

Design of an Android-Based Online Guidance Application as a Written Communication Medium for Students and Supervisors at Politeknik Penerbangan Surabaya

I Wayan Satya Pramudita¹, Meita Maharani Sukma², Faoyan Agus Furyanto³
Politeknik Penerbangan Surabaya, Indonesia

Corresponding Author: Faoyan Agus Furyanto
D3 Air Traffic Controller
Politeknik Penerbangan Surabaya, Indonesia
Email: faoyan_agusfuryanto@dephub.go.id

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Abstract

The process of borrowing items in the Air Transportation Management Study Program at the Surabaya Aviation Polytechnic was previously done manually by recording them in a logbook. This system had various weaknesses, such as illegible writing, no real-time information, and no notification of item returns, which caused inefficiency and potential data errors. This study aims to develop a web-based item borrowing application as a digital solution to enhance the effectiveness and efficiency of the borrowing process, as well as support the smooth operation of academic activities. The research method used is Research and Development (R&D) with a waterfall development model. Data collection was conducted through the distribution of questionnaires, which were then analyzed using validity and reliability tests, as well as quantitative descriptive analysis of respondent results. Validation results from media experts and subject matter experts showed an average score of 87.9%, indicating that the application is valid and suitable for use. With this system, the borrowing process becomes more organized, transparent, and well-monitored. This application has proven capable of addressing issues in the manual system and can be implemented as a tool to support academic activities in the MTU Program at Surabaya Aviation Polytechnic.



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1 INTRODUCTION

Academic activities at vocational colleges such as the Surabaya Aviation Polytechnic (Poltekbang Surabaya) require adequate facilities to ensure that the learning process runs optimally. One of the important facilities regularly used by lecturers and cadets is practical support equipment, such as laboratory equipment and other learning tools. In the Air Transportation Management Program (MTU), the borrowing process for these items is still done manually through logging in a log book. This conventional system has various drawbacks, such as illegible handwriting, lack of real-time access to information on item availability, and the absence of automatic reminder features for item returns. This leads to inefficiency in management, potential data errors, and delays in the borrowing and return process [1]. In facing the challenges of the Industrial Revolution 4.0 era, the use of information technology has become a necessity, including in educational facility management systems. One form of technology that is effective in supporting the digitization of services is a website. Websites are considered capable of

delivering information in real time, are flexible and accessible from various devices, and provide interactive features to support operational activities efficiently[2]. The implementation of a website-based item lending system has proven to be efficient in managing facilities in several other educational institutions. [3]. However, there is no similar system that has been specifically developed and implemented in the MTU Poltekbang Surabaya study program environment. Based on these conditions, this study was conducted to design and develop a website-based item lending application and evaluate its feasibility as a means of supporting academic activities in the Air Transportation Management Study Program at the Surabaya Aviation Polytechnic..

2 METHOD

A research method is a systematic procedure or set of steps used to collect and analyze data scientifically, both quantitatively and qualitatively, in order to obtain valid conclusions and achieve research objectives [4]. This research uses the Research and Development (R&D) method with the Waterfall development model. The process begins with needs identification, planning, modeling, development, implementation, and comprehensive product support [5]. This method was chosen because it is suitable for designing, testing, and developing web-based applications that can be used as a means of supporting academic activities. The development process was limited to the functional prototype stage, which represented the final design of the system for evaluation purposes.

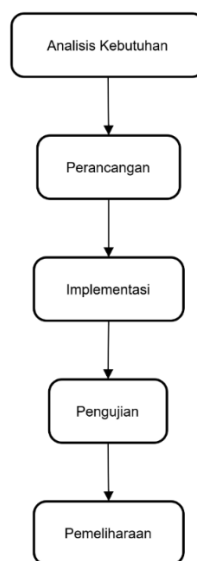


Figure 1 Stages of the Waterfall Method

The main stages include:

1. Needs Analysis – User needs were identified through questionnaires and discussions with the Air Transportation Management (MTU) Study Program at the Surabaya Aviation Polytechnic. The data was used to determine the features, workflow, and system specifications.
2. System Design – The system design process includes Use Case Diagrams, Business Process Model and Notation (BPMN), and the determination of hardware and software specifications.
 - a. Hardware: Laptop with an Intel® Core™ i3-5005U processor, 4 GB RAM, and Intel® HD 5500 graphics.
 - b. Software: Visual Studio Code, XAMPP, and the Bootstrap framework.
3. Implementation – The system design is implemented into a web-based application according to specifications, covering all modules for users and administrators.

