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The Meaning of Passenger Satisfaction in Using Face Recognition Technology and On-Time Service: PT KAI Phenomenological Study

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Abstract :
The purpose of this literature study is to develop a hypothesis regarding the influence of variables that can be used for further research in the field of marketing management. The research article on the meaning of passenger satisfaction in using face recognition technology and the timeliness of service is a scientific literature article in the field of marketing management. The approach used in this literature review is a descriptive qualitative one. The data collection technique is to use a literature study or to review relevant previous articles. The data used in this descriptive qualitative approach comes from previous research applicable to this research and is sourced from academic online media such as Thomson Reuters, Springer, Taylor & Francis, Scopus Emerald, Elsevier, Sage, Web of Science, Sinta Journal, DOAJ, EBSCO, Google Scholar, and digital reference books. The results of this literature review article are: 1) The use of Face Recognition Technology affects Passenger Satisfaction at PT. KAI; and 2) On Time Service affects Passenger Satisfaction at PT. KAI.

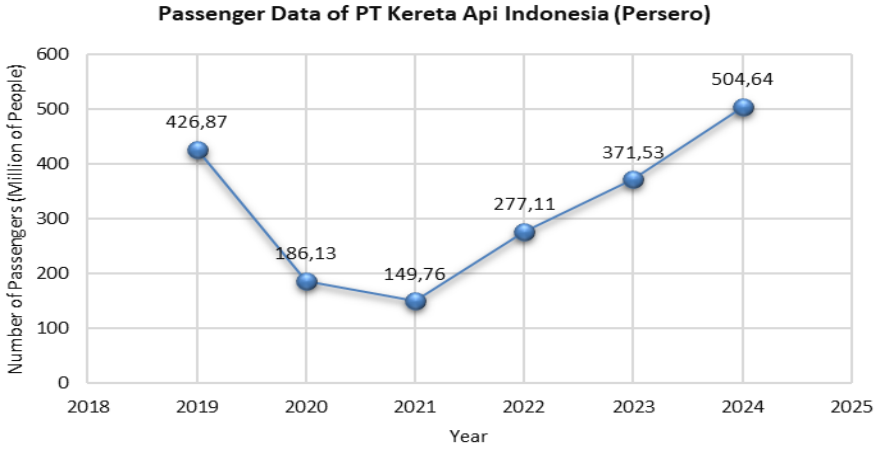
Keywords:
Passenger Satisfaction;
Face Recognition;
Technology,
On Time Service;
Literature Review;
Phenomenological Study

1. Introduction

Transportation is the process of moving people, goods, or services from one place to another using specific means and infrastructure (Anita et al., 2024). Transportation plays an important role in supporting the social, economic, and cultural activities of society by facilitating the mobility and distribution of resources (Susanto et al., 2021). In general, transportation has three main elements, namely transportation facilities, infrastructure, and people as users. The form of transportation facilities or modes is divided into several types, such as land transportation, sea transportation, air transportation, space transportation, pipeline transportation, cable transportation, and others (Indriyati, 2020)

The development of the transportation industry in Indonesia continues to make significant progress along with the growth of passenger traffic. According to PT. KAI, the number of passenger trains continues to increase every year. In 2023, PT. KAI served more than 371.536 million passengers, a significant increase compared to 2022, which only reached 277.116 million passengers. This increase indicates that the public's need for train transportation services is increasing.

Figure 1
Passenger Data of PT Kereta Api Indonesia (Persero) Source: BPS, 2024



The figure above shows the data regarding the number of passengers using PT Kereta Api Indonesia (Persero) from 2019 to 2024, in millions of people. The figure shows a fluctuating trend, which is influenced by various factors such as social and economic conditions and transportation policies during the period.

In 2019, the number of passengers reached 426.87 million. This number is relatively high, reflecting the high mobility of people who use trains as their main mode of transportation, both for long-distance and urban travel. However, in 2020, the number of passengers dropped sharply to 186.13 million people. This drastic decline is most likely due to the COVID-19 pandemic that hit the world, including Indonesia. Policies of social restrictions, lockdowns, and a significant decrease in travel activity have affected the number of train passengers. This downward trend continued into 2021, with the number of passengers declining further to 149.76 million. Although not as significant as the previous year, this decline still reflects the lingering effects of the pandemic. During this period, many people continued to limit their mobility, while transport companies such as PT KAI also implemented capacity restrictions and strict health protocols to reduce the risk of the virus spreading.(Torabi et al., 2022)

The peak of recovery was reached in 2024, when the number of passengers increased to 504.64 million. This number even exceeds the number of passengers before the pandemic in 2019. This increase shows that PT KAI not only managed to recover its operations but also expanded its market share by increasing capacity, opening new routes, and providing better services to the community.

