

# Design and Development of an Android-Based Application for Employee Leave and Absence Management at the Faculty of Science and Engineering, Bangka Belitung University

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## ABSTRACT

The process of submitting leave and absence management for employees of the Faculty of Science and Engineering, Bangka Belitung University, is still carried out manually using paper forms, potentially causing delays in information, recording errors, and difficulties in data archiving. This study aims to design and implement an Android- and web-based leave and absence management application system to improve the efficiency of personnel administration. The system development method used includes the stages of needs analysis, system design, implementation, and testing. The Android application was developed using Flutter, while the web-based system uses PHP with a MySQL database and Application Programming Interface (API) integration for real-time data measurement. This system provides features for submitting leave and permits, application history, verification and approval stages by superiors, employee data management, and application status notifications. The results of functional testing indicate that most features run according to system requirements, although there is one date logic validation test that does not meet expectations. Overall, the system developed is able to improve the efficiency of the administrative process, minimize recording errors, and support more structured, transparent, and integrated personnel data management.



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## 1. INTRODUCTION

Applying for leave is an official application process carried out by an employee or worker to a superior or authorized party to obtain permission to be absent from work for a certain period of time for legitimate reasons such as personal needs, health, pregnancy, family matters, worship, and for other purposes regulated in employment regulations or internal policies of an agency or company.

In general, employee leave and absence requests at the Faculty of Science and Engineering at Bangka Belitung University are still processed manually, namely by filling out paper forms and submitting them directly to superiors or the personnel department. However, this process often causes problems such as complicated and time-consuming processes, the risk of losing or damaging physical documents, a lack of transparency in application status, documentation that is not centralized and difficult to find, susceptibility to administrative errors, lack of efficiency and delays in approval, and difficulties in automatically monitoring and summarizing remaining leave. Therefore, utilizing

technology such as Android-based applications can streamline the process of requesting leave and absence from work, making it quick, transparent, and integrated. This not only simplifies employee leave and absence requests but also assists the HR department in monitoring, recording, and reporting employee leave and absence data accurately and in real time.

Based on initial observations and literature review, several key issues were identified that prompted the development of this application. These include the manual process for submitting leave and permits, which is prone to delays and data loss. The lack of notifications makes it difficult for employees to monitor the status of applications. Furthermore, the lack of a digital system makes recapitulation and auditing inefficient. Access is also limited due to the lack of a mobile application, especially for employees outside the office. The lack of integration with the personnel system leads to data duplication and potential input errors.

## 2. RESEARCH METHOD

In this research, several stages and methods were used, such as: problem identification, literature study, system development methods, tools and materials used, information system design, system testing methods.

### 2.1. Problem Identification and Literature Study

The results of the problem identification are as follows:

1. A personnel information system is a system used to manage personnel data such as employee attendance, leave, and permits in a structured and integrated manner.
2. Leave and permit management is part of human resource management that must be effective to avoid disrupting the institution's operations. Procedures for submission, approval, and data recapitulation are crucial aspects of this system.
3. With the advancement of technology, Android application development has become a practical solution that provides easy access anytime and anywhere. Android, as an open and flexible mobile operating system, allows the integration of notification features, electronic forms, and real-time status tracking.
4. To ensure application functionality meets user requirements, black box testing is used. This testing focuses on system input and output without addressing internal code, making it ideal for testing functionality such as login, leave requests, and approval notifications.

### 2.2. System Development Methods

In this research, the system development method used is the Software Development Life Cycle (SDLC) with the waterfall model. This model was chosen because it has systematic, structured, and sequential stages, thus meeting the needs of academic research, which requires clear documentation at each stage of development.

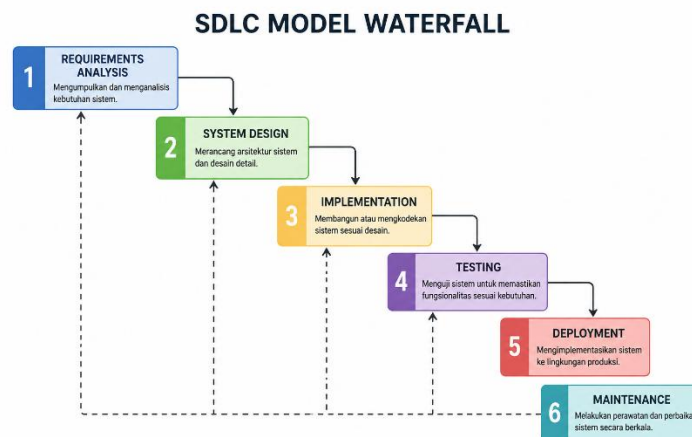


Figure 1. SDLC model waterfall

### 2.3. Research Procedures

The research procedure is described using a flow diagram as shown in Figure 2.

