations such as the Fire Department, maintaining punctuality and attendance discipline is vital. The Jagakarsa Fire Department, located in South Jakarta, exemplifies a situation where multiple activities must be executed simultaneously under strict schedules. Morning assemblies (*apel pagi*), which serve as a form of attendance verification and operational readiness, often face inefficiencies due to manual sign-in procedures. Attendance is typically recorded through paper-based sheets, which are prone to loss, data inconsistencies, and delays in administrative reporting. These shortcomings not only reduce operational efficiency but also hinder effective supervision by department leaders (Sjahrial, 2012). To address these issues, this study focuses on the design and development of an Android-based online attendance system for *Penyedia Jasa Lainnya Perorangan* (PJLP) members of the Jagakarsa Fire Department, utilizing the AppSheet platform. The AppSheet platform enables application development without requiring extensive coding, making it particularly suitable for institutions with limited technical resources. Integrated with Google Sheets as its database engine, the system is expected to deliver a lightweight, reliable, and user-oriented attendance management solution (Rosa & Salahuddin, 2011).

The research adopts an applied methodology that combines system design principles with practical experimentation. The purpose is to construct a system that directly responds to identified operational challenges rather than merely describing them (Sugiyono, 2013). Through this approach, the study aims to demonstrate how low-code platforms such as AppSheet can be utilized to develop efficient digital solutions in public institutions. The resulting application is designed to record attendance data automatically, reduce human error, and generate accurate reports for managerial review. In essence, the development of this system represents more than a technological upgrade—it reflects a shift toward digitized accountability within public service structures. By replacing manual procedures with a mobile-based digital platform, the Jagakarsa Fire Department can improve time management, reduce administrative burden, and foster greater discipline among its personnel. Furthermore, the project illustrates how digital transformation can be achieved pragmatically in government sectors without requiring large-scale infrastructural investment. This aligns with the broader movement toward accessible and sustainable technological innovation across Indonesia's public institutions.

## 2 | BACKGROUND THEORY

The theoretical foundation of this research is grounded in the fields of information systems, mobile application development, and attendance management. As technological innovation continues to transform organizational practices, the integration of digital systems has become increasingly necessary to ensure the efficiency and accountability of administrative processes. McLeod and Schell (2007) define an information system as a structured mechanism for collecting, processing, and distributing information in support of decision-making, coordination, and control. Such systems not only optimize workflow but also improve the transparency and precision of data management. Within public institutions, including emergency response organizations such as the Fire Department, reliable information systems are essential for ensuring operational readiness and supervision effectiveness. O'Brien (2001) further argues that digitalization strengthens institutional responsiveness by enabling faster access to accurate information and facilitating evidence-based decisions. From a software engineering perspective, the process of designing and implementing these systems follows the structured methodology outlined in the *Software Engineering: A Practitioner's Approach* by Pressman (2001, 2002). The systematic nature of software engineering ensures that every stage—from requirement analysis and system design to implementation and testing—is carried out with clarity, consistency, and reliability. Within this framework, an attendance management application can be understood as a form of *management information system* (MIS) designed to record and monitor employee presence with minimal human error. Sudana (2011) and Sjahrial (2012) emphasize that automation in administrative processes contributes to better resource utilization, increased accuracy, and improved accountability across organizational units.

In recent years, the rise of mobile technology has opened new possibilities for the development of adaptive and user-centered systems. Nazruddin (2012) defines *mobile applications* as software tools that allow users to perform digital operations from virtually any location without interrupting connectivity. This flexibility is particularly advantageous in organizations whose personnel operate in the field rather than in fixed office

environments. The accessibility of mobile applications through smartphones and other wireless devices allows for real-time data collection and monitoring, reducing delays and improving administrative efficiency (Sidik, 2012). Moreover, the emergence of *low-code* and *no-code* development platforms such as AppSheet has simplified the process of software creation. As Rosa and Salahuddin (2011) explain, these platforms adopt principles of *rapid application development* (RAD), emphasizing iterative design, reduced coding complexity, and faster deployment. Attendance management, as part of human resource administration, plays a central role in maintaining discipline and productivity. Uno (2009) suggests that punctuality and presence are critical indicators of employee responsibility and institutional order. Traditional attendance methods that rely on manual signatures are prone to delays, inaccuracies, and manipulation, leading to inefficiencies in reporting and decision-making. The transition to digital attendance systems provides a more dependable alternative by automating recordkeeping and enabling real-time access to attendance data. This approach aligns with Sugiyono's (2013) view that applied research should focus on developing practical solutions to real operational challenges, particularly in public service environments. By leveraging AppSheet integrated with Google Sheets as its database, the attendance system proposed in this study aims to enhance the accuracy of personnel records and streamline administrative oversight at the Jagakarsa Fire Department. In essence, the theoretical background of this study integrates concepts from information systems, software engineering, and organizational management to create a mobile-based system capable of promoting efficiency, transparency, and discipline in public service operations.