This graph reflects how the transportation industry, and PT KAI in particular, has been able to recover from the severe challenges posed by the pandemic. This success is inextricably linked to effective adaptation strategies, service innovation, and adherence to safety standards that have increased public confidence.(Jimenez et al., 2016)

Overall, this graph provides a comprehensive overview of the dynamics of changes in PT KAI's passenger numbers over the past six years. The consistent recovery trend since 2022 confirms that rail transport remains the first choice for Indonesians. PT KAI's success in overcoming the impact of the pandemic and returning to better performance demonstrates the importance of innovation, policy adaptation, and service quality improvement in maintaining the sustainability of the public transportation industry.(Manandhar, 2023; Rachmat, 2020)

However, as the number of passengers increases, so do their expectations of service quality. PT Kereta Api Indonesia (PT. KAI), as the main train operator in Indonesia, continues to innovate to improve service quality, including the application of modern technology such as facial recognition and improved service punctuality. This innovation is being implemented to meet the needs of passengers who are increasingly prioritizing speed, comfort, and efficiency in their travel. This technology will be piloted in several major stations, such as Gambir and Bandung stations, in 2023. The system allows passengers to automatically verify their identity without having to show a physical ticket or ID card, making the process of boarding the platform faster and more efficient.(Rachmat, 2020)

In the context of digital innovation, the application of facial recognition technology at major stations such as Gambir and Bandung creates a paradox between efficiency and privacy, while the problem of punctuality is still a scourge that is difficult to overcome. Based on research by Kurniawan et al. (2023) and Dinhar & Sitasi (2018), there is a striking difference in the level of satisfaction of intercity passengers (72%) compared to commuter passengers (58%), with the main factors of dissatisfaction being

Table 1
Factors of passenger dissatisfaction by type of service

Number	Factor	Intercity Trains	Commuter Train
1	Delay	68%	82%
2	Cleanliness	15%	28%
3	Quality of Service	12%	8%
4	Digital Facility	5%	12%

Source: Yaiza Wilona Kaulika, Rizki Hegia Sampurna, (2023)

The table above shows data on passenger dissatisfaction factors based on the type of train service, namely intercity and commuter trains. This data covers four main factors that contribute to passenger dissatisfaction, namely delays, cleanliness, service quality, and digital facilities.(Ricardianto et al., 2023). The first factor, delays, is the main cause of passenger dissatisfaction for both types of service. The percentage of passenger dissatisfaction due to delays is 82% for commuter trains and 68% for intercity trains. This shows that delays are more frequent on commuter services, which generally have a higher frequency of service and are more prone to service disruptions. The second factor is cleanliness, complained about by 28% of commuter passengers and 15% of intercity passengers. The higher percentage for commuter trains may be due to the high volume of daily passengers, which has the potential to make the car area dirtier more quickly (Jeeradist et al., 2016).

The third factor is service quality, which is more dissatisfactory on intercity trains, with a dissatisfaction rate of 12% compared to 8% on commuter trains. This difference may be related to higher passenger expectations on long-distance services, which demand better comfort and service. The final factor, digital facilities, shows a dissatisfaction rate of 12% on commuter trains and only 5% on intercity trains. This may be due to commuters' greater need for digital access, such as schedule information, electronic payments, and Internet connectivity while traveling.

Despite the growing body of literature examining passenger satisfaction in railway transportation, most previous studies tend to analyze service quality dimensions in a partial manner, focusing either on operational aspects such as punctuality or on general service quality indicators. Meanwhile, empirical and conceptual studies that simultaneously integrate digital innovation, particularly face recognition technology, with on-time service performance in explaining passenger satisfaction remain limited, especially in the context of Indonesia's national railway operator, PT Kereta Api Indonesia (Persero). Furthermore, existing research largely adopts quantitative approaches, leaving a gap in understanding the conceptual and phenomenological meaning of passenger satisfaction in the era of digital transformation in public transportation services. Therefore, this study offers novelty by developing a comprehensive literature-based framework that integrates face recognition technology and service punctuality as key determinants of passenger satisfaction, providing a deeper theoretical foundation for future empirical research and contributing to the advancement of marketing management studies in the transportation sector. Overall, these data show that delays are a major contributor to passenger dissatisfaction, especially on commuter services. Meanwhile, cleanliness, service quality, and digital facilities are also areas that need improvement to increase passenger satisfaction on both types of services.

