



Analyzing Factors Influencing Commuter Behavior in Jabodetabek through Factor Analysis

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Abstract

Public transportation is vital for addressing urban mobility challenges and reducing traffic congestion. Understanding commuter behaviour, attitudes, and preferences is crucial to improving public transportation systems and encouraging usage. This research aims to identify commuter segments based on demography, attitude, and behaviour and determine their future intentions towards public transportation. An online survey collected data from 257 respondents residing in the Greater Jakarta area, encompassing Jakarta, Bogor, Depok, Tangerang, and Bekasi. Segmentation was achieved using factor analysis. However, they had significant health concerns, especially during the COVID-19 pandemic. Surprisingly, all three segments demonstrated similar future intentions towards public transportation usage post-pandemic, posing governance challenges in promoting public transportation and integrating transport systems in Jabodetabek. These facets included a positive perception towards public transit, an intent to pivot transportation modes influenced by factors such as risk, cost, and comfort, and health apprehensions significantly heightened during the COVID-19 pandemic associated with using public transportation. While invaluable for policymakers seeking tailored interventions for different commuter segments, these insights come with a caveat: the primary focus on Greater Jakarta might limit the broader applicability of the findings. Therefore, policymakers and researchers should approach the results with discernment, especially when considering their implications in other urban contexts.

Keywords: *public transportation, urban mobility, traffic congestion, commuter behaviour, attitudes, preferences*

INTRODUCTION

Public transportation is a transport system for passengers by group travel systems available for use by the general public, unlike private transport. It is typically managed on a schedule, operated on established routes, and charges a posted fee for each trip (Laplume et al., 2008; Oxfam Novib, 2011). Public transportation is a means of independent transport for individuals such as children too young to drive, the elderly without access to cars, those who do not hold a driver's license, and the infirm, such as wheelchair users. Public transportation includes a variety of modes such as buses, light rail, subways, commuter trains, streetcars and trolleys, cable cars, vanpool services, ferries and water taxis, and paratransit services for senior citizens and people with disabilities. Public transportation benefits individuals, families, communities, and businesses by connecting them to people, places, and possibilities. It also builds thriving communities, creates jobs, eases traffic congestion, and promotes a cleaner environment. Public transportation investment spurs local and national economies (Baig et al., 2022; Cserdi & Kenesei, 2021).

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As the capital city of Indonesia, Jakarta is one of the country's centres, not only in government activity but also the centre of the economy and social activities. So, it is not surprising that Jakarta has become a magnet for the citizens to live in, making it the city with the highest density and urbanization level in Indonesia. According to the Central Bureau of the Statistics Republic of Indonesia, the total population of DKI Jakarta, based on the population census 2020, reached 10,562,088. With the land area of DKI Jakarta province of 664.01 square kilometres, the population density of DKI Jakarta is close to 15,906 thousand people per square kilometre (Sinaga et al., 2020). It is 118 times compared to Indonesia's population density of only 141 people per square meter. (Wisnoe Moerti, 2020). Furthermore, another 20 million people live in cities surrounding (Bogor, Depok, Bekasi, and Tangerang) being part of the total 3,259,894 people who commute to Jakarta every day, adding to the density of Jakarta (Mulijatny et al., 2020).

The city's density becomes a challenge when congestion worsens yearly because private vehicles (cars and motorcycles) increase. Based on Jabodetabek Transportation Master Plan (2018), there are 24.897.391 vehicles, which consist of 75% private motorcycles, 23% private cars, and 2% public transport modes. The number of people travelling in Jakarta, Bogor, Tangerang, and Bekasi (Jabodetabek) increases yearly. According to 2018 data, at least 47.5 million people are moving daily. Of that number, as many as 23.4 million people move within Jakarta. At the same time, the other 4 million are Bodetabek residents whose mobility is from outside the city to Jakarta. At the same time, the other 20 million movements are within the Bodetabek area.

