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ANALYSIS OF IMMIGRATION AUTOGATE PLACEMENT LAYOUT TO EXPEDITE PASSENGER BOARDING PROCESS AT THE AIRPORT

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Abstract

Ideally, an international terminal should have additional inspection procedures, including immigration, customs, and health checks, while providing excellent service to passengers from various countries. Currently, at Terminal 2 of Juanda International Airport, immigration autogates are only available at gates 6–8, while gates 1–5, which were previously used for domestic flights, are not yet equipped with immigration facilities. This study aims to identify the passenger boarding process and determine the appropriate placement layout for immigration autogates at the former domestic gates in Terminal 2 of Juanda International Airport Surabaya. Using a descriptive qualitative approach, data were collected through observation, interviews with informants, and documentation. Data analysis techniques included data reduction, data presentation, and data verification. The findings indicate that boarding time at gates 1–5 reaches 20 minutes and is not friendly to vulnerable groups. The location of immigration autogates at gates 6–8 prolongs the boarding process and requires shuttle bus services to the aircraft parking area. Ideally, immigration autogates should be placed at the junction in front of gates 1–5, reducing boarding time to 5–10 minutes. In conclusion, the passenger boarding flow at gates 1–5 of Terminal 2 at Juanda International Airport Surabaya is not yet optimal, and immigration autogates should be placed at the junction near the waiting rooms for gates 1–5.

Keywords: *immigration autogate, boarding, layout.*

Introduction

Aviation has become one of the most significant innovations in human history, bringing revolutionary changes to how people explore the world (Anjani & Utami, 2020). In the modern era, the importance of aviation for mobility cannot be underestimated. Aviation is not merely a mode of transportation; it is the foundation of global connectivity, international trade, tourism, and cultural exchange (Dwijayanti & Pramesti, 2021). Today, amid the complex demands of global mobility, especially after the COVID-19 pandemic (Yuniar et al., 2023), aviation serves as a backbone that supports the movement of people, goods, and ideas worldwide.

In Indonesia, aviation plays a key role in shaping an increasingly interconnected global network (Samunderu, 2024). With hundreds of thousands of flight routes connecting nearly every region and country worldwide, aviation enables people to reach their destinations quickly and efficiently. This facilitates cross-border collaboration, international trade, and knowledge exchange among nations. Therefore, it can be concluded that aviation in Indonesia is critically important in supporting mobility in the modern era, both domestically, as an archipelagic country, and internationally. In a world that is increasingly globally connected, aviation has become the foundation that enables cultural, economic, and humanitarian exchange, while also facilitating the growth and development of societies at large (Komalasari, 2022).

Juanda International Airport in Surabaya is categorized as a hub airport in Indonesia. Within the country, Juanda International Airport serves as a departure and transit point for passengers traveling to eastern Indonesia (Putra et al., 2022). It also serves international routes such as Jeddah, Singapore, Malaysia, Brunei Darussalam, and Hong Kong. These international routes serve as gateways for foreign tourists entering and leaving the country.

An international airport must meet the CIQ (Customs, Immigration, and Quarantine) requirements, which means the airport must provide agencies to oversee and regulate passengers entering or exiting a country. Juanda International Airport has two terminals: Terminal 1 serves domestic routes, while Terminal 2 handles international routes (Kurniawan, 2020). However, in its current operations, several gates in Terminal 2 (specifically gates 1–5, which were previously used for domestic flights) remain unequipped with immigration autogate facilities.

Before the COVID-19 pandemic, Terminal 2 operated with a clear segmentation: Gates 1-5 served domestic flights for airlines like Garuda Indonesia, Pelita, and AirAsia, while Gates 6-8 were reserved for international operations, equipped with dedicated immigration facilities. This structure, designed to streamline passenger flows, remains unchanged today. However, the post-pandemic revival of air travel has exposed critical inefficiencies in this decades-old layout, particularly as Gates 1-5 now sit largely inactive despite growing flight demand.