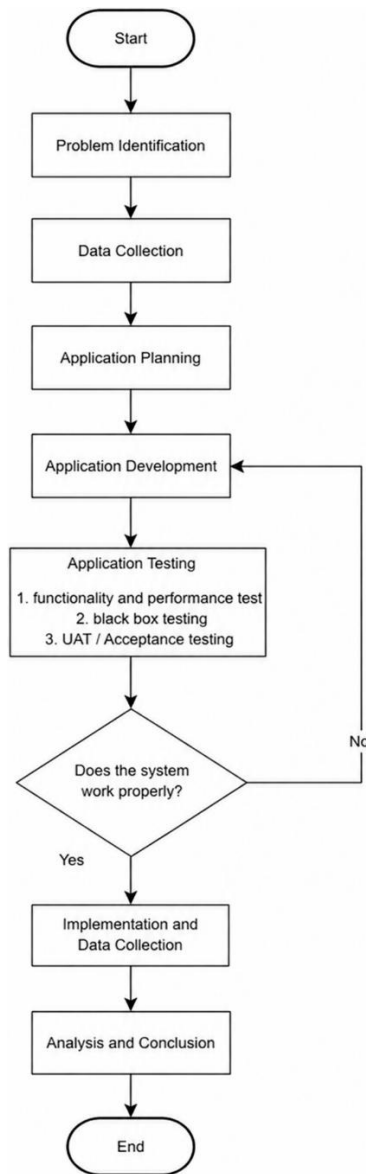


Figure 2. The research procedure

### 2.4. Information System Design

#### 1. Information System Architecture

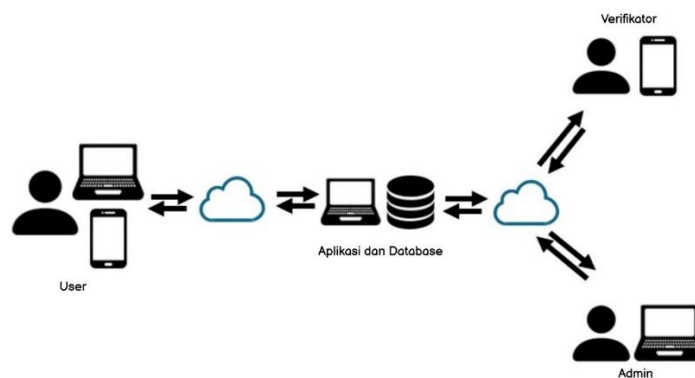
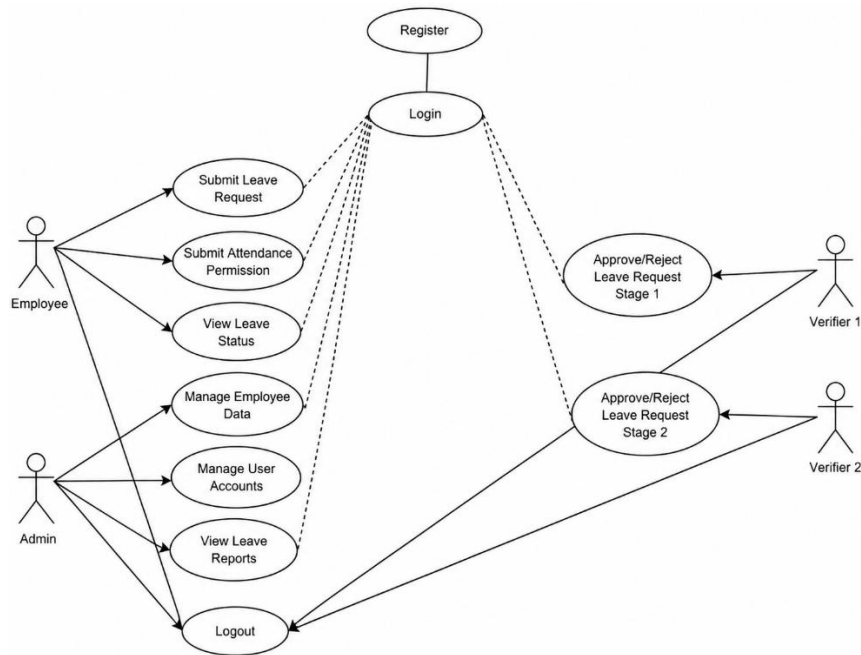