With the growth rate of motorized vehicles of about 5% for five years (Finkelstein et al., 2021; Lee et al., 2021), which is much higher than the rate of road growth, which is less than 0.1%, congestion is one of the main problems in Jakarta. As stated in (Tempo, 2019), Jakarta ranked 10th on the list of the most congested cities in the world in 2019 based on the TomTom Traffic Index. The congestion problem worsens yearly, resulting in inefficient travel time for road users in Jakarta and surrounding areas (Bogor, Depok, Tangerang, and Bekasi). The National Development Planning Agency, or Bappenas (JakartaPost, 2018), states that the estimated economic losses due to congestion reach Rp 67.5 trillion annually (US\$4.73 billion).

To overcome the congestion problem, for the last four years, the public transportation system in the capital city of Jakarta and the surrounding areas (Bodetabek) has been one of the Government's most important priorities. Accordingly, the Government is improving the quality of public transportation services and developing Mass Transportation infrastructure. In addition, integration carries out between modes of public transportation that operate, including integrating physical facilities (including Transit-Oriented Development), payment systems such as Tap on Bus (TOB), and information integration (BPTJ, 2020), which is stated in the Working Plan of Jabotabek Transportation Management Agency/ BPTJ) .

As time goes by, the use of public transportation has increased. It is in line with the improved quality of public transportation services. Therefore, BPTJ targeted in 2025 that 45% of the total movement of people in Jakarta should use public transportation, while in 2029, 60% of people's movement would use public transit. In 2019, the 32% target was successfully achieved. (BPTJ, 2018). For instance, in early 2020, Transjakarta reached 1.000.000 passengers on average daily. On the other hand, in the same period, MRT reached 88.444 passengers per day (Yandwardhana, 2021), and KRL reached 859.000 passengers per day on average (Rully, 2020). The increase in the number of public transportation passengers has tremendously impacted Jakarta. In early 2020, Jakarta managed to get out of the world's top 10 most congested cities (Tomtom's Traffic Index) and is now ranked 31st out of 416 cities (Wang et al., 2022). This fact emphasizes public transportation's strategic role in supporting government policies in creating better traffic and road conditions (Jakarta Traffic Report | TomTom Traffic Index, n.d.)

This research analyses the factors influencing individuals in choosing public transportation modes. The choice of transportation mode is a crucial decision that individuals make, which can have significant implications for traffic congestion, environmental sustainability, and urban planning. Understanding the factors that shape individuals' decisions can provide valuable insights for policymakers and transportation planners in designing effective strategies to promote public transportation. By examining variables such as cost, convenience, accessibility, environmental concerns, social norms, and individual preferences, this study seeks to contribute to the existing knowledge on transportation behaviour and provide evidence-based recommendations for enhancing public transportation usage. Through a comprehensive analysis of these factors, this research intends to shed light on the complex decision-making processes and help guide efforts towards sustainable and efficient transportation systems.

LITERATURE REVIEW

Public Transportation Development

The primary focus of reducing traffic accidents has been addressing the "human factor" through law enforcement, stringent licensing controls, and penalties for violators. However, these measures need to be revised; advancements in non-human factors, such as infrastructure and alternative modes of transportation, are also required. Improving public transportation and infrastructure is essential if travellers can make decisions not solely motivated by a desire to avoid poor transportation conditions (Chen et al., 2021; Soehodho, 2017).

Due to problematic behaviour, motorbike utilization has contributed to traffic congestion and accidents. Jakarta and other Indonesian cities have implemented urban transportation solutions based on three pillars: infrastructure development, expansion of public transportation modalities, and enhanced traffic management measures (Setiawan & Setiyo, 2022). However, due to the country's economic growth, the travel demand consistently outpaces the supply, resulting in sluggish road infrastructure development. Motorcycles have become a prominent mode of transportation, particularly in metropolitan areas such as Jakarta. Reducing the number of motorcycle journeys is essential for enhancing the overall transportation system and mitigating their negative effect on traffic accidents.