2. Method

This study employs a descriptive qualitative approach. This method was chosen because it allows researchers to explore and understand the general characteristics related to passenger satisfaction. The collection and analysis of descriptive qualitative data allows researchers to tailor their approach to the

research needs and characteristics of the subjects being studied. The data used in this study comes from previous research related to passenger satisfaction, the use of facial recognition technology, and service timeliness. The researcher will analyze existing literature to identify patterns and trends in passenger satisfaction, use of facial recognition technology, and timeliness of service. By using previous research, the researcher can develop stronger, evidence-based arguments and contribute to a broader understanding of the factors that influence passenger satisfaction of PT. KAI Persero (Susanto et al., 2024). This study uses data from several leading academic journals, including Thomson Reuters Journal, Springer, Taylor & Francis, Scopus, Emerald, Sage, Web of Science, Sinta Journal, DOAJ, and EBSCO, as well as platforms such as Publish or Perish and Google Scholar. By using these sources, researchers can ensure that the data they collect is valid and accountable. Using multiple sources also allows researchers to gain a more complete understanding of passenger satisfaction from multiple perspectives.

The data in this study are secondary data obtained from reputable national and international academic publications. Therefore, this research does not involve direct respondents or primary data collection. The sampling technique used is purposive sampling, where scientific articles are selected based on specific criteria: (1) relevance to passenger satisfaction, face recognition technology, or service punctuality; (2) publication in peer-reviewed journals or conference proceedings; (3) accessibility of full-text articles; and (4) publication within the last ten years to ensure the relevance and currency of the data.

The instruments used in this study are literature matrices and thematic analysis tables, which function to record key information from each selected article, such as research objectives, methods, variables, main findings, and theoretical contributions. Although this study does not apply measurement scales (e.g., Likert scales), conceptual indicators from previous empirical studies are identified and compared to construct analytical dimensions for each variable.

Data analysis is conducted using qualitative content analysis and thematic synthesis. This technique is chosen because it allows researchers to systematically categorize, interpret, and integrate findings from multiple studies to identify recurring themes, patterns, similarities, and differences across the literature. The analysis process consists of three stages: (1) data reduction through article selection and coding; (2) data display by organizing findings into thematic categories; and (3) conclusion drawing through interpretation and synthesis of the results.

The use of this analytical technique is justified as it enables the development of a strong theoretical framework and research propositions that can serve as a foundation for future empirical studies. By utilizing multiple academic databases—such as Thomson Reuters, Springer, Taylor & Francis, Scopus, Emerald, Sage, Web of Science, Sinta Journal, DOAJ, EBSCO, Publish or Perish, and Google Scholar—this study ensures data credibility, validity, and triangulation of perspectives, thereby enhancing the robustness of the research findings.

3. Results and Discussion

3.1. Results

Based on the above problem formulation, the relevant theories, indicators, and previous research in this study are as follows: Social Systems Theory Parsons Talcott (1991) emphasizes how each element in the social system interacts to achieve stability and specific goals. In rail service, this theory can be applied to explain how various components, such as infrastructure, technology, employees, and passengers, interact synergistically to create effective transportation services. Furthermore, in the intermediate theory, the Expectation Confirmation Theory is used, where this theory also helps to explain the interesting phenomenon that some passengers remain loyal despite frequent delays - this happens when they have adjusted their expectations to the reality of train service in Indonesia (Ghozali, 2020).