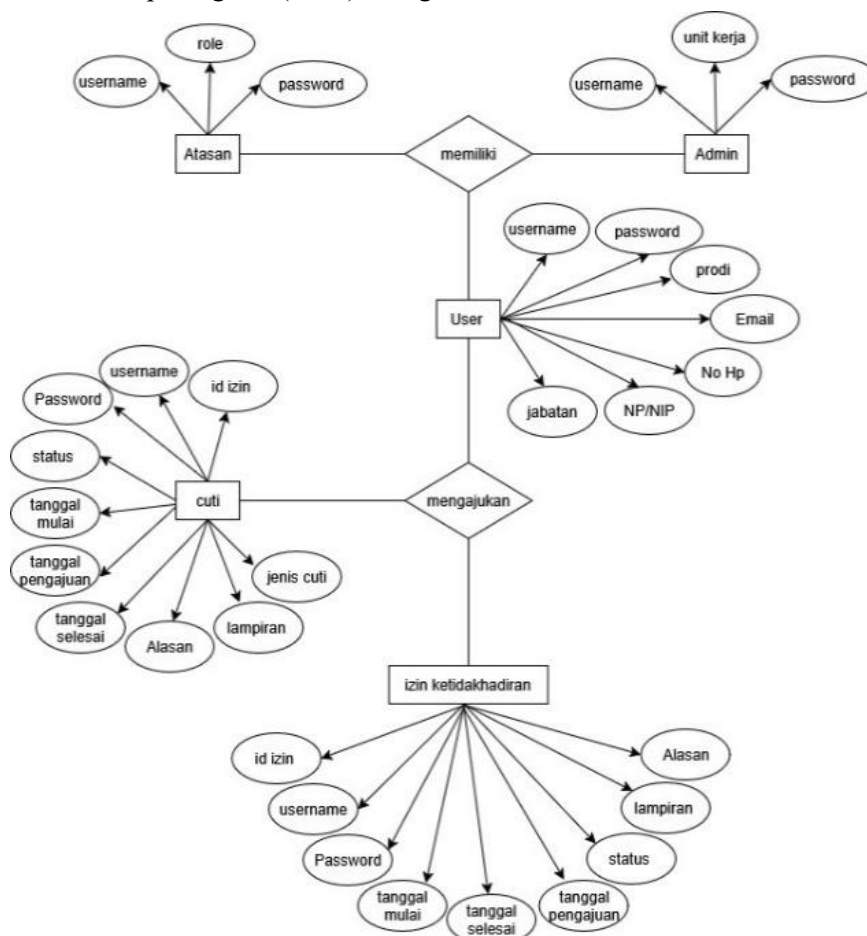
Figure 3. Employee leave and absence management application system architecture

## 2. Use Case Diagram Design



**Figure 4.** Use case diagram

## 3. Entity Relationship Diagram (ERD) Design



**Figure 5.** ERD for leave applications and employee absence permits

#### 4. System Database Design

The database tables in this system consist of: user table, admin table, leader table, leave table, absence permit table, and reason table. The database tables are as shown in Tables 1, 2, 3, 4, 5, and 6.

**Table 1.** User table

No	Field Name	Type	Keterangan
1.	Id_user (pk)	INT	Primary Key, Auto increment
2.	Username	VARCHAR (50)	unik
3.	Password	VARCHAR (100)	Terenkripsi
4.	Nama	VARCHAR (100)	
5.	Jabatan	VARCHAR (100)	
6.	prodi	VARCHAR (50)	
7.	Email	VARCHAR (50)	
8.	No_hp	VARCHAR (100)	
9.	NIP/NP	VARCHAR (15)	Nomor induk pegawai
10.	role	VARCHAR (30)	Hak akses

**Table 2.** Admin table

No	Field Name	Type	keterangan
1.	Id_admin(pk)	INT	PK
2.	Id_user(fk)	INT	FK ke User
3.	Unit_kerja	VARCHAR (50)	

**Table 3.** Leader table

No	Field Name	Type	keterangan
1.	Id_atasan(pk)	INT	PK
2.	Id_user(fk)	INT	FK ke User
3.	Jabatan	VARCHAR (50)	