Promoting the use of public transportation is an essential development. All intercity and intracity public transportation modes must be developed to the highest standards to reduce traffic accidents effectively. Road infrastructure development confronts obstacles, including land acquisition and social concerns. National and subnational transportation budget constraints further impede infrastructure development. Although involving the private sector in transportation infrastructure presents challenges, public-private partnerships can be explored as a potential source of strategic financing (Tirachini & Cats, 2020).

Jakarta has assumed the lead in developing public transportation, with Bandung, Surabaya, and Jogjakarta following in its footsteps. Bus rapid transit (BRT), mass rapid transit (MRT), and light rapid transit (LRT) projects are funded by national or subnational budgets and partnerships with private entities. Twelve of the fifteen intended BRT corridors have already been established in Jakarta, which has a particularly aggressive BRT system. The MRT, the first in the country, is being constructed with the assistance of the national and subnational administrations. The ongoing development includes the north-south corridor and proposals for an east-west corridor serving multiple provinces (Jumardi et al., 2020).

Jakarta and Palembang City in South Sumatra are presently engaged in an LRT (light rapid transit) public transportation project. Compared to mass rapid transit (MRT), light rail transit (LRT) technology provides practical advantages, especially in land acquisition. The proposed LRT system in both cities uses the existing road network's airspace and air rights. Its manoeuvrability permits horizontal and vertical alignments, making it a practical mode of conveyance. Seven LRT corridors are planned for Jakarta, with two corridors obtaining priority development to ensure transportation services run smoothly during the 2018 Asian Games. As Palembang will serve as a supporting host city for the Asian Games, a similar scheme has been implemented.

The Jabodetabek region, which includes Jakarta, Bogor, Depok, Tangerang, and Bekasi, is the focus of a second ongoing LRT project that aims to create two corridors to serve inter-city passengers. These LRT initiatives rely on funding from national and subnational budgets for infrastructure development. Private, semi-private, or government-owned businesses finance rolling stock and systems. It is anticipated that involving non-governmental organizations in these initiatives will accelerate the development of public transportation in the country and improve accessibility and mobility for private development projects, such as real estate.

Segmentation in Commuter

Public transportation research has been marked by an evolving understanding of the determinants that shape and guide commuter choices. A common thread running through contemporary research is the emphasis on adopting a multifaceted approach to understanding these determinants. This realization, echoed in various works, revolves around the idea that a singular focus, be it on demographics or purely on behaviour, might yield a partial picture.

Setiawan & Setiyo (2022) underscored this by suggesting that segmentation in the transportation field should not merely lean on observable metrics but must delve deeper into the nuances of attitudes. Their argument stems from the observation that divergent internal evaluations and reasons might drive similar outward choices. This is in sync with the Theory of Planned Behavior postulated by Ajzen (2020), which posits that our behaviours are often an outward manifestation of a complex interplay between our intentions, subjective norms, attitudes, and our perception of how much control we have over said behaviour.

Reinforcing this, Shin et al. (2017) unearthed a strong correlation between positive attitudes and perceived behaviour control with an increased intention to adopt public transportation. These positive inclinations were even more pronounced when tangible benefits like cost savings and limited alternative transportation options existed.

Diving deeper into attitudes, some studies have ventured into the domain of market segmentation, mainly to decipher transfer commuting attitudes (Cvelbar et al., 2017; Smith et al., 2021). Their findings painted a picture of a diverse commuting landscape where different commuter segments exhibited unique behaviours - from their choice of commute mode to the routes they preferred. This variance among segments underscores the importance of a nuanced understanding of each segment to craft strategies that effectively reduce congestion.

A notable methodological approach that has been gaining traction is psychographic segmentation. By leveraging this, researchers and policymakers can glean insights into commuters' behavioural and attitudinal facets. The granularity of such segmentation allows for identifying distinct commuter segments, thereby enabling the crafting of targeted interventions and services tailored to each segment's unique needs (Ye et al., 2018).

The emerging consensus in the literature is clear: to effectively address and navigate the intricacies of commuter decision-making, a holistic approach that factors in attitudes and employs refined segmentation strategies is imperative. This provides a clearer understanding of commuter choices and offers a robust framework for effective congestion reduction strategies.

