



Analysis of Space Configuration on Passenger Accessibility in the Gambir Station Design Plan

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ABSTRACT: The train is one of the leading transportation modes favored by the Indonesian people. Frequently, overcrowding occurs, disrupting passenger circulation and resulting in suboptimal use of facilities. The distance between the parking area and the platform and the ineffective station layout often lead to difficulties during scheduled intercity train arrivals and departures. The situation of overloaded stations with suboptimal passenger circulation creates a crowded and chaotic atmosphere. When the schedules of intercity train arrivals and departures are close, passengers find it challenging to access the station, from the parking area to the platform. The ineffective station layout in its respective functions affects the visibility and accessibility of passengers, leading to cross circulation. This research aims to verify and understand how visibility and accessibility in the planned spatial layout at Gambir Station can accommodate passenger circulation issues through a new spatial configuration that facilitates passenger access. It requires a layout plan that allows passengers to access different spaces, considering spatial configurations that facilitate passenger movement within the station. To achieve this goal, evaluations are conducted for both the old and new layouts by analyzing visibility and accessibility. The research uses a mixed methods approach, starting with observation and data processing through the depthmapX application, which will be analyzed. The research results show that by considering the visibility and accessibility of passenger activities through the description of depthmapX results, we can determine better and more organized passenger movement directions when engaging in activities at the station.

KEYWORDS: DepthmapX, Station, Spatial Configuration, Passenger, Visibility.

INTRODUCTION

Currently, the railway transportation mode is one of the preferred means of transportation by the Indonesian community due to its affordable fares and meeting the criteria of comfort, safety, convenience, and guaranteed security. It embraces all aspects of Indonesian society, making it a favorite choice, especially during the holiday seasons of Eid al-Fitr and Christmas. The transportation sector is one of the most flexible ones, as it directly influences the quality of life in the city and the environmental quality (Bubelny, Kubina, 2021).

Railway stations are essential facilities supporting train travel operations, providing primary and supporting amenities for passenger service. Pick (1930) states a railway station is where passengers board or alight from trains. As the arrival and departure points for trains and passengers, two distinct units exist within a railway station: the passenger concourse and the train platform, each requiring different dimensions to serve their respective purposes. The station activities are quite hectic, serving passengers boarding and alighting when trains arrive and depart. The economic activities and physical interactions among passengers and tenants in the station increase significantly during holiday periods.

Gambir Station was chosen because it is located in Jakarta, the capital city of Indonesia, and serves as the center for all government and business activities. Therefore, Gambir Station has become a priority alternative for transportation on Java Island and is one of the busiest stations in Indonesia. Currently, Gambir Station experiences passenger congestion in the southern hall area, especially on weekends (Friday, Saturday, and Sunday) and national holidays, necessitating this research. This can be identified by the diversity of activities, particularly passenger activities, in the station, which requires an effective and efficient spatial configuration. The formation of spatial structures determines this configuration. As explained by Siregar (2014), in a configuration, space is not just a node but also a path or route that is generally public. In general, space organization is a level that requires close supervision and control in the social order, which can be seen in the station where several entities play a role, such as passengers, tenant employees, officials, and porters. Therefore, spatial configuration is a relationship where objects depend on each other within a structure (Hanson, 1984)

METHODOLOGY

The research method to be employed is a qualitative approach involving the analysis of images generated by the UCL DepthmapX software. It will begin with observation and detailed interviews, and the gathered data will be analyzed. Subsequently, to deepen the understanding of the changes in the layout based on spatial configurations from the design plan of Gambir Station, the image data will be processed using the DepthmapX software. The observational data and obtained images will be elaborated through descriptive analysis, representing the depiction of the output from DepthmapX. This process will strengthen the results of the changes in the layout arrangement and spatial configurations in the station's design plan, specifically those that result in passenger visibility that accommodates passenger accessibility.

RESULT AND DISCUSSION

Areas in the existing layout and the new layout

These days, Gambir Station has a new design layout that will be implemented to accommodate the issues experienced in the existing layout. The layout changes focus on improving accessibility and visibility for passengers to explore the available areas in Gambir Station. Improved accessibility and visibility for passengers significantly influence the distribution of traffic congestion points. This means that areas that used to appear empty will be filled with passengers bustling around and engaging in various activities.