The current setup requires passengers boarding from parking stands Alpha 1-5, adjacent to the dormant Gates 1-5, to detour through Gate 6 for immigration clearance. Compounding the issue, regulatory requirements (PM 185/2015, Article 28) mandate shuttle bus transfers when an aircraft stands more than 200 meters from the terminal. Observational data reveal stark consequences: while narrow-body aircraft at connected gates complete boarding in just 10 minutes, those parked at Alpha 1-5 require 20 minutes for the same process, a 100% increase in time attributable solely to logistical hurdles.

This inefficiency stems from the centralized immigration autogate placement, creating unnecessary passenger congestion and resource strain. The extended boarding times not only inconvenience travelers but also reduce gate turnover capacity during peak hours. As Terminal 2 faces increasing passenger volumes, reevaluating gate utilization and decentralizing immigration facilities could unlock significant operational improvements, a necessary evolution for an

airport striving to meet the demands of modern aviation.

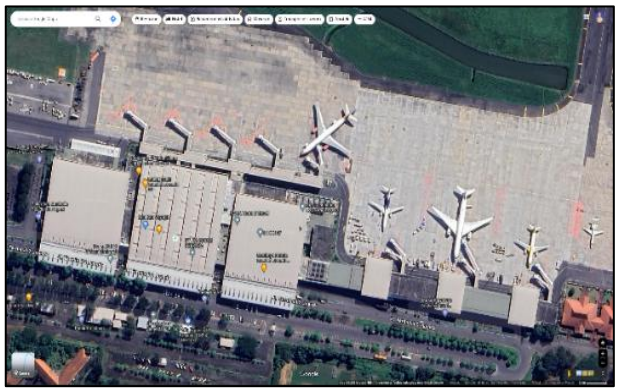


Figure 1. Top View of Terminal

Based on the current condition at Terminal 2 of Juanda International Airport in Surabaya, during the author's observation, the following issues can be analyzed:

Table 1. Phenomenon Table

No	Phenomenon	Current Condition	Desired Condition
1.	Long boarding process time	The boarding process to apron Alpha 1–5 takes longer because passengers must use a shuttle bus.	Former domestic gates are repurposed as international gates to accelerate the passenger boarding process in Terminal 2.
2.	Uncomfortable boarding process	Passengers, especially elderly and vulnerable passengers, complain about the transfer route from the terminal building to the aircraft.	Passengers should board the aircraft directly without using the airline's shuttle bus.
3.	Immigration autogate facilities do not reach the former domestic gates	Immigration autogate facilities are not yet available for former domestic gates, so passengers must go through the autogates available at gates 6, 8, and 9.	Immigration autogate facilities should be placed appropriately to support the passenger flow from former domestic gates, avoiding the need to go through gates 6, 8, and 9

Boarding is the process of allowing passengers to enter the aircraft and receive a boarding pass containing flight information, including boarding time and seat number. Staff at the boarding gate are responsible for monitoring and directing passengers (Ningrum & Fatchul, 2023). According to (Morozov & Fedotova, 2020), a passenger is an individual transported by an aircraft under an air transport agreement. Meanwhile, (Ningrum & Fatchul, 2023) define a passenger as a user of air transportation services who complies with regulations to ensure safety, security, and comfort during the flight.

According to Haming and Nurjamanuddin, as cited in (Permana et al., 2018), layout has a strategic influence with long-term impacts on material handling and work comfort. An efficient layout can enhance operational efficiency, minimize the risk of accidents, and promote product quality and organizational flexibility. Moreover, layout decisions can save costs and support environmental sustainability. Jay, Barry, and Chuck, as cited in (Dewanto, 2021), further state that layout is a key decision that determines operational efficiency and shapes a company's competitive priorities in terms of capacity, processes, flexibility, and cost.

An airport is an area used for aircraft landings, takeoffs, and other air transport-related activities. As the economy grows, air transportation is increasingly used. According to (Wiko et al., 2023)An international airport is equipped with customs and immigration facilities for international flights, often has longer runways, and has facilities for large aircraft. Airports are classified based on current and future needs and political considerations, such as the designation of international airports for national capitals and domestic airports for provincial capitals.