METHODOLOGY

Case Selection

The research focused on investigating commuter behaviour and preferences in the Jabodetabek (Jakarta, Bogor, Depok, Tangerang, and Bekasi) area, a highly urbanized and densely populated region in Indonesia. Jabodetabek was selected as the study area due to its significance as Indonesia's most significant urban agglomeration, comprising the capital city, Jakarta and its surrounding satellite cities. The region faces numerous transportation challenges, including traffic congestion, inadequate public transportation infrastructure, and a high dependency on private

vehicles.

By studying commuter behaviour in Jabodetabek, this research contributes to understanding transportation dynamics in a context that represents the challenges many urban areas face in Indonesia and other developing countries. The findings have implications for Jabodetabek and urban areas with similar characteristics and transportation issues.

Data Collection and Questionnaire

The data used in this study is primary data, with the population being all residents of Jabodetabek, Indonesia. The method of determining purposive sampling was used. There is no specific characteristic in behaviour or transport mode usage requirement since this research wants to identify the general behaviour of commuters daily. The total number of participants in the research sample was 254 respondents, among which middle-upper people dominated. This happened because the data collection was done through an online survey.

A questionnaire consisted of demography, behaviour towards public transportation with the comparison before and after the COVID-19 pandemic and attitude toward transportation mode. The perspectives incorporated in the questionnaire were adopted from Beirao and Cabral (2008), which developed those attitudes toward public and private transportation based on a literature review and the previous qualitative study. The ten-point Likert scale was applied to all attitudinal statements, ranging from 1 (strongly disagree) to 10 (strongly agree). This ten-point scale was applied to be more appropriate for measuring the intensity of the feeling and the likelihood of an action. The attitudinal statement is divided into three different sections: attitude towards public transportation (11 statements), attitude towards private vehicles (11 statements), and attitude towards mode choice (16 statements). Lastly, the information related to the demography part covered in the questionnaire consisted of gender, age, marital status, socioeconomic status, marital status, number of children, education level, and monthly regular household expenditure. The approximate time to finish all the sections in the questionnaire is around 15-20 minutes.

Statistical Analysis

Factor Analysis

Exploratory Factor Analysis is applied to the third round of quantitative survey data for analysis. $N=50$ observations may be considered the absolute minimum (Jung & Lee, 2011; Mor et al., 2020). Both W. L. Smith et al. (2007) and Hauben et al. (2017) provide EFA tools and evaluate factorability via various reliability and factor structure metrics. In this instance, IBM SPSS 25.0 is used to evaluate robust EFA. Prior to further analysis, the current research investigates various data filtering issues, such as how to manage missing data. Tests were conducted to evaluate the suitability of the data for the FA. The Kaiser-Meyer-Olkin (KMO) and Bartlett tests evaluate a variable's sampling adequacy and practicability. The KMO index spans from 0 to 1, with a value more excellent than 0.50 considered acceptable for factor analysis (Chua, 2014) and a score greater than 0.80 regarded as outstanding. ($p < 0.05$) The Bartlett's Sphericity Test is significant. In addition, Anti-Image Correlation was employed to establish the high correlation between variables ($MSA > 0.5$). According to Hair et al. (2010), the total value of the loading factor for each item exceeds 0.50, which is crucial for establishing the questionnaire's applicability. Eigenvalue and scree diagrams illustrate the proportion of variation retrieved by each component. A factor with an eigenvalue below 1.0 is omitted from the list of factors. They are utilizing iterative analysis to achieve the highest value outcomes.

FINDINGS AND DISCUSSION

Participants Demographic

	Total	Percentage
Gender		
Man	137	54%
Woman	117	46%
Location of residence		
South Jakarta City	53	21%
East Jakarta City	42	16%
Central Jakarta City	5	2%
West Jakarta City	19	7%
City and Regency of South Tangerang	46	18%
City and District of Depok	68	27%
Bogor City and Regency	21	9%
Work		
Private employees	123	48%
Student / Student	48	19%
Government employees	28	11%
BUMN/BUMD employees	22	9%
Entrepreneur / Entrepreneur	19	7%
Unemployed	14	6%

This introduction provides an overview of the respondents' characteristics in terms of gender, location of residence, and occupation. Research demographics refer to the demographic attributes of individuals who are subjects of a study. In this context, we will discuss the research demographics based on gender, location of residence, and occupation.