Figure 1. Areas on the existing layout of Gambir Station.

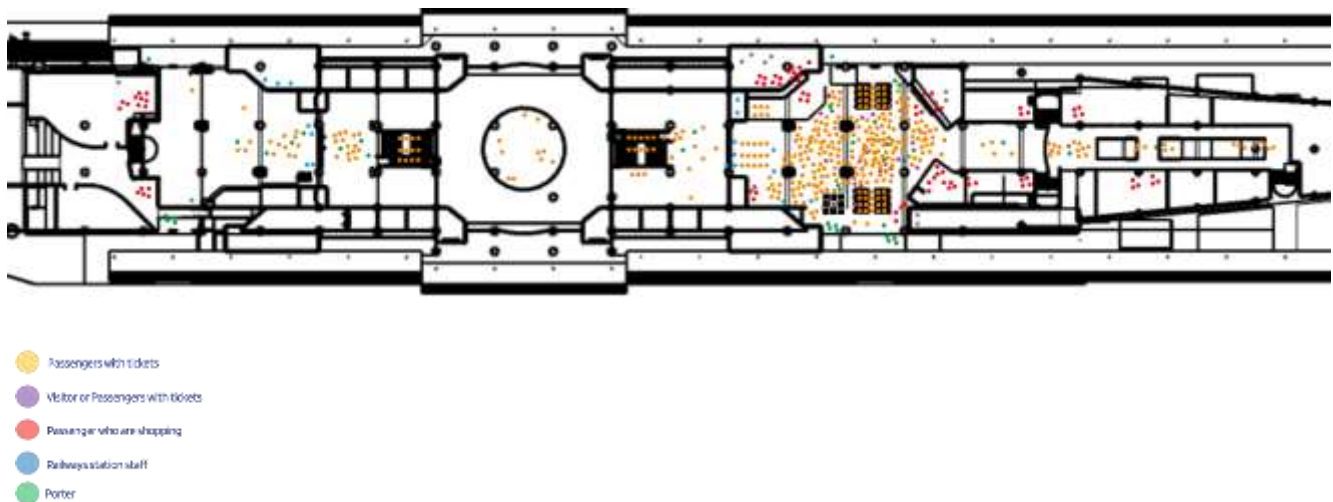


Figure 2. Activity map on the existing layout of Gambir Station



The observation results in the existing layout (seen figure 2); density points are seen to gather in the southern hall area, as indicated in the right part of the diagram, which serves as the main area for passenger activities in the station. Passengers begin their activities in the drop-off area, then proceed to the waiting area located in the hall. After that, passengers print their tickets in the hall area and then head to the boarding area for administrative checks related to their personal data and ticket information. These passenger activities, especially when several train departure schedules are close because the hall area becomes crowded and filled with passengers who already have their tickets.