Methods

A good research study begins with a clear understanding of the problem and the objectives to be achieved. The steps include selecting a research design that aligns with the identified problems and objectives. According to Furidha (2023) Qualitative research is a method grounded in postpositivist or interpretive philosophy. It examines the natural conditions of the research object, with the researcher serving as the key instrument. Data collection techniques are triangulated (observation, interviews, and documentation).

In conducting research using an evaluative approach, several stages or steps need to be followed (Skivington et al., 2021)As outlined below, to improve the effectiveness of passenger departure flow at Terminal 2 of Juanda International Airport Surabaya, delays have been observed due to layout issues that have not been adjusted following the terminal's post-COVID-19 transformation into a fully international route terminal. However, immigration services are still unavailable at gates previously used for domestic routes, which now require passengers boarding from apron gates Alpha 1 to Alpha 5 to undergo longer processing. This situation can negatively impact boarding time, passenger satisfaction, and comfort with the airport operator. One proposed solution is strategically placing immigration autogate facilities in Terminal 2 of Juanda International Airport Surabaya. The airport operator, PT Angkasa Pura I, is expected to enhance the quality of airport service management.

Research Subjects

The research subjects include personnel involved in the passenger boarding process at Terminal 2 (Strayer et al., 2025). These subjects consist of Terminal Service Officers, responsible for passenger facilities within the terminal area, and AirAsia ground staff and staff from Jasa Aviasi Semesta. Ground staff (also known as "pasasi") refers to airline personnel working at the airport, often called ground attendants. Their responsibilities encompass a wide range of airport activities, both before departure and after arrival. Some of the key duties of ground staff include: ticketing staff, check-in counter staff, boarding gate personnel, transfer desk services, lost and found, and customer relations officers.

Table 2. Resource Person

No	Name	Position	Reason
1.	Herwin	Terminal Service Officer	As a member of the Terminal Service Officer unit
2.	Faisol	Terminal Service Officer	As a member of the Terminal Service Officer unit
3.	Lintang	AirAsia Ground Staff	As ground staff responsible for handling passenger boarding
4.	Jessica	Pasasi Jasa Aviasi Semesta (JAS)	As a passport handling passenger boarding

Out of a total of 21 flights per day at Terminal 2, 10 airlines operate, and a third-party ground handling staff (ground staff/pasasi) are involved in the boarding process.

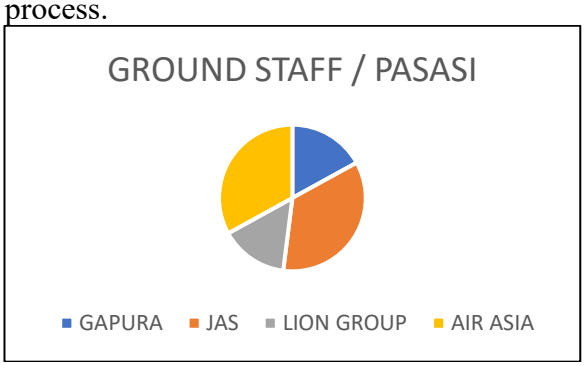


Figure 2. Diagram of Passenger Service Ratio per Day at Terminal 2

According to Mühlbacher et al. (2024) The research object is an attribute, characteristic, or value of a person, object, or activity that has certain variations, as determined by the researcher, to be studied and from which conclusions are drawn. In this study, the research object is the layout of the immigration autogate facility**,** which is still unavailable for the former domestic gates (Gates 1–5) at Terminal 2 of Juanda International Airport**.** The layout of the immigration facility was chosen because it significantly impacts the passenger departure process at the terminal.

Several commonly used data collection techniques are used in qualitative research (Susanto et al., 2024). One of the main techniques is interviewing, which involves direct interaction between the researcher and participants to gain an in-depth understanding of their experiences, perceptions, and views on the research topic. Observation is also an important technique in qualitative research, where the researcher actively observes and records behaviors, interactions, and the context occurring in the research setting (Jailani, 2023).

According to (Taherdoost, 2022), an interview is a meeting between two individuals to exchange information and ideas through questions and answers, allowing for the construction of meaning on a specific topic. Interviews are used as a data collection technique when the researcher aims to conduct a preliminary study to identify issues to be researched. In the digital era, interviews can be conducted using technological advancements, which means interviews do not always require face-to-face interaction and can be done through telecommunications media. In this study, interviews were conducted through WhatsApp video calls (Haryono, 2023).