Population and Sample

The population in this study was all active cadets in the Air Transportation Management (MTU) Study Program, Batches 9 and 10, at the Surabaya Aviation Polytechnic, who were directly involved in the goods borrowing process. The population consisted of 89 people. Because the population size was small (<100), this study used a saturated sampling technique, whereby all members of the population were included in the sample. [6]. Thus, the sample size in this study is 89 individuals.

Data Collection Techniques

Data collection in this study was conducted by distributing questionnaires to relevant respondents, with the aim of obtaining quantitative data to support the evaluation of the system. The questionnaire instrument was designed using the Likert scale, which allows respondents to rate statements based on their level of agreement. The statements in the questionnaire were grouped into five main indicators: Functionality, System Suitability,

Information & Quality, User Experience, and Web Display. These indicators were designed based on relevant theory and have been academically validated.

Data Analysis Techniques

1. Validity and reliability tests on the questionnaire instrument. Validity tests are used to measure the extent to which the instrument is able to reflect actual conditions and measure what should be measured. The testing was conducted using IBM SPSS Statistics 27 software, employing correlation analysis between indicator scores and total scores. The instrument is considered valid if the calculated *r* value is greater than the table *r* value and the significance level is less than 0.05. Reliability testing aims to measure the consistency of measurement results. Testing was carried out using Cronbach's Alpha values. The instrument is considered reliable if it has a Cronbach's Alpha value of more than 0.60. The higher the alpha value, the higher the reliability of the instrument in measuring the variables being studied. As can be seen from the table above, the calculated *R* value for each question item is not less than the table *R* value, so the needs analysis questionnaire can be considered valid.
2. The data was analyzed descriptively and quantitatively using a Likert scale to measure cadets' perceptions of the features, appearance, and functionality of the website-based item lending application. The instruments used have undergone validity and reliability tests, ensuring that the analyzed data is valid and consistent. Respondent response scores were calculated as percentages and interpreted based on Likert scale categories to determine the level of feasibility and the need for system feature development.

$$Ps \frac{S}{N} \times 100\%$$

Notes:

Ps = Percentage of components

S = Actual score from respondents

N = Maximum possible score

3 RESULTS

Results of Needs Analysis

The needs analysis was conducted based on questionnaire data distributed to cadets and staff of the Air Transportation Management Study Program. The approach was carried out through five main aspects, namely: functionality, system feasibility, information & quality, user experience, and web display.

From the **functionality aspect**, the manual logbook-based system made it difficult to search for data on item availability and did not provide a feature to track borrowing history.

In terms of **system feasibility**, the manual system was deemed inefficient because it could only be accessed physically and was limited by time and location.

In terms of **information and quality**, the old system was unable to provide accurate and real-time data, and loan history was difficult to track.

The **user experience aspect** showed that the manual system was considered unfriendly because it did not provide return notifications and had limited access to information.

Finally, in terms of **web design**, respondents expected a clean, responsive, easy-to-understand interface that professionally represented the institution's identity.

Table 1 Results of System Requirements Analysis Questionnaire Analysis

No	Aspect	Results	Description
1.	Functionality	86,23%	Respondents stated that this website is very much needed to facilitate online borrowing of items, from data entry and submission to checking the status of items.
2.	System Feasibility	88,01%	Respondents stated that there is a great need for a reliable, stable system that is capable of handling data and the borrowing process well.
3.	Information & Quality	89,13%	Respondents emphasized the need for a system that displays accurate and real-time information, including item availability, borrowing history, and return status.
4.	User Experience	87,73%	Respondents considered it very important to have a system with a simple display and easy-to-understand workflow, so that users could quickly understand the borrowing process without special training.
5.	Web Display	89,18%	Respondents stated that it is very important to have a website with an attractive, professional, and responsive design so that it can be accessed optimally through various devices.