**Table 4.** Leave table

No	Field Name	Type	Keterangan
1.	Id_cuti	INT	PK Auto increment
2.	Id_user	INT	FK ke User
3.	Tanggal_pengajuan	DATE	
4.	Tanggal_mulai	DATE	
5.	Tanggal_selesai	DATE	
6.	Jenis_cuti	VARCHAR (50)	
7.	Alasan	TEXT	
8.	lampiran	VARCHAR (255)	Path file
9.	Status	ENUM ('diajukan', 'disetujui', 'ditolak')	Default diajukan

**Table 5.** Absence permit table

No	Field Name	Type	Keterangan
1.	Id_izin(PK)	INT	PK Auto increment
2.	Id_user(FK)	INT	FK ke User
3.	Tanggal_pengajuan	DATE	
4.	Tanggal_mulai	DATE	
5.	Tanggal_selesai	DATE	
6.	alasan	TEXT	
7.	lampiran	VARCHAR (255)	Path file
8.	status	ENUM ('diajukan', 'disetujui', 'ditolak')	Default diajukan`

**Table 6.** Reason table (optional if you want to separate)

No	Field Name	Type	Keterangan
1.	Id alasan(PK)	INT	PK
2.	keterangan	TEXT	

5. Flutter Framework Design

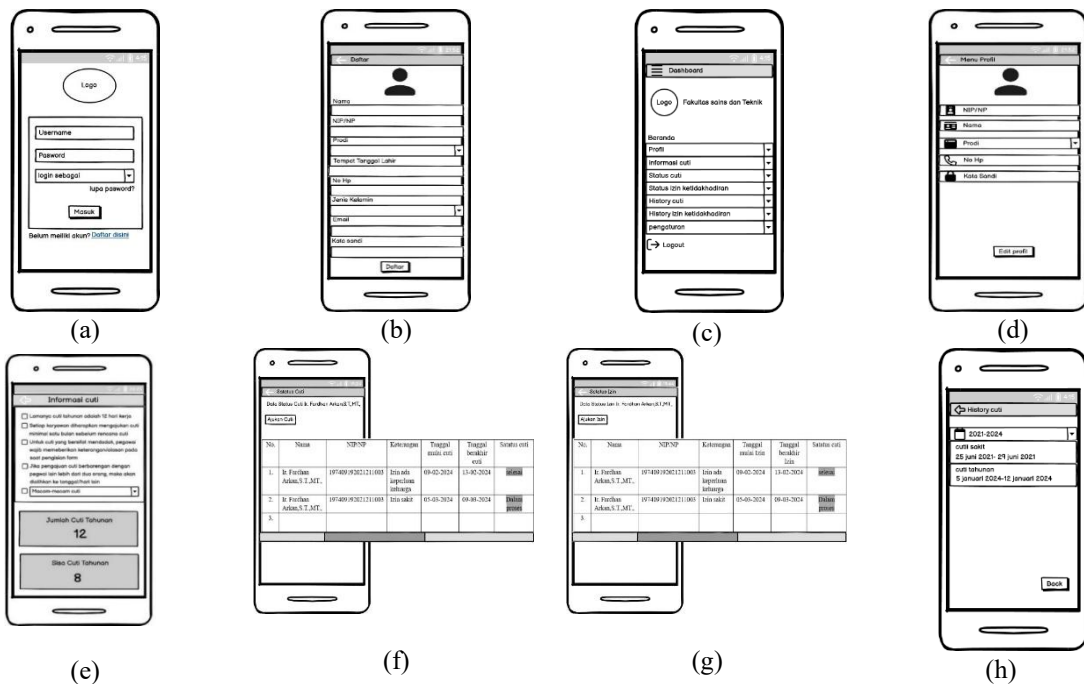
In developing this application, Flutter is used as a forwarder, displaying the user interface and managing user interactions. The system is designed using a client-server architecture with the following components:

- Client (Flutter application) : displays the user interface (UI), manages user input, sends and receives data via API.
- Backend (web service/API) : manages business processes, manages leave application data, connects the application to the database.
- Connects the application to the database : database (MySQL), stores employee data, stores leave and permit application data, stores approvals and application history.