According to (Hutchinson, 2021), Observant people pay close and focused attention to a specific part or the whole of a situation. This involves capturing comprehensive and significant detailed information. According to (Matoza et al., 2022), observation is the foundation of all science. Scientists can only work based on factual data about the real world obtained through observation. In this study, the researcher conducted observations of passenger movement in the departure area of Terminal 2, particularly around the former domestic flight gates (Gates 1–5), which are currently inactive due to the lack of immigration autogate facilities.

According to (Kiu et al., 2024), a document is a collection of tangible data obtained through a data management system known as documentation. Experts describe documentation as a systematic process, from data collection to data management, resulting in a collection of documents. The documentation used in this study includes the layout of Terminal 2 at Juanda International Airport, Surabaya, which was collected during the researcher's on-the-job training (OJT) over approximately four months.

Results And Discussions

Passenger boarding process flow in the departure area of Terminal 2, Juanda International Airport Surabaya (Maulidhiya & Pranoto, 2025). The observation activity regarding the international passenger boarding flow at the former domestic gates, conducted by the author at Terminal 2 of Juanda International Airport, Surabaya, took place from December 2023 to January 2024 during the author's on-the-job training. In this activity, observations were made on the passenger boarding at the former domestic gates (Gates 1–5) and Gates 6–8. The author observed that passengers wishing to board via Gates 1–5 must proceed through Gates 6–8 because the immigration facilities are not yet available at Gates 1–5.

This is because, prior to the COVID-19 pandemic in 2020, Terminal 2 of Juanda International Airport operated as a semi-domestic and international terminal (Oktavia & Utomo, 2025). However, by the time the author conducted the observation, Terminal 2 had already become fully international. With this status, there are differences in the handling flow for passenger departures and arrivals between the former domestic gates (1–5) and international gates (6–8).

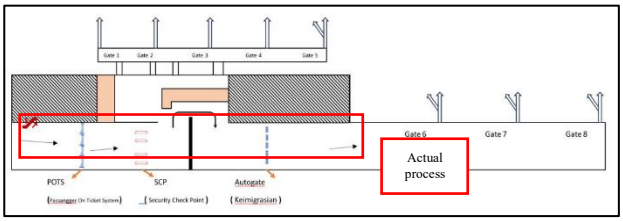


Figure 3. The Actual Process Flow

At Terminal 2, the difference in the departure flow between domestic and international flights lies in the layout of the immigration autogate, which is positioned in a pathway accessible only from Gates 6 through 8. This layout, created by the author, has been summarized to help readers understand the

departure flow. It is based on the original layout of the second floor of Terminal 2 at Juanda International Airport Surabaya, which can be found in Appendix C. This layout illustrates the passenger movement flow at Terminal 2. Currently, the immigration autogate is only available for the pathway leading to Gates 6–8, which impacts passengers heading to Gates 1–5. Passengers wishing to board at Gates 1–5 are required to undergo immigration checks and proceed through Gates 6–8. After passengers arrive at the waiting area of Gates 6–8, they will proceed to the first floor, either by stairs or elevator, to board the shuttle bus provided by the airline or ground handling services. Gapura operates these shuttle buses, Jasa Aviasi Semesta (JAS), AirAsia, and Lion Group.

Figure 4. Shuttle Bus Serving Passengers at Gate 1

This is also regulated in PM 185 Article 28, which states that airlines must provide four-wheeled vehicles if the distance between the departure area and the aircraft parking exceeds 200 meters and there is no pedestrian access. Therefore, it can be concluded that currently, passengers wishing to board at Gates 1–5 are required to take the shuttle bus.