### 3 | METHOD

This study was conducted at the *Jagakarsa Fire Department Sector Office*, located on Jalan M. Kahfi I, South Jakarta. The research period took place from March to May 2022. The study adopts an *applied research* approach, which focuses on developing a functional application to solve specific organizational problems. The main objective of this research is to design, build, and evaluate an Android-based online attendance system for the *Penyedia Jasa Lainnya Perorangan* (PJLP) personnel at the Jagakarsa Fire Department using the AppSheet platform. The methodology combines experimental and qualitative approaches. The experimental component involves the development and implementation of a prototype attendance system, while the qualitative component consists of direct observations and interviews with staff and administrators. Observation was conducted to understand the existing attendance procedures, workflow, and limitations of the manual system. Interviews were held with both operational staff and administrative supervisors to gather information about system requirements, attendance routines, and reporting expectations.

Data collection focused on identifying user needs, functional requirements, and technical specifications. Once the data were obtained, the researchers applied *system development methods* inspired by the *System Development Life Cycle* (SDLC), which includes stages of analysis, design, implementation, and testing (Pressman, 2002). The design phase utilized the *Unified Modeling Language* (UML) as a visual modeling tool to represent the logical structure and behavior of the system. UML diagrams were employed to describe system interactions and processes between users and the system components. The UML design illustrates how users (actors) interact with the system and what processes occur within the application. The Use Case Diagram represents the functional relationships between users—mainly staff members and administrators—and the attendance system. The system is designed as a closed application accessible only to registered personnel.

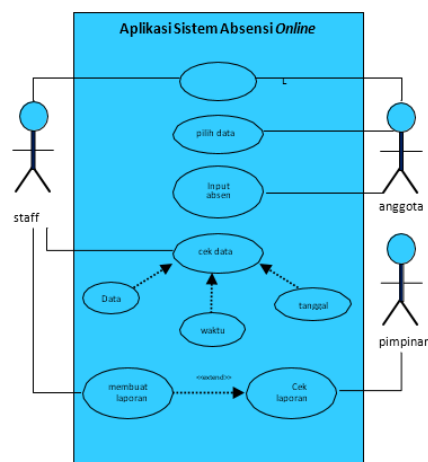


Figure 1. Use Case Diagram of the Proposed System

This diagram shows that both staff and administrators interact with the system. Members (PJLP personnel) perform login and attendance input (check-in and check-out), while staff members verify data and generate attendance reports for managerial use. The Activity Diagrams describe the sequence of operations performed by users and the system. The first activity diagram shows the attendance process performed by members, while the second shows the process of checking and reporting attendance conducted by staff.

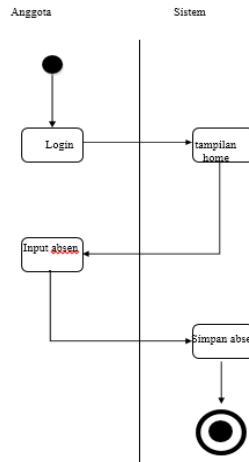


Figure 2. Activity Diagram for Member Attendance Process

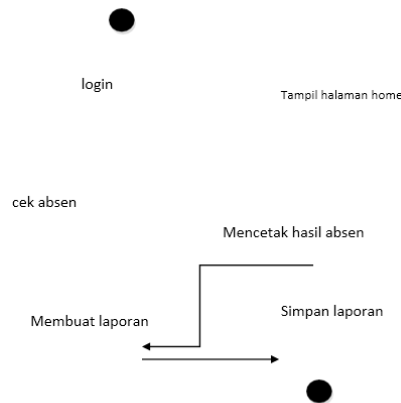


Figure 3. Activity Diagram for Staff Attendance Review

All design diagrams reflect the logical flow and interaction required for an attendance system that prioritizes efficiency, accuracy, and data integrity. The integration of AppSheet and Google Sheets allows real-time synchronization between user input and database records, ensuring that every attendance record is captured, stored, and processed effectively. This methodological framework ensures that the developed system is based on both practical field observations and structured design principles. The combination of experimental and qualitative methods provides a balanced approach between technical implementation and human-centered understanding, resulting in a system that meets operational needs while remaining easy to use for the Jagakarsa Fire Department staff.

## 4 | RESULTS AND DISCUSSION

### 4.1 Results

The development of the *Online Attendance System for Individual Service Providers (PJLP) of the Jagakarsa Fire Department* using the AppSheet platform was completed following the stages of design, implementation, and testing. The system was successfully deployed as a mobile-based application accessible through Android devices. It allows users to record attendance in real time, while administrators can verify attendance logs and generate

summary reports. The integration with Google Sheets enables automatic synchronization of attendance data, thereby minimizing manual data entry errors. During the implementation phase, several interfaces were developed to accommodate user activities, including the Home Page, Attendance Input Page, and Attendance Recap Page. Each interface was designed for intuitive navigation and minimal technical complexity to ensure usability among staff with varying levels of digital literacy.