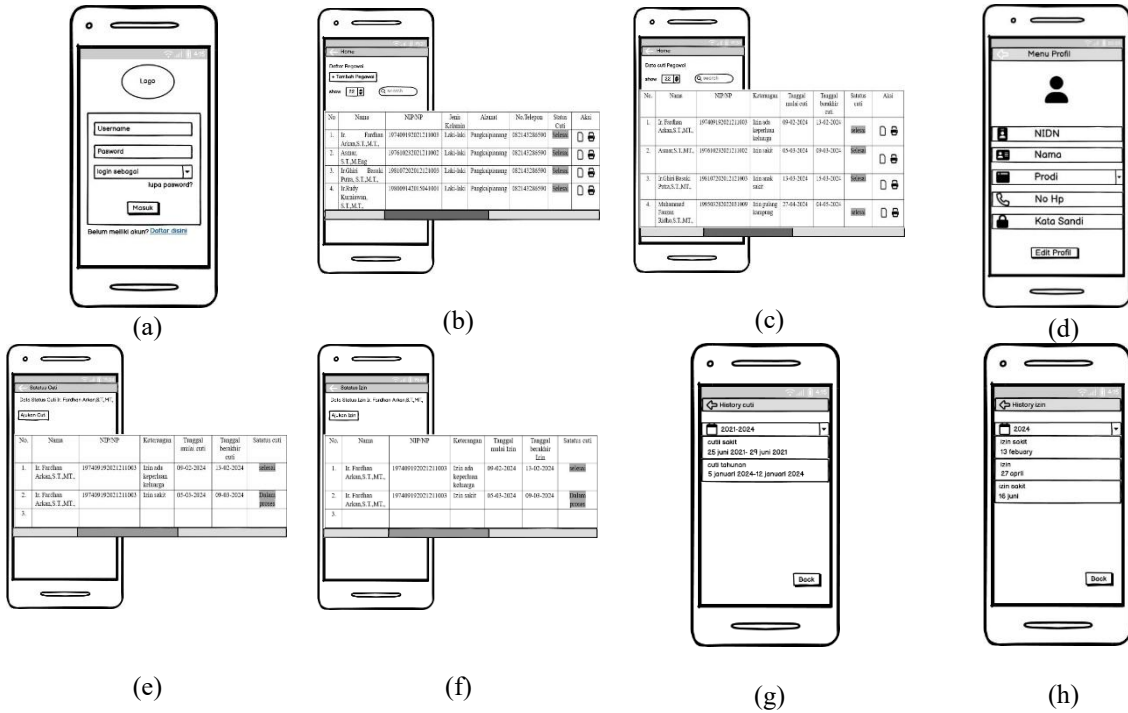
6. Application User Interface (UI) Display Design

This stage involves the design and planning of the application. The following is the user interface design, as follows:

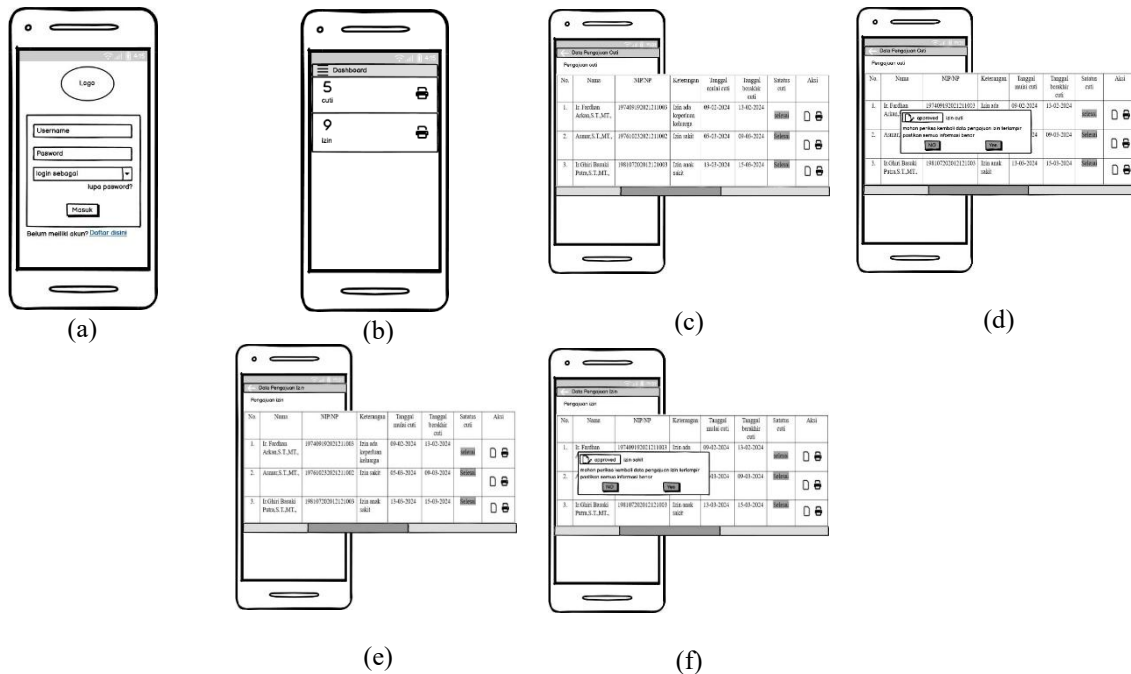
- Employee User Interface Design; This design consists of several displays, including: login page, registration page, dashboard page, profile page, leave information page, leave status page, permit status page, leave history page, permit history page, leave application form page, permit application form page.
- Admin User Interface Design; This design consists of several displays, including: login page, employee list page, employee leave data page, admin profile page, leave status page, permission status page, leave history page, permission history page, leave application page, permission application page.
- Design of the Leadership User Interface; This design consists of several displays, including: leadership login page, dashboard view, leave application page view, leave approval page view, permit application page view, permit approval page view.