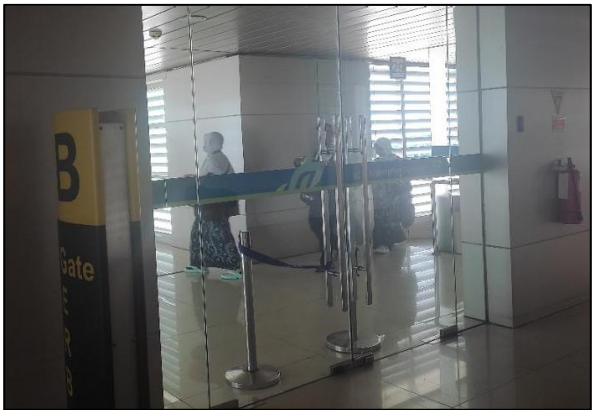


Figure 5. Passenger Boarding

After boarding the bus, passengers are taken to the designated gate. Upon arrival at the gate, passengers disembark and walk up the stairs to reach the second floor, where they can access the fixed bridge that connects directly to the jet bridge. From there, passengers can board the aircraft for which they are scheduled. However, the author observes the boarding process for Gates 1–5 passengers. The status of the former domestic gates has caused several issues, including the longer boarding process time, which takes 18 minutes and 22 seconds. In contrast, at Gates 6–8, where passengers can board directly without needing the shuttle bus, the boarding process takes less than 10 minutes.

The author has observed the boarding time from the first passenger entering the aircraft to the last passenger boarding. The boarding process at Gate 2 took 18 minutes and 22 seconds, starting when the ground staff instructed passengers to line up near Gate 6 in the waiting area. The passengers' boarding passes were then checked, and they proceeded to the departure area, either using the stairs or the elevator. They also had to queue to access the shuttle bus. After loading approximately 35-40 passengers, the bus departed and headed to Gate 2 via the access road. Upon arrival at Gate 2, the bus stopped, and passengers queued to disembark. After getting off the bus, passengers climbed the stairs to the second floor to proceed to the fixed bridge, which allows them to access the jet bridge and board the aircraft. The author observed this process until the fourth shuttle bus arrived, delivering passengers to Gate 2, and up until the last

passenger entered the aircraft, resulting in a total time of 18 minutes and 22 seconds.

Another issue can be seen from the passenger comfort perspective. The complex boarding process is particularly challenging for older passengers and passengers with special needs (vulnerable groups). Based on the author's observations, these passengers struggle when boarding and disembarking from the shuttle bus and when ascending and descending the fixed bridge. The mobility challenges vulnerable passengers face in navigating these facilities hinder their ability to board the aircraft parked at Parking Stands Alpha 1 through Alpha 5.

Based on the interview results, the author concluded that the international passenger boarding process at Terminal 2, Juanda International Airport, still faces several challenges. The departure process comprises several key stages, including ticket verification, check-in, boarding pass inspection, security check (at the Security Checkpoint), and immigration inspection. However, passengers using the former domestic gates (Gates 1-5) must proceed through Gates 6-8, as immigration facilities are not yet available in those areas.

The immigration auto gate plays a crucial role in speeding up and simplifying the immigration process for international passengers while also enhancing efficiency and security. However, its placement at Terminal 2 is still not optimal. This is due to the terminal's status change from serving domestic and international flights to serving only international flights. As a result, the immigration facilities that were previously available only at Gates 6-8 do not yet cover Gates 1-5.

The impact of this limitation is quite significant. Passengers using Gates 1-5 must first go through Gates 6-8 for immigration inspection before being transported to their departure gates by shuttle bus. This results in longer boarding times, ranging from 15 to 20 minutes, especially for narrow-body aircraft carrying approximately 120 to 140 passengers. Additionally, this procedure is considered uncomfortable, particularly for vulnerable groups such as the elderly and passengers with special needs.

As a solution, the informants suggested that the immigration autogate be placed more strategically, specifically at the intersection of the former domestic waiting area, right in front of the Alfa Express and Majapahit Lounge tenants. This placement would enable passengers using Gates 1-5 to undergo immigration checks without being redirected to Gates 6-8, eliminating the need to take the shuttle bus.