Passenger Satisfaction

Rail passenger satisfaction is the level of positive or negative feelings experienced by passengers after using rail services, based on a comparison between their expectations before the trip and their experience during the trip. Passenger satisfaction is also influenced by psychological aspects such as feeling valued and treated well by the service provider. If the passenger experience meets or exceeds

expectations, they are more likely to be satisfied and to use the service again in the future. Conversely, if the service does not meet expectations, such as delays, poor facilities, or unfriendly staff, satisfaction will decrease (Nissa & Awan, 2022). The indicators or dimensions of passenger satisfaction are as follows: 1) Matching expectations: The degree of alignment between passengers' actual experiences and their initial expectations before travel, covering all aspects of service; 2) Quality of Interaction with Staff: The attitude of staff (conductors, ticket agents, security guards) greatly influences satisfaction, including friendliness, responsiveness to complaints, and willingness to help. Polite and informative service (e.g. handicapped access guides) leaves a positive impression; 3) Physical comfort: includes the physical condition of the train and station, such as cleanliness, availability of comfortable seats, air circulation (AC/ventilation), lighting and support facilities; and 4) Intention to reuse: Where passengers are likely to use the service again in the future and recommend it to others (Novianty et al., 2021). The Passenger Satisfaction variable is relevant to previous research conducted by Jaya Sakti et al. (2021), Novani & Widadgo (2022), (Usman et al., 2022).

Face Recognition Technology

Facial recognition technology in rail services is the application of an artificial intelligence (AI) system that can automatically identify passengers' faces for various purposes, such as identity verification, ticket payment, or enhanced security. This technology works by scanning the passenger's facial features, matching them against a stored database, and processing the data in seconds. Its use can speed up the boarding process, reduce queues at ticket counters, and minimize identity fraud (Fadhilla & Putra, 2024). According to (Khan et al., 2024) People capture facial images, which are then automatically analyzed using image recognition software. The technology of face detection and recognition can be applied in multiple fields such as security, education, and healthcare.

The indicators or dimensions contained in face recognition technology are as follows: 1) Speed and accuracy of identification: The facial recognition system must be able to recognize passengers' faces quickly and accurately, minimizing verification errors (false positives/negatives) to avoid long queues; 2) Integration with other systems: This technology must be connected to the ticketing database, payment system, and security to ensure that the boarding process and access to the station area run smoothly without technical barriers; 3) Privacy: Protecting passenger biometric data from misuse or data leakage is a critical indicator. There must be data encryption and a clear policy for storing facial information; and 4) Ease of use: Passengers must be able to use the technology without difficulty, such as visual/voice guidance at facial scanning locations, especially for elderly passengers or those less familiar with the technology (B. D. Putri & Prunama, 2024). The face recognition technology variable is relevant to previous research that has been studied by Kamal et al. (2024), (I. U. Sari (2023), (Iswanto et al. (2025).

On Time Service

A train's on-time performance (OTP) is a measure of the extent to which trains arrive and depart according to a predetermined schedule. This factor is one of the most important indicators of passenger satisfaction, as delays can disrupt travel plans, especially for passengers with tight schedules, such as workers or students. High on-time performance not only increases passenger satisfaction but also enhances the reputation of rail as a reliable mode of transportation. Some operators even offer compensation (such as free tickets or discounts) if the train is delayed beyond a certain tolerance as a form of responsibility to passengers (Nurpiyanti et al., 2019).

The indicators or dimensions contained in on-time service are as follows: 1) On-time percentage: Calculates the percentage of trains that arrive/depart on time in a given period (e.g., 95% on time). The higher the OTP, the more reliable the service; 2) Average Delay Time: The average delay time (e.g., 5 minutes or 30 minutes) helps to assess how severe the disruption is for passengers. Short delays are more tolerable; 3) Transparency of delay information: Communicating the reason for the delay (weather, technical, etc.) in real time via loudspeakers, digital boards, or app notifications reduces passenger frustration; and 4) Compensation for delays: Compensation policies (free tickets, partial refunds, or replacement tickets) as a form of operator responsibility in the event of significant delays (Luth'v et al., 2022). The on-time service variable is relevant to previous research that has been studied by Alan et al. (2024), Subiyantoro et al. (2022), (Shalihah & Hargyatni (2022).

