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Mplementation of Flight Management Information System Using The First Come First Served (FCFS) Method (Case Study: Trunojoyo Airport Sumenep)

Nurul Hasanah[1], RachmadHidayah[2], Rizki Anantama[3]

[1,]Univeristas Kh. Bahaudin Mudhary Madura, Madura, 69451, Indonesia.
[2]Univeristas Kh. Bahaudin Mudhary Madura, Madura, 69451, Indonesia.
[3]Univeristas Kh. Bahaudin Mudhary Madura, Madura, 69451, Indonesia.

Correspondence:
Nurul Hasanah, Univeristas Kh. Bahaudin Mudhary Madura, Madura, 69451, Indonesia.
Email:
radityawirafabri@unibamadura.ac.id

Abstract
This research implements a web-based platform functioning as a flight management information system to provide real-time flight schedule information and enable prospective passengers to book tickets easily and quickly online. Previously, ticket booking was conducted manually via WhatsApp, causing disorder in queue management and service. The web-based system uses the FCFS algorithm to handle each ticket booking request according to the order of arrival or login, improving efficiency, fairness, and transparency. The system allows passengers to book tickets and access flight schedules online and helps the airport manage passenger data, flight schedules, and booking reports in a structured and real-time manner. Implementation results show that this information system reduces errors and speeds up service processes compared to manual methods.
Keywords: Flight Management, Information System, First Come First Served (FCFS), Trunojoyo Airport Sumenep

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Introduction

One of the key infrastructures on Madura Island is Trunojoyo Airport, located in Sumenep Regency, East Java. This airport serves as the main air transportation gateway for Madura Island, improving mobility and connectivity between Madura and surrounding small islands such as Pagerungan Besar and Bawean. Before the airport, travel to these islands relied heavily on sea transport, which took days and was highly dependent on weather and waves. With Trunojoyo Airport, travel time to Bawean Island is reduced to around fifty-five minutes and to Pagerungan Island to one hour. (Menhub et al., 2022).

The presence of Trunojoyo Airport is crucial for improving the quality of life in remote areas. Residents can more easily access health services, such as patient evacuation to advanced hospitals in major cities, and access better education by reaching schools or universities outside the island more quickly and effectively. Thus, the airport has a positive impact on various aspects of life in remote regions(Rofik et al., 2021).

Currently, the flight ticket booking process at Trunojoyo Airport Sumenep faces several issues because it is still conducted manually via WhatsApp with staff. This process requires direct communication, often causing service delays, recording errors, and lack of information regarding flight schedules and ticket availability. Manual booking is inefficient, time-consuming, and prone to errors in recording and confirmation. Therefore, Trunojoyo Airport Sumenep needs a system to help make flight operations more efficient and effective.

To address these issues, the researcher reviewed previous studies. The first journal reviewed discusses the implementation of the FCFS method in a pawnshop service queue information system using a website. This study found that FCFS increased queue management effectiveness and efficiency, reduced waiting times, and improved customer satisfaction. Data analysis showed that FCFS optimized service flow, allowing employees to serve customers more regularly and quickly.

The second journal reviewed covers the application of FCFS in a campus asset maintenance and repair service information system. FCFS improved the effectiveness of service management, made queue processes more orderly, reduced user waiting times, and increased user satisfaction by clearly displaying service request statuses.

Literature Review

The development of transportation infrastructure plays a pivotal role in enhancing connectivity and improving the quality of life in remote and underdeveloped regions. One of the key transportation infrastructures on Madura Island, East Java, is Trunojoyo Airport, located in Sumenep Regency. As noted by Menhub et al. (2022), Trunojoyo Airport serves as the primary air transportation gateway for Madura and its surrounding small islands such as Pagerungan Besar and Bawean. Prior to the establishment of this airport, travel to these islands was predominantly reliant on maritime transportation, which was not only time-consuming—often taking days—but also highly susceptible to weather disruptions. With the advent of air transport via Trunojoyo Airport, travel time has significantly decreased, with flights to Bawean Island taking approximately 55 minutes and to Pagerungan Island about one hour (Rahman, H., Abidin, R. Z., & Hidayat, N., 2025).

Beyond reducing travel time, the airport also contributes to improving essential aspects of daily life in remote areas. As reported by Rofik et al. (2021), easier access to healthcare—such as emergency medical evacuations—and educational opportunities outside the island has been facilitated by the presence of the airport. This indicates the broader social and economic value that Trunojoyo Airport brings to isolated communities (Yuni K, K. C., Hidayat, N., & Musfiroh, A., 2025).

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Despite these advancements, the ticket booking system at Trunojoyo Airport still operates manually via WhatsApp communication with airport staff. This outdated process often results in service inefficiencies, such as delayed responses, booking errors, and lack of up-to-date information about flight schedules and seat availability. Manual handling also leads to significant operational limitations, including poor data recording and difficulty in real-time monitoring of booking status (Nurul Hidayat, Jannatul Firdaus, Hertin Khalifatun Nisa Arifah, Any Sani'atin, Edi Awan, & Nur Diana Khalida., 2025).