Here is the menu and submenu design of this website

Design Display on Admin

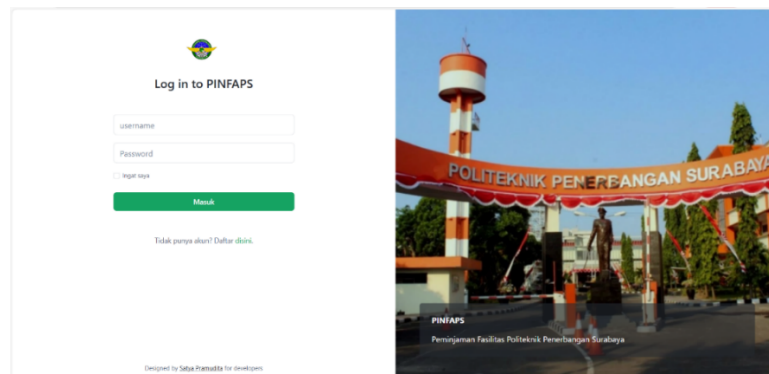


Figure 2 Admin login page display

The PINFAPS login page displays a form for admins to enter their username and password, complete with a “Remember me” option and a registration link for new users.

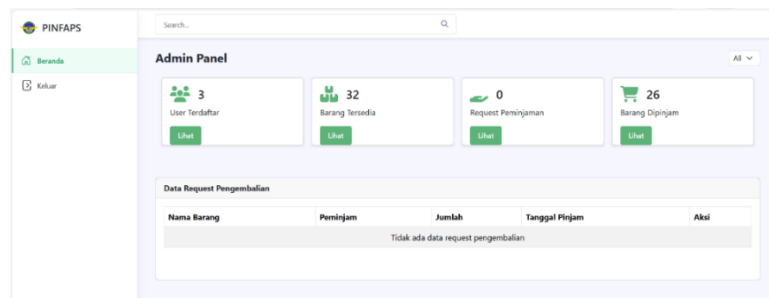


Figure 3 Admin dashboard page display

The Admin Panel page on the PINFAPS website displays a summary of user data, items, loan requests, and borrowed items in an informative panel. There is also a table containing data on item return requests.

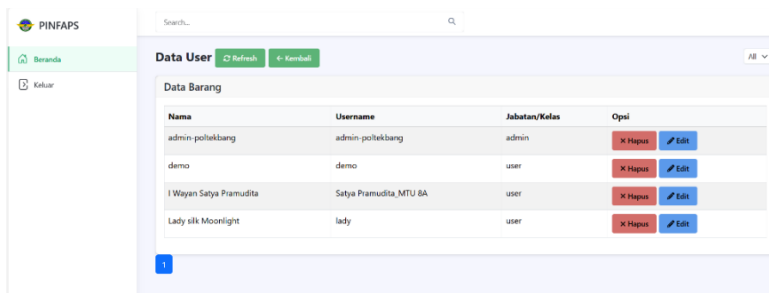
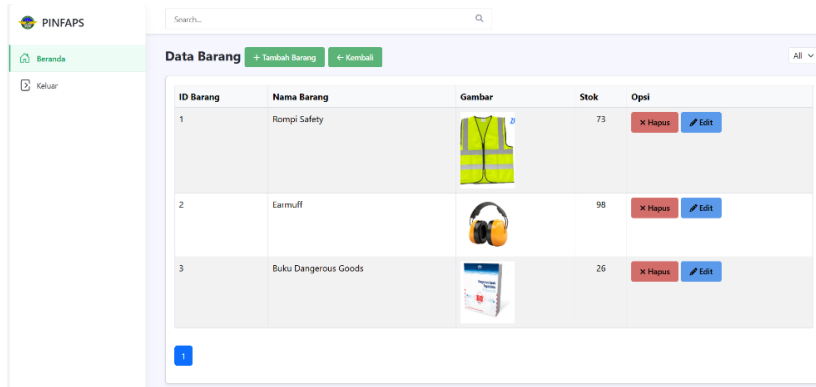


Figure 4 Display on the Registered User Page

This page is used by administrators to manage user data, such as viewing, editing, and deleting registered user data.