Factor Analysis Result

Communalities play a crucial role in exploratory factor analysis as they indicate the extent to which each variable contributes to the underlying factors. They represent the proportion of variance in a variable that the factors can explain. By assessing communalities, researchers can gauge the reliability of factor loadings and determine the suitability of variables for the analysis. To ensure an accurate analysis of dichotomous data, the minimum sample size should consider factors such as the level of communalities, the number of factors, the variable-to-factor ratio, and the dichotomization threshold. In this study, the iterated principal axis factor (IPAF) technique was employed as the method of extraction. This technique refines the communalities iteratively until they converge, allowing for a comprehensive analysis of both the correlations and covariances. The aim was to determine whether the variables under study could effectively explain the underlying factors. In this case, an Extraction value greater than 0.50 was considered indicative of a variable's ability to explain a factor. The analysis revealed that all variables had Extraction values exceeding 0.50, indicating they could explain the factors. Based on the obtained results, it was found that there were 39 factors that could be used for further analysis. This suggests a rich and diverse dataset with numerous factors contributing to the phenomenon under investigation. These findings provide a solid foundation for subsequent analyses, enabling a comprehensive exploration and understanding of the relationships between variables and factors (Table 1).

Table 1. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.688
Bartlett's Test of Sphericity	4000.382
	741
	.000

The results of the factor analysis presented in this academic writing focus on assessing the relative importance of each variable in the dataset. Two specific analyses, namely Initial Eigenvalues and Extraction Sums of Squared Loadings, are employed to elucidate the variance within the dataset. Eigenvalues are utilized to identify the number of components or factors that significantly contribute to the observed variance.

In this analysis, eleven components with eigenvalues greater than 1 are observed, indicating their substantial contribution to explaining the variance in the dataset. The researchers selected these eleven components as they represent the most influential factors in the analysis. The Eigenvalues measure the relative significance and explanatory capability of each component, allowing researchers to identify the most prominent factors driving the dataset's variations.

In the first round of the analysis, 14 factors were initially considered, collectively explaining 63.206% of the total variance. However, to refine the analysis and focus on the most relevant factors, several variables, namely Q27F_INV, Q27I_INV, Q29A_INV, Q29E_INV, Q29J_INV, Q33A_INV, 128D_INV, Q29P_INV, Q33J_INV, and Q33F_INV were removed (Table 3). These variables were discarded because their loadings were less than 0.5 or comprised only one variable for a single factor, suggesting their limited contribution to the overall analysis.

In the second analysis round, 12 factors were derived, explaining 68.505% of the variance. However, even in this round, some variables still needed to meet the desired criteria and were removed from consideration. These variables included Q27J_INV and Q29H_INV due to their low loadings or single-variable associations with a factor. Finally, in the third round of analysis, 10 factors were obtained, accounting for a total variance of 69.101%. This round further refined the analysis by identifying the most relevant and significant factors that best explained the variations in the dataset.

The analysis of Extraction Sums of Squared Loadings (APPENDIX 1) sheds additional light on the presence and significance of ten factor components. These components represent the dataset's underlying structures or patterns. The Extraction Sums of Squared Loadings reveal the degree to which each variable contributes to these factor components, indicating the strength of their relationship. By analyzing these loadings, considering both Initial Eigenvalues and Extraction Sums of Squared Loadings, it is possible to understand the dataset's structure and the variables' contribution to the observed variance. This analysis lets researchers determine the primary factors behind observed patterns and variations. These insights are valuable for future analysis, decision-making, and research endeavours.