**Figure 6.** Employee user interface design : (a) login page, (b) registration page, (c) dashboard page, (d) profile page, (e) leave information page, (f) leave information page, (g) leave status page, (h) permit status page



**Figure 7.** Admin user interface design : (a) login page, (b) employee list page, (c) employee leave data page, (d) admin profile page, (e) leave status page, (f) permission status page, (g) leave history page, (h) permission history page



**Figure 8.** Design of the leadership user interface : (a) leadership login page, (b) dashboard view, (c) leave application page view, (d) leave approval page view, (e) permit application page view, (f) permit approval page view

## 7. User Experience (UX) Design

UX design is carried out by paying attention to several aspects, namely:

- a. Ease of access (Usability); the application is designed with simple navigation so that users can easily log in, apply for leave or permits, and monitor the status of applications without experiencing any difficulties.
- b. Process efficiency; the application process is structured in several steps, from filling out the form to submitting the data, saving users time compared to manual systems.
- c. Clarity of information (feedback system); the system provides notifications and real-time application status information so employees can know whether the application has been approved or rejected.
- d. Consistency; the interface design is consistent on every page, in terms of layout, color, and action buttons, thus enhancing the app's usability.

### 8. Application and System Testing Methods

The testing methods in this study are divided into several stages, namely:

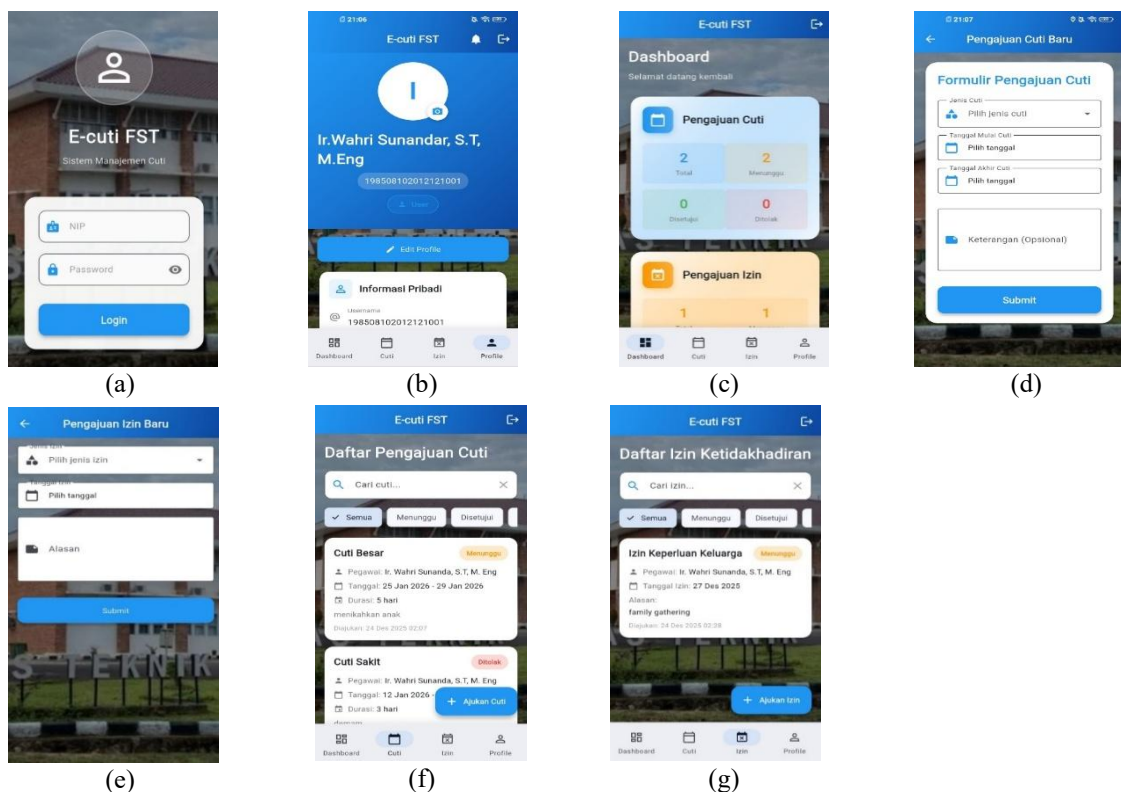
- a. System functionality and performance testing (test each feature created)
- b. System suitability testing (black box testing)
- c. System User Acceptance Test (UAT)/Questionnaire