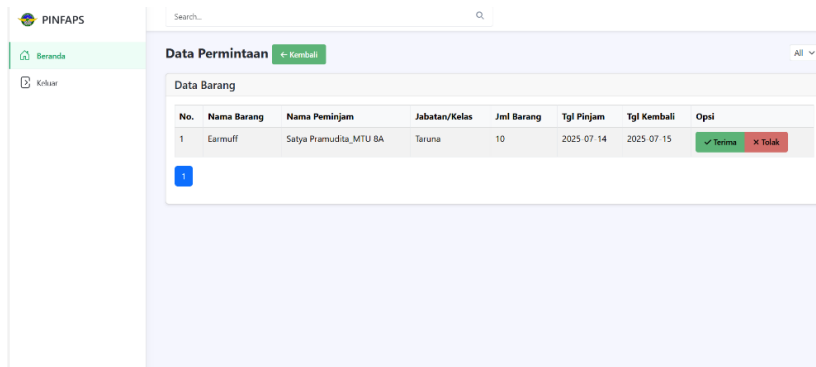


Data Barang + Tambah Barang ← Kembali

ID Barang	Nama Barang	Gambar	Stok	Opsi
1	Rompi Safety		73	X Hapus Edit
2	Earmuff		98	X Hapus Edit
3	Buku Dangerous Goods		26	X Hapus Edit

Gambar 5 Display on the Available Items Page

The Item Data page is used by administrators to manage item information, such as ID, name, image, stock, and edit and delete features.



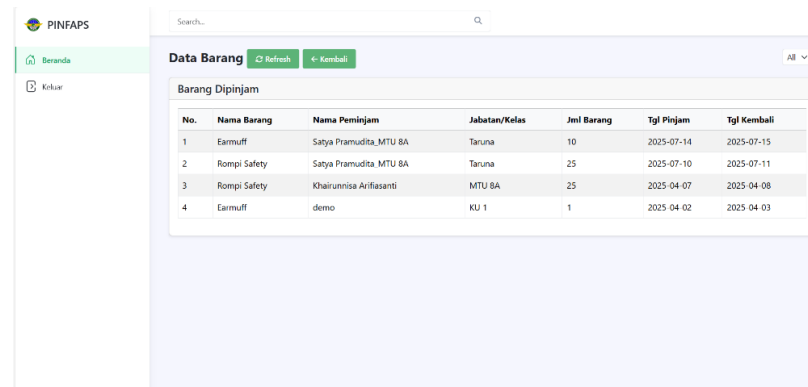
Data Permintaan ← Kembali

Data Barang

No.	Nama Barang	Nama Peminjam	Jabatan/Kelas	Jml Barang	Tgl Pinjam	Tgl Kembali	Opsi
1	Earmuff	Satya Pramudita MTU BA	Taruna	10	2025 07 14	2025 07 15	✓ Terima X Tolak

Figure 6 Display on the Borrowing Request Page

The Request Data page displays a list of item loan requests, complete with borrower details and loan schedules. Admins can approve or reject these requests to simplify the loan management process.



Data Barang Refresh ← Kembali

Barang Dipinjam

No.	Nama Barang	Nama Peminjam	Jabatan/Kelas	Jml Barang	Tgl Pinjam	Tgl Kembali
1	Earmuff	Satya Pramudita MTU BA	Taruna	10	2025-07-14	2025-07-15
2	Rompi Safety	Satya Pramudita MTU BA	Taruna	25	2025-07-10	2025-07-11
3	Rompi Safety	Khairunnisa Arifiasanti	MTU BA	25	2025 04 07	2025 04 08
4	Earmuff	demo	KU 1	1	2025 04 02	2025 04 03

Figure 7 Display on the Borrowed Items Page

The Borrowed Items page displays active borrowing data, such as item name, borrower, quantity, and borrowing and return dates. This feature helps administrators monitor and manage the return process.