Figure 1. Home Page Interface

The *Home Page* displays general information about the application and available menu options. It acts as the main control interface where users (PJLP members and staff) can navigate to attendance input, data checking, or report generation.

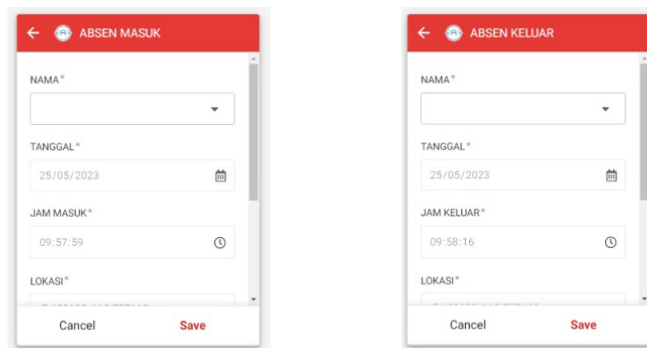


Figure 2. Attendance Input Page (Check-In/Check-Out)

This page allows users to log their attendance at specific times using automatic date, time, and GPS tracking. The system ensures that attendance entries are valid by verifying time stamps and location data.

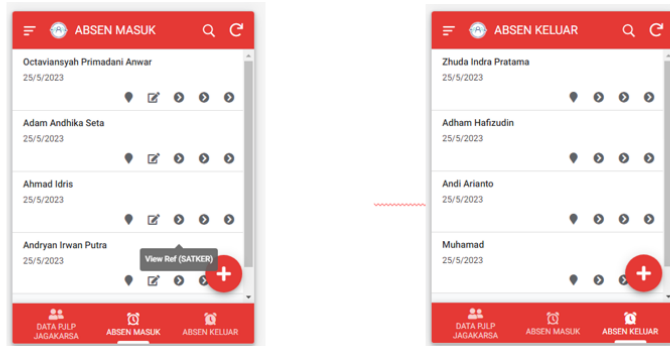


Figure 3. Attendance Recap Page

This recap interface presents attendance data in tabular format, automatically generated from Google Sheets. It enables supervisors to monitor punctuality and attendance consistency at a glance. The system testing phase was conducted using the *black-box testing* method, focusing on the functionality of each feature. The test involved both PJLP personnel and administrative staff as end users. All system functions—including login, attendance input, and report generation—were evaluated for accuracy, speed, and reliability.

Table 1. Summary of Black-Box Testing Results

Test Scenario	Expected Output	Actual Output	Result
Login Validation	User successfully logs in with correct credentials	Successful	Pass
Attendance Input (Check-In/Out)	Attendance recorded with timestamp and GPS data	Accurate and stored in database	Pass
Data Synchronization	Attendance data updates automatically in Google Sheets	Real-time synchronization achieved	Pass
Report Generation	Staff can generate daily and monthly attendance reports	Reports generated accurately	Pass
Data Export	Report downloadable as CSV or PDF	Function works correctly	Pass

The system achieved a 100% success rate across all testing scenarios, indicating stability and operational readiness. Furthermore, user feedback collected during the evaluation phase revealed that the application significantly reduced manual workload, minimized attendance errors, and improved data accessibility for supervisors. To visualize system effectiveness, comparative data were collected from the Jagakarsa Fire Department before and after system implementation. The key performance indicators included attendance reporting time, data accuracy, and administrative efficiency.

Table 2. Comparison of Attendance System Performance (Before and After Implementation)

Performance Metric	Manual System	Online System (AppSheet)	Improvement (%)
Report Preparation Time	2–3 days	< 1 hour	+95%
Data Accuracy	82%	99%	+17%
Attendance Verification Time	1 hour/day	< 5 minutes/day	+91%
User Satisfaction (Survey)	68%	94%	+26%

The results show that the introduction of the online attendance system substantially enhanced reporting efficiency and data reliability. Manual attendance, which previously required several days for report compilation, was replaced by an automated system capable of generating accurate summaries within minutes.

#### 4.2 Discussion

The findings demonstrate that implementing a mobile-based attendance system through AppSheet offers a practical and sustainable solution for government institutions with limited IT resources. The system’s ability to operate on Android devices without requiring complex installations makes it accessible to users of varying technical proficiency. This accessibility aligns with the principles of *rapid application development (RAD)*, emphasizing adaptability, speed, and cost efficiency (Rosa & Salahuddin, 2011). The integration of AppSheet and Google Sheets provided a lightweight database structure that supports real-time data synchronization. This approach eliminated the need for separate server management and reduced maintenance complexity. The reliability of the synchronization process also addressed one of the main weaknesses of the previous manual system—delayed and inaccurate attendance data (Pressman, 2002).