Previous Research

Based on the above findings and previous research, the research discussion is formulated as follows:

Table 2
Previous Relevant Research

No	Author	Research Results	Similarities with this research	Difference with this research
1	(Aji, 2024)	The E-Service Quality Face Recognition variable affects Passenger Satisfaction for KAI DAOP 6 Yogyakarta	There is a similarity with the research, namely in the Face Recognition variable as another independent variable and the Passenger Satisfaction variable as another dependent variable.	There is a difference with previous research, namely that there is a research object conducted at DAOP 6, Yogyakarta.
2	(Ependi et al., 2024)	The Use of Face Recognition Affects Passenger Satisfaction at Madiun Station	There is a similarity with the research, namely in the Face Recognition variable as another independent variable and the Passenger Satisfaction variable as another dependent variable.	There is a difference with previous research, namely that there is a research object conducted at Madiun Station.
3	(Tahfizah et al., 2024)	- The Timely Service Variable affects KAI Customer Satisfaction at the Medan Train Station - The Operational Cost Variable affects KAI Customer Satisfaction at the Medan Train Station	There is a similarity with the research, namely in the Timely Service variable as another independent variable and the Passenger Satisfaction variable as another dependent variable.	There is a difference with previous research, namely that there is a research object conducted at the Medan Train Station.
4	(Adawia et al., 2020)	-The Timeliness of Service Variable affects the Satisfaction of the Cikarang to Jakarta Commuter Line Train -The Facilities Variable affects the Satisfaction of the Cikarang to Jakarta Commuter Line Train	There is a similarity with the research, namely in the Timely Service variable as another independent variable and the Passenger Satisfaction variable as another dependent variable.	There is a difference with previous research, namely that there is a research object conducted on the Cikarang to Jakarta Commuter Line Train.

3.2. Discussion

Based on the problem formulation, relevant theories, and previous research, the discussion in this study is as follows:

1. The Effect of Using Face Recognition Technology on Passenger Satisfaction of PT. KAI Persero

Based on a review of the literature and relevant previous research, the use of facial recognition technology has an impact on the satisfaction of PT. KAI passengers. To influence passenger satisfaction through the use of facial recognition technology, what companies or organizations need to do is 1) Speed and accuracy of identification: This is the most important factor to consider. A facial recognition system

that can quickly and accurately recognize passengers' faces will speed up the process of entering the station or platform, making passengers feel more comfortable and less worried about misidentification; 2) Integration with other systems: When facial recognition technology is integrated with electronic ticketing systems, passenger data and travel information, it will create a more efficient and seamless service. With good integration, passengers can enjoy a more convenient and uninterrupted check-in process; 3) Privacy: Where companies need to ensure that passenger facial data is managed securely and in accordance with personal data protection regulations so that passengers feel comfortable using this service; and 4) Ease of use: Plays an important role in ensuring that passengers from all walks of life can easily understand and use facial recognition technology. Clear guidance and a user-friendly interface will enhance the passenger experience.

If the organization can implement speed and accuracy of identification, integration with other systems, privacy, and ease of use, it will have an impact on passenger satisfaction, which includes 1) Compliance with expectations: Because passengers feel that the service they receive meets their expectations, such as ease, comfort and speed of the travel process; 2) Quality of interaction with staff: With a reduced manual role in the identity verification process, staff can focus more on personal service and helping passengers who need special assistance; 3) Physical comfort: By eliminating the need for passengers to take out physical tickets or wait in long lines, the journey feels more comfortable and efficient; and 4) Intention to reuse: A positive experience will make passengers trust PT. KAI's services are more likely to choose this mode of transportation for their next trip.(Hidayat et al., 2021; Indriyati, 2023). The results of this study are consistent with previous research conducted by Aji (2024) and Ependi et al. (2024), which found that the use of facial recognition technology affects passenger satisfaction.