Design Display on User

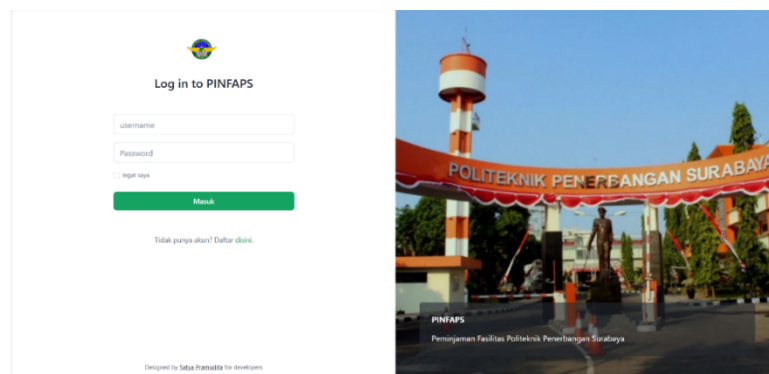


Figure 8 User Login Page Display

The PINFAPS login page requires users to enter their username and password to access the system.

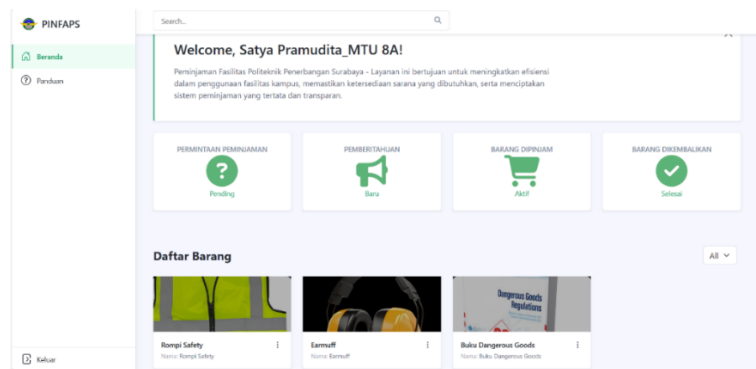


Figure 9 User Dashboard Page Display

The image shows the user dashboard page on the PINFAPS website, which displays a summary of the loan status, including a list of items, loan requests, notifications, borrowed items, and returned items.



Figure 10 Display on the Loan Request Page

The Item Request Data page displays user request details, such as the name and quantity of items, as well as the loan and return dates, accompanied by a Return and Print button.

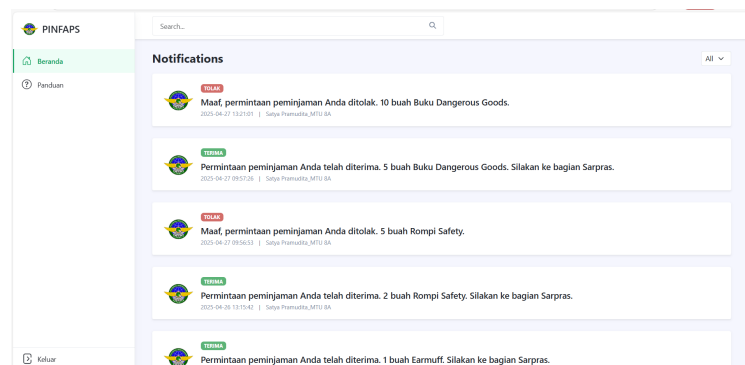


Figure 11 Display on the Notification Page

The Notification Page on the PINFAPS website displays information on the status of item loan requests in chronological order, with color markers: red for rejected and green for accepted. Each notification includes details of the item, time, and instructions for users.



Figure 12 Display on the Borrowed Items Page

The Borrowing Data page displays information about items that have been borrowed by users, including the name of the item, quantity, date of borrowing, and date of return, after the request has been approved or rejected.