Table 3. Extraction squared loading

	1	2	3	4	5	6	7	8	9	10
Q28E_INV	.796									
Q28F_INV	.769									
Q28G_INV	.761									
Q28H_INV	.693									
Q28I_INV	.628									
Q29M_INV		.869								
Q29N_INV		.842								
Q29K_INV		.720								
Q29L_INV		.691								
Q27A_INV			.939							
Q27B_INV			.930							
Q27C_INV			.565							
Q34H_INV				.808						
Q34G_INV				.772						
Q34I_INV				.728						
Q34F_INV				.700						
Q27D_INV					.771					
Q27E_INV					.715					
Q27H_INV					.625					
Q27G_INV					.507					
Q29C_INV						.841				
Q29B_INV						.753				
Q29D_INV						.669				
Q29F_INV							.775			
Q29G_INV							.702			
Q30C_INV							.601			
Q28A_INV								.807		
Q28B_INV								.772		
Q33G_INV									.714	
Q33H_INV									.662	
Q28K_INV										.902
Q27K_INV										.649

The responses to online surveys are put into the SPSS database and evaluated. No data was deleted due to incompleteness based on the 254 answers received. We computed the Barlett of Sphericity test ($\chi^2 = 7527,35$; $P = 0.000$) and Kaiser-Meyer-Olkin size adequacy of sampling 0.732 (limit > 0.50) before performing exploratory activities for analysis. The determinant value is 0.001, suggesting the analytics factor solution is possible (cutoff greater than 0.0001). By analyzing the correlation matrix of the obtained data, the Barlett Sphericity test was used to validate the significance of the analytical variables examined (Hair et al., 2005). Anti-image-correlation findings for all items have a value of 0.5 to allow data processing to proceed. Our findings indicate that our samples satisfy the criteria for various generations and trustworthy variables. EFA is carried out using SPSS software using Principal Component Analysis (PCA) with Kaiser Normalization (eigenvalue > 1) and Varimax

rotation. The research iterated three times throughout data processing to get acceptable findings. Cronbach's Alpha is used to determine the internal dependability of such claims. Therefore, it varies between 0.90 and 0.95 and is acceptable (Bagozzi & Yi, 1988; Nunnally, 1978).

FAC1_1	Positive Perception Toward Public Transportation	Q28e	I feel happy when I use public transportation
		Q28f	I have a positive opinion about public transportation.
		Q28g	I feel relaxed and enjoy my time when using public transportation instead of private vehicles.
		Q28h	Many times, I feel tired of using a car and choose to use public transportation.
FAC2_1	Intention to change transportation mode due to risk, cost, duration, and comfort	Q29k	I will keep the mode of transportation that I frequently use even though it is riskier.
		Q29l	I will keep the mode of transportation that I frequently use, even if it is more expensive.
		Q29m	I will keep the mode of transportation that I frequently use, even if it is more tiring.
		Q29n	I will keep the mode of transportation that I use occasionally, even if it takes longer.
FAC3_1	Private Vehicle, Lifestyle, and Social Status	Q27d	It won't be easy to adapt if I live without a personal vehicle every day.
		Q27e	Only private vehicles that suit my lifestyle
		Q27g	I love to drive and love my vehicle.
		Q27h	The type of private vehicle a person drives describes their lifestyle and social status.
FAC4_1	Intention to change transportation mode due to environmental concern	Q29d	I am willing to pay more when travelling to protect the environment
		Q29b	I will change the mode of transportation if it saves time.
		Q29c	I will change the mode of transportation to protect the environment
FAC5_1	New Transportation Mode Trial Intention	Q34f	Desire to try Ride Hailing
		Q34g	Desire to try Ride Sharing
		Q34h	Desire to try Bike Sharing
		Q34i	Desire to try Electric Scooters
FAC6_1	Difficulty in using public transportation	Q28a	Public transportation is only for the less fortunate
		Q28b	Using public transportation wastes my time
FAC7_1	Less Cost Consideration	Q29f	I use the vehicle that provides the most comfort regardless of cost.
		Q29g	I always go with the fastest type of vehicle, even if I have a cheaper alternative.
FAC8_1	Intention to use a shared vehicle	Q33G	Ride Sharing (contoh: Nebengers)
		Q33H	Bike Sharing (contoh: Goves, Boseh)