2. The Effect of Time Service on Passenger Satisfaction of PT. KAI Persero

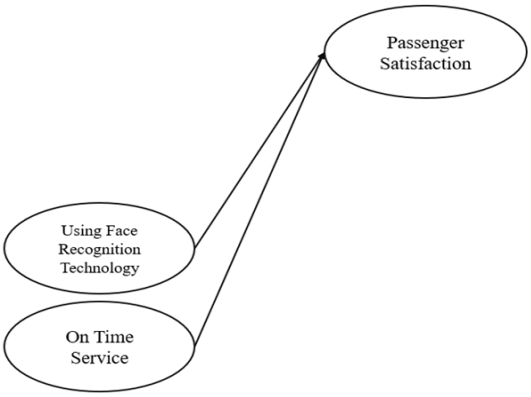
Based on a review of the literature and relevant previous research, it is found that on-time service affects the satisfaction of PT. KAI passengers. To influence passenger satisfaction through on-time service, what companies or organizations need to do is: 1) Punctuality percentage: The higher the percentage of punctuality, the lower the risk of passengers being delayed, so they can manage their travel schedules well. PT. KAI must maintain operational standards so that the percentage of on-time performance remains optimal; 2) Average delay time: Where delays are unavoidable, the company must ensure that the duration of the delay is not prolonged. By minimizing the waiting time due to delays, passengers will still feel satisfied because the trip does not interfere too much with their plans; 3) Transparency of delay information: plays an important role in maintaining passenger confidence. PT. KAI must provide clear, accurate, and real-time information about the reason for the delay, the estimated time of arrival, and the action being taken. This information can be provided through station announcements, applications, or digital screens on the platform to ensure that passengers continue to receive the information they need; and 4) Compensation for delays: This is a form of corporate responsibility to passengers. This compensation can take the form of partial ticket refunds, travel vouchers, or additional facilities that can mitigate the inconvenience caused by delays. (Indriyati et al., 2017)

If the organization can implement a percentage of punctuality, average delay time, transparency of delay information, compensation for delays, it will have an impact on passenger satisfaction, which includes 1) Meeting expectations: Because passengers feel that the service they receive is as expected; 2) Quality of interaction with staff: That is, officers who can provide polite explanations and help passengers find solutions will increase satisfaction; 3) Physical comfort: Passengers do not have to wait too long on the platform, making the trip more comfortable and enjoyable; and 4) Intention to use again: That is, the implementation of on-time service will increase the intention to use PT. KAI's services. A good experience will build passengers' trust, making them more likely to choose PT. KAI is their main mode of transportation for their next trip.(Z-score, n.d.). The results of this study are consistent with previous research conducted by Tahfizah et al. (2024) and Adawia et al. (2020), which states that on-time service affects passenger satisfaction.

Conceptual Framework

The conceptual framework is determined based on the problem formulation, research objectives, and previous research relevant to the discussion of this literature review.

Figure 2
Conceptual Framework



Based on Figure 2 above, the use of face recognition technology and on-time service affect passenger satisfaction. However, besides the variables of the use of face recognition technology and the timeliness of service that affect passenger satisfaction, other variables influence, including:

a) Price Ticket: (Novianty et al., 2021), (Sihombing et al., 2023), (Ricardianto et al., 2023), (A. N. Sari & Wakhidah, 2022).
b) Ease of Purchase: (Heni et al., 2020), (Fatmawati M & Ali, 2021), (Abu-Alsondos et al., 2023), (N. I. Putri, 2021).
c) Travel Information: (Fauziah et al., 2023), (Primadi et al., 2024), (Lidya et al., 2022), (Leliana & Oktaviastuti, 2020).

4. Conclusion

Based on the problem formulation, results, discussion, and the conceptual framework developed in this study, several important conclusions can be drawn.

1) First, the use of face recognition technology has a significant influence on passenger satisfaction at PT Kereta Api Indonesia (Persero). The findings from the literature review indicate that this technology contributes positively to passenger satisfaction by improving the efficiency of the boarding process, reducing queues, and enhancing perceived convenience. However, the discussion also highlights that passenger satisfaction is not determined solely by technological adoption, but by how well the technology is integrated with existing systems, its ease of use, and the extent to which passenger data privacy is protected. When these aspects are managed properly, face recognition technology strengthens passengers' positive experiences and increases their intention to reuse rail services.
2) Second, on-time service is consistently identified as a critical determinant of passenger satisfaction. The reviewed studies show that punctuality directly affects passengers' perceptions of reliability and trust toward PT KAI. Delays, especially when frequent or poorly communicated, are a major source of dissatisfaction. Conversely, high on-time performance, transparency of delay information, and fair compensation policies can mitigate negative perceptions and maintain passenger confidence. This confirms that operational reliability remains a core foundation of service quality in railway transportation, even in the era of digital innovation.
3) Overall, this study concludes that passenger satisfaction at PT KAI is shaped by the combined effect of technological innovation and operational performance. The integration of face recognition technology represents a modern service enhancement, while on-time service reflects the fundamental expectation of passengers. The main contribution of this study lies in providing a conceptual synthesis that positions both variables as complementary factors in improving passenger satisfaction. The findings can serve as a theoretical reference for future empirical research and as a

strategic consideration for PT KAI in developing sustainable, customer-oriented transportation services.

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