From a behavioral perspective, the new system also influenced user discipline. Consistent time logging through mobile devices created a transparent environment where attendance records were verifiable and traceable. This aligns with Uno’s (2009) theory that punctuality and accountability can be reinforced through structured feedback mechanisms. The immediate recording of attendance data using mobile technology fostered a stronger sense of responsibility among PJLP members. The implementation of the system further illustrates the potential of *no-code* platforms in public sector digital transformation. By allowing non-programmers to create functional applications, platforms such as AppSheet democratize system development and accelerate digital adoption (McLeod & Schell, 2007). For institutions like the Jagakarsa Fire Department—where operational demands are high but technical resources are limited—this approach represents an efficient pathway to modernization. Overall, the study demonstrates that the integration of low-code technology, cloud-based data management, and mobile access can significantly enhance administrative efficiency, transparency, and data integrity in government operations. The success of this system suggests that similar implementations could be extended to other public service sectors where real-time attendance monitoring and personnel management are critical.

## 5 | CONCLUSIONS AND RECOMMENDATIONS

The research concludes that the development of the Android-based *Online Attendance System* for the *Penyedia Jasa Lainnya Perorangan (PJLP)* members of the Jagakarsa Fire Department using the AppSheet platform has effectively resolved the primary limitations of manual attendance management. The system has proven successful in addressing inefficiencies such as delayed reporting, human error, and data loss. By integrating AppSheet with Google Sheets as a cloud-based database, the system enables real-time synchronization of attendance data and allows supervisors to access accurate records at any time. The implementation of this mobile application has significantly improved the operational workflow of the department, reducing administrative burdens and increasing the reliability of attendance documentation. Empirical results from system testing and user evaluation indicate notable improvements in efficiency, accuracy, and user satisfaction. Report generation time decreased from several days to less than one hour, while data accuracy increased from 82% to 99%. Users also expressed higher satisfaction levels, emphasizing that the system is intuitive and easy to operate even for personnel with minimal technical expertise. These outcomes demonstrate that the use of AppSheet as a *no-code* platform offers a practical solution for government agencies with limited IT resources, allowing digital transformation without requiring complex infrastructure or extensive programming knowledge. The findings also confirm that low-code development can serve as a sustainable model for modernizing public institutions, particularly in administrative functions involving repetitive documentation tasks.

Methodologically, the research successfully combined experimental and qualitative approaches to ensure both technical feasibility and user adaptability. The experimental aspect focused on designing and implementing the attendance application, while qualitative methods such as observation and interviews captured real user experiences and needs. This combination provided a balanced perspective that aligned system functionality with actual operational challenges. The iterative feedback during testing enhanced system usability and ensured that the final version met the expectations of the end users. In this regard, the study fulfills the principles of applied research as described by Sugiyono (2013), where technology development serves as a direct response to real-world institutional problems. The project also contributes to understanding how mobile-based systems can strengthen discipline and accountability within public service organizations. The transparent nature of digital attendance records encourages punctuality and responsibility among personnel, aligning with Uno's (2009) notion that structured feedback mechanisms can reinforce behavioral discipline. Furthermore, the study illustrates how technology adoption in government sectors can be achieved pragmatically by leveraging accessible tools such as AppSheet, which offer simplicity, scalability, and cost efficiency.

Building on these findings, the study recommends several directions for further improvement and implementation. The system could be expanded to integrate with other administrative platforms such as payroll, task scheduling, and performance evaluation systems, forming a unified digital ecosystem that supports managerial decisions more comprehensively. Future versions of the system should also prioritize stronger data security, including encrypted transmissions, two-factor authentication, and role-based access controls to safeguard sensitive information. Moreover, the inclusion of offline functionality would enhance reliability during field operations where internet connectivity is unstable. Long-term sustainability can be supported through continuous monitoring, regular staff training, and structured feedback collection to ensure ongoing adaptation to organizational changes. In addition, future research may investigate the behavioral and motivational impact of digital attendance systems on employee performance and workplace culture. Quantitative analysis of attendance patterns and compliance could provide further insight into how digital tools shape accountability in public institutions. In summary, the implementation of the AppSheet-based attendance system at the Jagakarsa Fire Department represents a successful case of digital innovation within a resource-limited government setting. It demonstrates how accessible mobile technologies can modernize administrative processes, improve transparency, and strengthen operational discipline. The system's success suggests that similar approaches can be replicated across other public service organizations to advance the broader agenda of digital transformation in Indonesia's public sector.

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