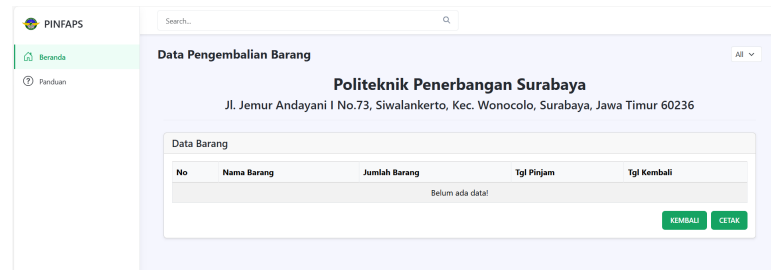


Figure 13 Display on the Returned Items Page

The Returned Items Data Page displays information about items returned by users, including the item name, quantity, loan date, and return date.

Website Feasibility Results

In this study, two types of validation were conducted on the website, namely website media validation and website material validation. Website media validation covers four main indicators, namely Functionality, Reliability, Usability, and Efficiency. Meanwhile, website material validation uses three indicators, namely Website Material Quality, Information Completeness, and Language.

Media Expert Validation Results

The following is a description and analysis of the data:

Table 2 Media Expert Test Results Data

Assessment Aspects	Scores obtained from Media Experts			Max Score
	Expert 1	Expert 2	Expert 3	
Functionaly	14	14	16	60
Reliability	9	9	9	
Usability	16	16	13	
Efficiency	16	16	15	
Total	55	55	53	

Table 3 Processing of Media Expert Test Results Data

Assessment Aspects	Percentage of scores obtained from media experts (%)			Accumulated percentage of scores	Notes
	Expert 1	Expert 2	Expert 3		
Total	91,6	91,6	88,3	90,5	Suitable for use as revised

Material Expert Validation Results

The following is a description and analysis of the data:

Table 4 Expert Material Test Results Data

Assessment Aspects	Scores obtained from Subject Matter Experts		Max Score
	Expert 1	Expert 2	
Quality of material on the website	17	19	60
Completeness of information	15	17	

Language	15	20	
Total	47	56	

Table 5 Data processing Results of subject matter expert testing

Assessment Aspects	Percentage of scores obtained from subject matter experts (%)		Accumulated percentage of scores	Notes
	Ahli Materi 1	Ahli Materi 2		
Total	78,3	93,3	85,8	Suitable for use as revised

The average validation of the website-based goods lending application in the Air Transportation Management Study Program at the Surabaya Aviation Polytechnic by media experts was 90.5% and by material experts was 85.8%. It can therefore be concluded that the results of the expert validation were “valid” because the results of each validation showed $\geq 61\%$ and exceeded the lower limit of the test.

Table 6 Advice and Input from Experts

No	Expert	Position	Suggestions and Feedback
1.	Yudhis Thiro Kabul Yuniar, ST., M.Kom	Asisten Ahli	Needs to be developed in integrated system database management
2.	Rahma Dini Maghfiroatul Laili, S.Kom	Pranata Komputer Ahli Pertama	Development includes adding loan validation with automatic logic, optimizing features that are not yet functional, and creating a manual book.
3.	Khoirina Wulan Nurbianti, S.Tr.T	Pranata Komputer Ahli Pertama	The loan date must be before the return date, loans cannot be made if there is insufficient stock, and the search feature must be functional or removed.
4.	Putri Aulia Adiva Rahma, A.Md	Pengelola Program Studi	You can use the return feature.
5.	Febrya Ekasari Romadhoni	Adm. Prodi MTU	Continue

4 CONCLUSION

Based on the results of the design and testing of a website-based goods lending system at the Air Transportation Management (MTU) Study Program at the Surabaya Aviation Polytechnic, it can be concluded that

1. The development of this application was carried out using the Waterfall model approach. The website design used tools such as Visual Studio Code, XAMPP, and Bootstrap, which technically support the efficiency of system creation and responsive display. The features included in this application are user login, item list, loan application, admin verification process, and loan history. The application interface is designed to be as simple as possible so that it is easy to understand and use by users without special training. In addition, the application is also equipped with usage instructions as a technical guide for interacting with the system.
2. The validation results were carried out by three media expert validators and two material expert validators, obtaining scores of 90.5% for media validation and 85.8% for material validation. Based on the assessment scale of these results, this website is declared “Very Suitable” for use.

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