To explore potential solutions, the researcher refers to previous studies that implemented the First Come First Served (FCFS) algorithm to optimize queue management in different service contexts. In one study, the FCFS method was applied in a pawnshop queue management system developed as a website-based application. The implementation of FCFS significantly improved queue flow, minimized waiting times, and enhanced customer satisfaction (Author, Year). The study highlighted that FCFS enabled more regular and systematic service handling, thus increasing operational efficiency (Najiatun, Wulandari, N., Hidayat, N., Arifah, H. K. N., Khan, H. A. U., & Rohmayati, N. S., 2025).

Similarly, another study applied the FCFS method in a campus asset maintenance and repair information system. In this context, the FCFS approach helped manage incoming service requests in a more orderly manner, providing transparent updates on request status. This not only streamlined the repair process but also boosted user satisfaction by reducing uncertainty and wait times (Hidayat, N., Arifah, H. K. N., K, K. C. Y., & Hidayati, A., 2023).

These findings suggest that integrating a queue management mechanism such as FCFS into the flight booking process at Trunojoyo Airport could address current inefficiencies. Automating bookings through a digital platform and applying queue prioritization logic may enhance overall service quality, minimize human error, and improve the passenger experience (Hidayat, N., Ilahi, L. K., Najiatun, & Arifah, H. K. N., 2024).

Research Methods

The research design uses a qualitative approach as the main methodological foundation due to its deep relevance to the research objectives. The primary method for collecting initial data is in-depth interviews with website users (prospective passengers) who have used the ticket queue system with the FCFS method and searched for flight schedules.

Results and Discussion

Result

The result of this implementation is a web-based flight ticket booking system for Trunojoyo Airport, Sumenep Regency. The system is equipped with the First- Come-First-Served (FCFS) method applied to the ticket booking queue mechanism, so users who book first are prioritized based on access time.

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Table 1. The system is equipped with the First- Come-First-Served (FCFS)

No	User Name	System Entry Time	Queue Number	Access Start Time	Access End Time	Booking Status	Description
1	*User* A	10:00:00	0	10:00:00	10:05:00	Success	First turn, active access
2	*User* B	10:01:30	1	10:05:01	10:10:01	Success	Second turn after User A
3	*User* C	10:02:10	2	10:10:02	10:15:02	Failed	Did not finish within the time limit
4	*User* D	10:03:20	3	10:15:03	10:20:03	Success	Active after User C removed

Discussion

First-Come-First-Served (FCFS) is a queue-based scheduling method used in flight ticket booking systems to arrange service order by user arrival time. FCFS ensures that the first user to enter the system has priority for booking over subsequent users. Testing of this method evaluated how the system manages user turns fairly and accurately, ensuring a limited access time (e.g., 5 minutes) is given exclusively to the first user in the queue. Simulation involved several user accounts entering the system sequentially. The system stores the user queue list using cache, and only the user at the first index (queue number 0) is given full access to book tickets. After the allotted time expires (5 minutes), the user is automatically removed from the queue and the turn shifts to the next user.

Testing Steps and Indicators

1. Staged Login Simulation
   Three user accounts enter the booking page in sequence. The system records the order and places them in the FCFS queue.
2. Timer Verification
   The system provides a maximum of 5 minutes (300 seconds) for the first user. The countdown timer is displayed in real-time.
3. Access Validatio
   Only the user with queue position 0 has access to the booking form. Others see a disabled form with a "not your turn" message.
4. Automatic Turnover

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After 5 minutes, the system automatically removes the first user from the queue and shifts the turn to the next user, without manual intervention.

5. Access Prevention After Time Expires
   If the first user does not complete the booking within the given time, access to the booking page is automatically restricted.

Conclusions and Practical Implication

Based on the research and system implementation, several conclusions can be drawn:

1. This study produced a web-based flight ticket booking system for Trunojoyo Airport, Sumenep Regency, built using the Laravel framework and MySQL database.
2. The developed system is equipped with the First-Come-First-Served (FCFS) method implemented in the ticket booking queue process. This method effectively manages user priority based on booking time, making the process more orderly and fair.
3. System testing was conducted using Black Box Testing on all main features for both admin and users. Results showed all features functioned as expected with no errors or malfunctions.
4. The system provides supporting features such as ticket search, payment forms, user reviews, travel information articles, and help features (admin/CS chat) to enhance user convenience and experience in online ticket booking.

The author acknowledges that the developed system still has room for improvement and further development. Recommendations for future enhancements include:

1. Adding automatic notification features via e-mail or WhatsApp for booking confirmation and flight schedule reminders.
2. Developing alternative queue or service priority methods for comparison and increased system efficiency.

These suggestions are expected to be valuable for future system development and serve as references for subsequent research.

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