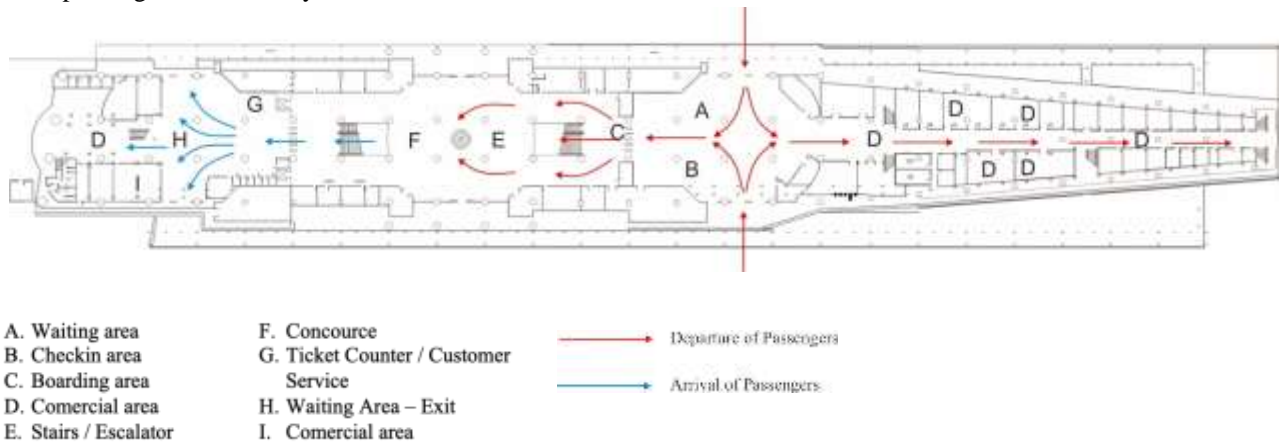


Figure 3. Arrival and Departure Passenger flow

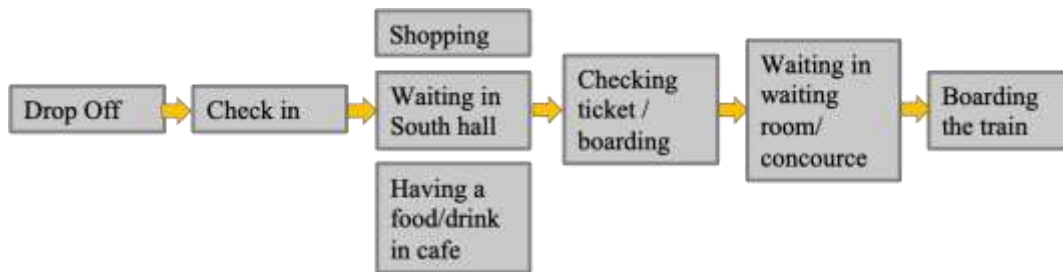


Figure 4. A sequence of Departure passenger activities at the station



Figure 5. A sequence of Arrival passenger activities at the station

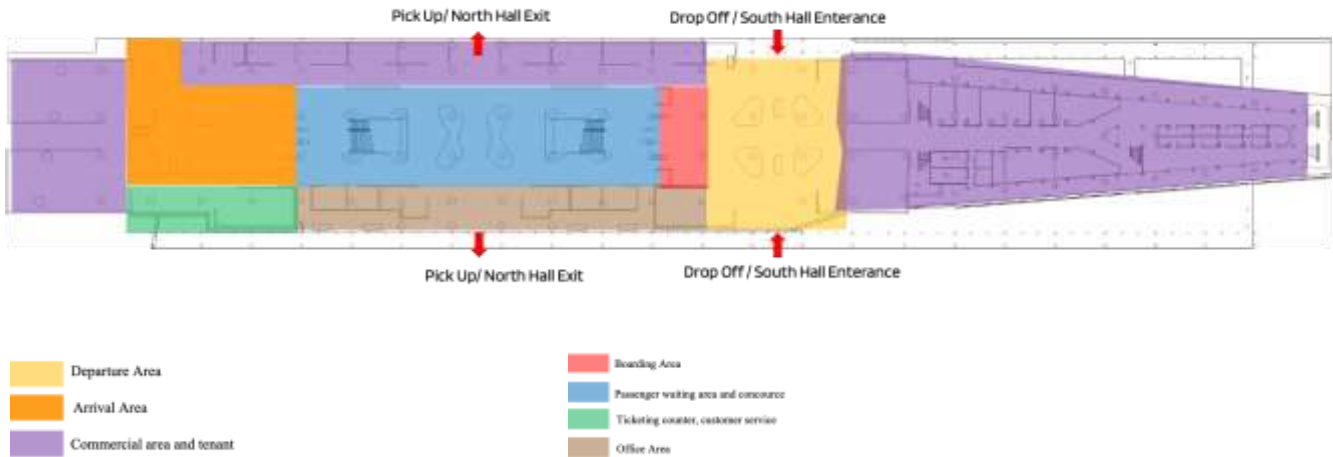


Figure 6. Areas on the new layout of Gambir Station

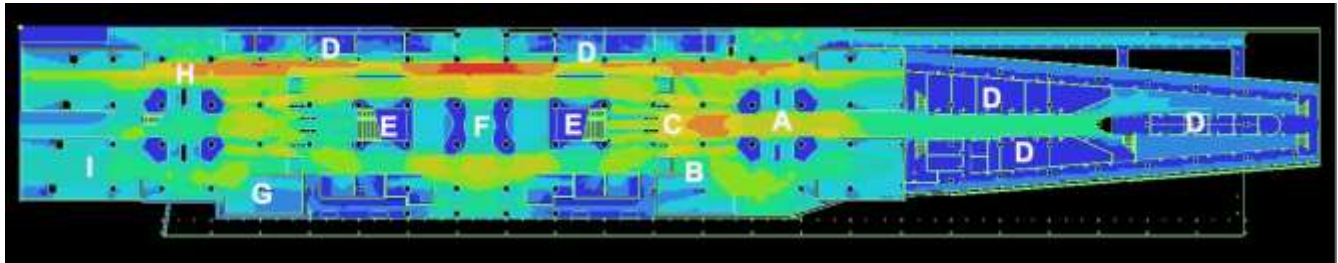
There is a quite significant difference in the layout of the new Gambir Station, as depicted by the scattered locations of commercial tenants along the waiting area or concourse, making it easy for passengers to access the available commercial tenants. The front concourse area also connects the southern and northern halls, allowing passengers to directly access the southern hall and vice versa. The new layout arrangement shows open access on the east and west sides, whereas, in the existing layout, it was in the form of a concourse. With the new accessibility, there is an interconnected effect between the southern and northern hall areas, making it easier for passengers to access other areas in the station. This results in improved visibility for passengers in accessing various spaces and areas throughout the station.

Visibility in the existing layout and the new layout of Gambir Station



Figure 7. Visibility maps on the existing layout of Gambir Station

In the visual above, which is generated by the DepthmapX software, the red areas indicate high connectivity and accessibility capabilities in those spaces. This is because the hall area serves as a central meeting point for other areas, resulting in a high level of integration for the region. On the