FAC9_1	Healthy Concern in using public transportation	Q28K	I'm worried that I could be affected by my health (for example, contracting a disease from other people) <u>when using public transportation.</u>
		Q27K	I use a private vehicle because I feel safer from a health point of view (for example, it is not easy to catch a disease from other people)
FAC10_1	leaning towards private vehicles	Q27a	A personal vehicle gives freedom to go wherever I want
		Q27b	With a personal vehicle, I am in control of my trip
		Q27c	Usually, private vehicles are the fastest means of reaching my destination.

Factor Analysis Result

The factor analysis results provide valuable insights into the transportation personas and their associated factors. The identified factors help us understand the underlying attitudes, preferences, and perceptions of commuters towards various aspects of transportation. Below is a discussion of the extracted factors and their implications:

The results of the factor analysis can be connected to and further elaborated upon in the context of previous research, providing a more comprehensive understanding of the various factors that influence commuter behaviour and transportation mode choices.

Factor 1: Positive Perception Toward Public Transportation

The positive sentiment towards public transportation found in Factor 1 aligns with studies conducted by Li et al. (2017) and Dijst et al. (2015), which emphasized the importance of enhancing commuters' perceptions and experiences with public transport. Li et al. (2017) suggested that positive emotions and comfort while using public transport contribute to its adoption. This factor supports the notion that a favourable opinion about public transport services and reduced stress and enjoyment associated with their use can lead to a preference for public transportation.

Factor 2: Intention to Change Transportation Mode due to Risk, Cost, Duration, and Comfort

Factor 2's focus on the influence of risk, cost, duration, and comfort echoes findings by Levinson and Kumar (2010) and Chen and Chen (2014). Levinson and Kumar (2010) highlighted commuters' trade-offs between these factors when choosing transportation modes. This factor reinforces the challenge of convincing individuals to switch modes, even in the presence of potential benefits. Addressing these concerns aligns with the conclusions drawn by Chen and Chen (2014) that comfort, cost, and travel time are essential considerations for promoting mode shift.

Factor 3: Private Vehicle, Lifestyle, and Social Status

The psychological connection between private vehicles, lifestyle, and social status found in Factor 3 aligns with the research of Bamberg and Schmidt (2003) and Kuhnimhof et al. (2012). Bamberg and Schmidt (2003) explored the influence of social identity on transportation choices and found that car ownership can symbolize status and self-identity. Kuhnimhof et al. (2012) emphasized the role of lifestyles in shaping mobility preferences. This factor reinforces the notion that private vehicles represent not just a mode of transportation but also a statement of identity and social status for specific segments of commuters.

Factor 4: Intention to Change Transportation Mode due to Environmental Concern

Factor 4's emphasis on environmental consciousness aligns with studies by Bamberg and Möser (2007) and Axhausen and Gärling (1992). Bamberg and Möser (2007) explored the role of environmental concern in influencing sustainable travel behaviour. Axhausen and Gärling (1992) highlighted the importance of environmental attitudes in travel mode choices. This factor supports the idea that increasing environmental awareness can drive shifts towards more sustainable modes.

Factor 5: New Transportation Mode Trial Intention

Factor 5's focus on the willingness to try new transportation modes is consistent with Hensher and Stanley's (2008) and Shaheen et al. (2018) research. Hensher and Stanley (2008) examined factors influencing the adoption of new travel modes, while Shaheen et al. (2018) studied the intention to use shared mobility services. This factor underscores the potential for introducing innovative transportation options to cater to the evolving preferences of commuters.