## 3. RESULTS AND DISCUSSION

This chapter explains several results and discussions which include: results of application implementation on the user page, results of web-based system implementation, and system testing results.

### 3.1. Result of Application Implementation on the User Page

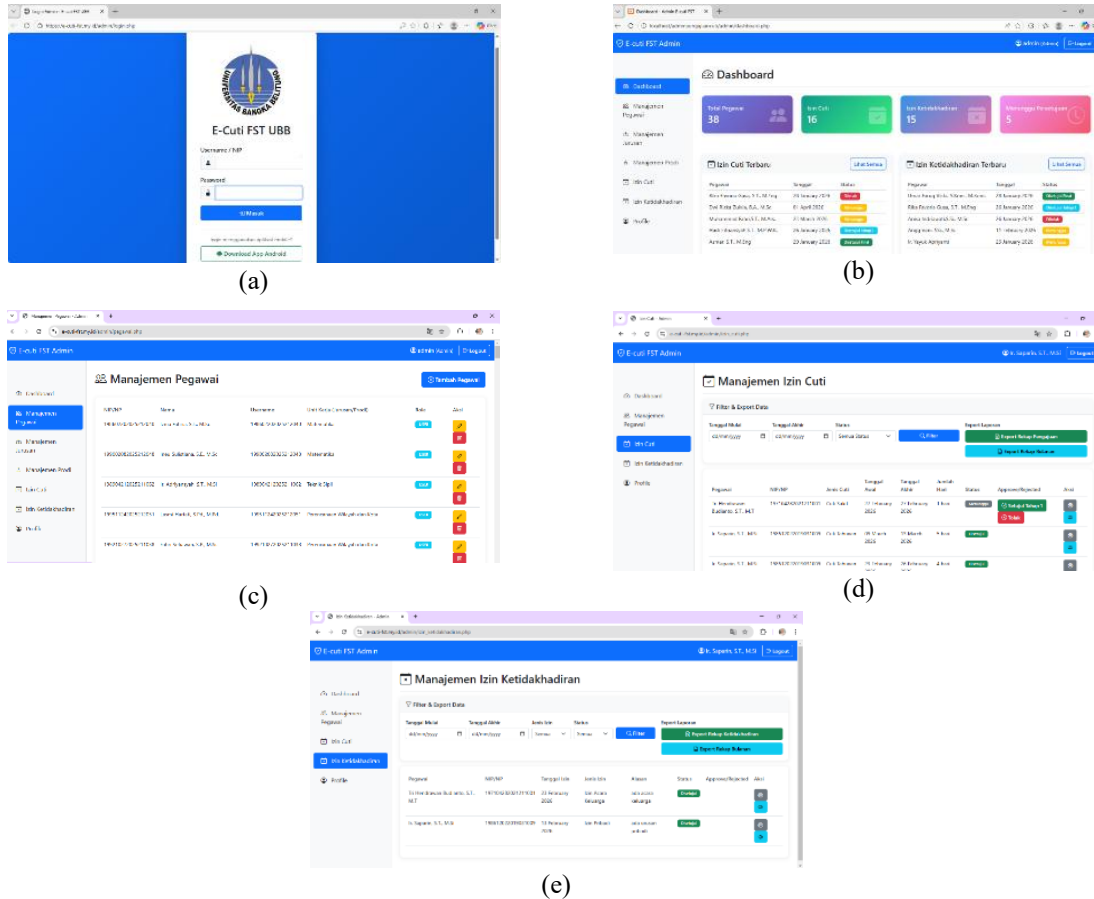
In the result of application implementation on the user page, several display results are explained, such as: User Login Page, User Profile Page, User Dashboard Page, Leave Application Form Page, Permit Application Form Page, Leave Application Status and History Page, Permit Application Status and History Page. The display results of several of these pages can be seen in Figure 9.