other hand, in the tenant area on the right side, with access formed by corridors, each tenant's side shows a relatively weak blue color, indicating limited social interactions, even though the tenants are spaces for social activities. When passengers arrive at the station before departure, they tend to stay in Area A, the waiting area, without engaging in other activities to access the surrounding areas. This tendency is due to the commercial layout extending away from the central activities in Areas A, B, and C, namely the waiting, boarding, and check-in areas.

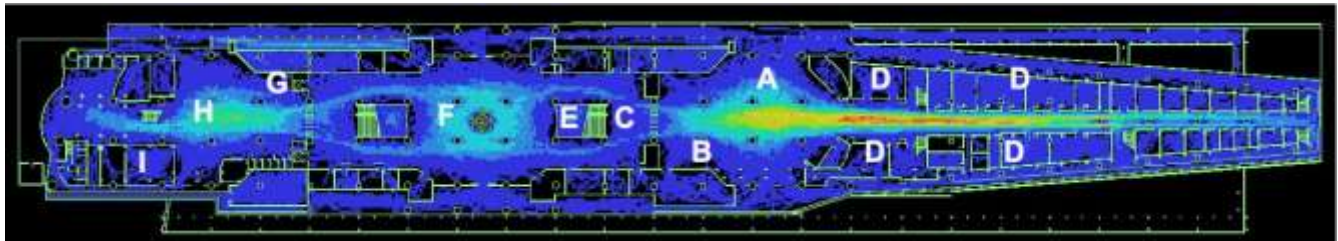


- | | |
|-----------------------|--------------------------------------|
| A. Waiting area | F. Concourse |
| B. Checkin area | G. Ticket Counter / Customer Service |
| C. Boarding area | H. Waiting Area – Exit |
| D. Comercial area | I. Comercial area |
| E. Stairs / Escalator | |

Figure 8. Visibility maps on the new layout of Gambir Station

In the visual representation of the new layout plan, the orange and red areas are spread more extensively, indicating a well-distributed integration of the area, and it shows a more even distribution of passenger movement, resulting in improved passenger visibility towards other spaces. In the new layout, the distribution of orange and yellow colors is more even, making passengers more likely to engage in activities in those areas. When they arrive at the station, their activities will be more diverse as they explore previously untouched areas of the station. In the commercial area represented by area D, indicated by yellow and green colors, the distribution is more even than the visibility shown in the existing layout.