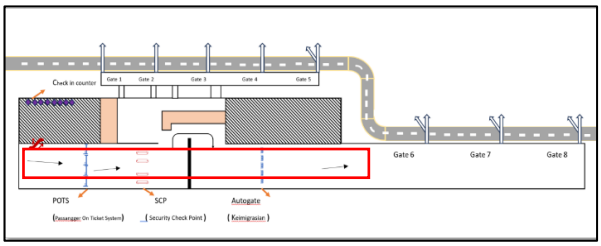
Table 3. Discussion Table

No	Existing	Ideal	Recommendation
1.	The boarding process at Gates 1-5 in Terminal 2 takes 15-20 minutes because passengers must pass through Gates 6-8 and use the shuttle bus.	The ideal boarding process should take 5-10 minutes, from the first passenger to the last passenger boarding the plane.	The boarding process should be as quick as possible, not exceeding the average of 10 minutes in Terminal 2.
2.	Passengers heading to Gates 1-5 must take the shuttle bus because the distance is greater than 200 meters, and there is no pedestrian access.	Passengers heading to Gates 1-5 should be able to board directly onto the plane without needing a shuttle bus.	There should be a change in the boarding process flow to make it more efficient.
3.	The boarding process is challenging for vulnerable passengers because they must descend stairs, take a bus, and climb stairs again at the gate.	The ideal boarding process should be comfortable, without climbing and descending shuttle buses and stairs to reach the second floor.	Passenger movement should be comfortable, especially for vulnerable passengers with difficulty moving around.
4.	The layout of the immigration	The immigration auto gate	The immigration auto gate should ideally be placed

	autogate is only available for the route to Gates 6-8.	should be available at all gates in Terminal 2, which is fully designated as an international terminal.	before the waiting area of Gates 1-5. This would allow for direct boarding without the need for a shuttle bus and reduce the time to 5-10 minutes.

As a result, the boarding time could be shortened to 5-10 minutes, improving comfort and efficiency for all passengers. In conclusion, the layout of the immigration auto gate at Terminal 2, Juanda International Airport, needs to be adjusted so that all gates, including Gates 1-5, can support a smooth international passenger boarding process.

Figure 6. The Existing Boarding Flow



The figure above shows the departure flow at Terminal 2. After checking in and dropping off their baggage on the lower floor, passengers proceed to the second floor for a boarding pass and security (SCP) checks. Currently, passengers heading to Gates 1-5 must pass through Gates 6-8 for immigration checks, which requires a shuttle bus. This results in a longer boarding time (15-20 minutes) and reduces comfort, especially for vulnerable passengers. The following image shows the author's proposed layout recommendation.

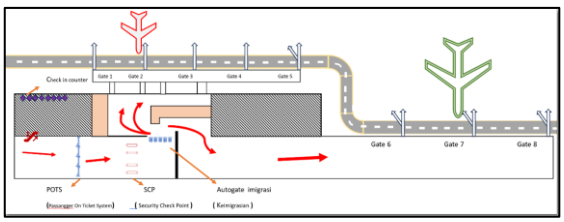


Figure 7. Suggested layout revision

The redesign of the immigration autogate layout at Terminal 2 of Juanda Airport involves moving it further forward, right before the intersection of the waiting area for Gates 1-5. This change will speed up the boarding process by reducing the time to 5-10 minutes, making it easier for vulnerable groups to access the boarding area without using the shuttle bus. This adjustment also reduces operational costs for shuttle buses, fuel, and driver wages, thereby improving time and cost efficiency and enhancing passenger satisfaction at Terminal 2.

Conclusion

Inspecting the immigration autogate placement design at Terminal 2, Juanda International Airport, reveals significant inefficiencies within the current passenger boarding procedure. The boarding time, currently taking 15–20 minutes, indicates suboptimal performance, and the lack of adequate facilities for vulnerable passenger groups and the continued use of shuttle buses are all areas that must be addressed further. Additionally, the misplaced autogate for immigration, located in the direction of Gates 6-8 instead of at the entrance to Gates 1-5 intersection, impedes passenger flow and slows the boarding process. Relocating the autogate to a more effective site near the center waiting area could significantly accelerate passenger movement, reduce congestion, and optimize overall efficiency. These issues can be resolved by an optimized design layout, which improves boarding times and provides passengers more comfort and convenience, aligning with international airport service standards.

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