**Figure 9.** Application implementation results on the user page: (a) user login page, (b) user profile page, (c) user dashboard page, (d) leave application form page, (e) permit application form page, (f) leave application status and history page, (g) permit application status and history page

### 3.2. Results of Web-Based System Implementation

The results of the web-based system implementation show several display results, such as: Admin Login and Approval Pages, Admin and Leader Dashboard Pages, Employee Data Management Pages, Leave Approval Pages, and Absence Permit Approval Pages. The display results of these several pages can be seen in Figure 10.



**Figure 10.** Application implementation results on the user page: (a) admin login and approval pages, (b) admin and leader dashboard pages, (c) employee data management pages, (d) leave approval pages, (e) absence permit approval pages

### 3.3. System Test Results

The system testing results show several test results, such as: System Functionality and Performance Test Results (Functionality Test Results and System Performance Test Results), Black Box Testing Results on the Application, User Acceptance Test (UAT)/Questionnaire System Test Results.

#### 1. System Functionality and Performance Test Results

The results of the system's functionality and performance tests showed results that met expectations and achieved a 90% success rate. Meanwhile, the system performance tests met expectations and demonstrated satisfactory application access times.

#### 2. Black Box Testing Results

**Table 7.** Black Box Testing results on applications

No.	Submission scenario	Description	Results
1.	Enter the login page	Can display login page on all user levels	<input checked="" type="checkbox"/> accepted <input type="checkbox"/> ditolak
2.	Open the home page	Can display various types of information on the home menu for each user	<input checked="" type="checkbox"/> accepted <input type="checkbox"/> rejected
3.	Submitting a leave application	Can display the leave page and can submit leave requests based on the superior who will approve them	<input checked="" type="checkbox"/> accepted <input type="checkbox"/> rejected

No.	Submission scenario	Description	Results
4.	Submitting an absence request	Can display the absence permit page for the permit application based on the superior who will be approved	<input checked="" type="checkbox"/> accepted <input type="checkbox"/> rejected
5.	Opening the history page	Can display a summary of leave or permits that have been approved or rejected	<input checked="" type="checkbox"/> accepted <input type="checkbox"/> rejected
6.	Approving leave	Can display the leave approval page and make approvals or rejections	<input checked="" type="checkbox"/> accepted <input type="checkbox"/> rejected
7.	Conduct permit approval	Can display the permission approval page and make approvals or rejections	<input checked="" type="checkbox"/> accepted <input type="checkbox"/> rejected
8.	Open the leave status page	Can display leave status approved, rejected or in process	<input checked="" type="checkbox"/> accepted <input type="checkbox"/> rejected
9.	Open the permission status page	Can display the permit status approved, rejected or in process	<input checked="" type="checkbox"/> accepted <input type="checkbox"/> rejected
10.	Logout	Can end the user session and redirect the user back to the login page so that the account cannot be re-logged in.	<input checked="" type="checkbox"/> accepted <input type="checkbox"/> rejected

### 3. User Acceptance Test (UAT)/Questionnaire System Test Results

Based on the UAT/Questionnaire results by giving several questions to 22 respondents and the results of the recapitulation and calculation of the actual score and the calculation of the maximum score, the UAT results obtained a value of 93.27% which is in the very appropriate category. This indicates that the Android-based employee leave and absence application has been very well received by users, both in terms of ease of use, interface appearance, and system functionality.

## 4. CONCLUSION

Based on the results of the requirements analysis, system design, Android application implementation, and testing, the following conclusions were drawn:

1. The Android-based leave and absence application can be implemented successfully and is capable of running all features, such as application, history, and approval, effectively in real time.
2. The system's functionality and performance tests yielded a 90% success rate, black box testing revealed no system failures, and the UAT/Questionnaire test, which included questions from 22 respondents, yielded a score of 93.27%, categorizing it as highly appropriate.

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