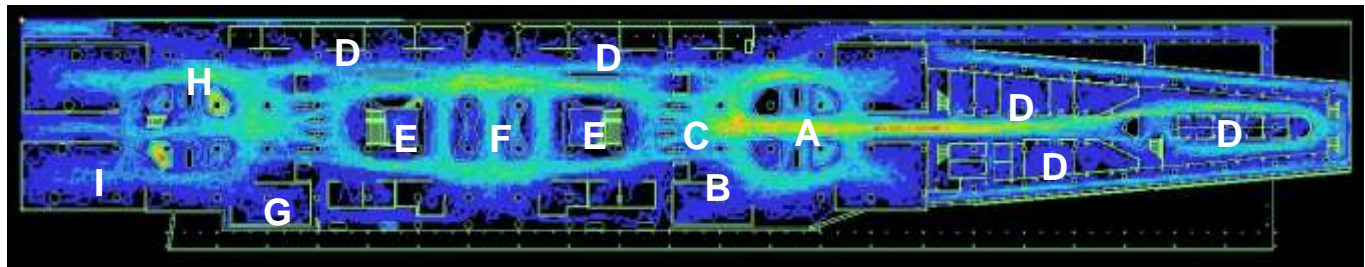
Accessibility in the existing layout and the new layout of Gambir Station



- | | |
|-----------------------|--------------------------------------|
| A. Waiting area | F. Concourse |
| B. Checkin area | G. Ticket Counter / Customer Service |
| C. Boarding area | H. Waiting Area – Exit |
| D. Comercial area | I. Comercial area |
| E. Stairs / Escalator | |

Figure 9. Accessibility maps on the existing layout of Gambir Station

It can be observed in the generated movement pattern that tends to resemble what has been produced from the visual graph, where the density points are indicated with colors ranging from orange to red in the area of the southern hall towards the corridor surrounded by tenants. Passenger movements are dispersed in the northern hall of Gambir Station. This indicates that passenger activity in the northern hall is relatively passive.



A. Waiting area	F. Concourse
B. Checkin area	G. Ticket Counter / Customer Service
C. Boarding area	H. Waiting Area – Exit
D. Comercial area	I. Comercial area
E. Stairs / Escalator	

Figure 10. Accessibility maps on the new layout of Gambir Station

The image displayed in the visibility map of the new layout shows that human movement is well-distributed through each area and space available, enabling passengers to access every public space easily while engaging in activities at the station. Areas D, E, and F, which are relatively bright in color, represent the concourse and commercial areas, and passengers will frequent them more during departure. This is expected to attract more visitors, especially passengers, to the commercial tenants.

In conclusion from the analysis depicted in figures 6-9 states that the new layout design shows improved accessibility and visibility, which is more evenly spread, reaching throughout the Gambir Station. The impact of the changes in the Gambir Station layout results in an enhancement perceived by passengers, specifically the ease of access and visual navigation between spaces in the station, starting from the drop-off area, commercial area, and all the way to the platform area.

CONCLUSION

The research results show that by considering the visibility and accessibility of passenger activities through the description of depthmapX results, we can determine better and more organized passenger movement directions when engaging in activities at the station.. The southern hall's waiting area, boarding area, commercial tenants, and several adjacent spaces also show evenly distributed congestion points. This will make it easier for passengers to access the entire area available at the station. The changes in the layout of the northern and southern halls have resulted in a more evenly distributed passenger density compared to the existing layout. It can be concluded that by considering the visibility and accessibility of passenger activities through the depiction of depthmapX results, we can determine better and more organized passenger movement directions when engaging in activities at the station. The impact of the changes in the Gambir Station layout results in an enhancement perceived by passengers, specifically the ease of access and visual navigation between spaces in the station, starting from the drop-off area, commercial area, and all the way to the platform area.

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