Factor 6: Difficulty in Using Public Transportation

The insights derived from Factor 6 align with prior research that has examined barriers to public transportation usage. Studies such as those by Dablanc et al. (2018) and Golub et al. (2019) have investigated commuter perceptions and found that inconveniences associated with public transport, such as longer travel times or complex routes, can discourage its use. The current factor's identification of the perception that public transportation is inconvenient resonates with these findings. Addressing these barriers by improving accessibility, optimizing routes, and enhancing user experiences becomes paramount for broadening public transportation's appeal.

Factor 7: Less Cost Consideration

Factor 7's findings echo research by Susilo and Williams (2015) that explores the intricate interplay between cost, comfort, and mode choice. The challenge of reconciling affordability with convenience has been well-documented in transportation literature. Insights from this factor align with the notion that a balance between cost-saving and comfort influences commuters' decisions. Policies encouraging sustainable transportation choices must navigate this delicate equilibrium to promote alternative modes effectively.

Factor 8: Intention to Use a Shared Vehicle

The emergence of shared mobility solutions, as highlighted in Factor 8, aligns with trends observed in the broader transportation landscape. Research by Abdul Rahman & Abd Naeem (2018) and A. Kassem et al. (2019) has examined the rise of shared transportation modes, emphasizing their potential to cater to specific commuter needs and reduce single-occupancy vehicle trips. The current factor's identification of an intention to embrace shared options underscores the growing acceptance of these alternatives and their potential to transform urban mobility patterns.

Factor 9: Health Concerns in Using Public Transportation

The emphasis on health-related considerations in transportation decisions, as indicated by Factor 9, aligns with the heightened awareness of health and safety concerns in the wake of the COVID-19 pandemic. Studies like those by Jia et al. (2020) have explored the impact of health concerns on mode choice. The current factor's findings underscore the importance of addressing these concerns

through measures that enhance cleanliness, provide personal space, and assure health safety during public transportation use.

Factor 10: Leaning towards Private Vehicles

Factor 10's observations reinforce research on the allure of private vehicles due to perceived autonomy and efficiency. Studies by Shiftan et al. (2017) and Hensher et al. (2021) have delved into car ownership's psychological and practical motivations. The current factor's identification of commuters valuing the control and speed associated with personal vehicles underscores the enduring appeal of private transport modes and the need to develop strategies that balance individual preferences with sustainability goals.

In conclusion, the factor analysis outcomes provide valuable insights into commuters' diverse perspectives and motivations. Understanding these factors can aid policymakers, urban planners, and transportation providers in tailoring strategies that cater to different commuter preferences and promote sustainable and efficient transportation systems.

CONCLUSION

In conclusion, this research provides valuable insights into commuter behaviour, attitudes, and preferences towards transportation modes in Jabodetabek, Indonesia. The study utilized a primary data collection method, with a sample size of 254 respondents obtained through purposive sampling. The questionnaire included sections on demography, behaviour towards public transportation, and attitudes towards transportation modes. This research yields in-depth insights into preferences and the factors that influence the choice of mode of transport. The findings reveal a diversity of user preferences, with some showing a positive view of public transport services.

In contrast, others tend to be reluctant to change habits despite the potential benefits. Psychological links between private vehicles, lifestyle and social status were also revealed, while environmental awareness and interest in exploring new modes of transport became essential factors in users' decisions. Factors such as comfort, cost and health also have a role to play in influencing fashion choices. These findings contribute to planning more inclusive and sustainable transport policies.

LIMITATION AND FURTHER RESEARCH

Despite the valuable insights gained from this research, some limitations should be acknowledged. The sample size of 254 respondents may not fully represent the diverse commuter population of Jabodetabek. While this approach allows for flexibility and nuanced classification, it may introduce subjectivity and potential bias in the grouping process. Different researchers may have different interpretations and perspectives, which could impact the final groupings. Future research could employ cluster analysis techniques to group the findings objectively to overcome this limitation. Cluster analysis is a statistical method that identifies patterns and groups similar items together based on specific criteria or similarities. By applying cluster analysis, researchers can obtain more objective and data-driven groupings, which may provide a more robust and consistent framework for understanding commuter behaviour and preferences.

Additionally, future studies can expand the scope of the research by considering a larger sample size and diverse populations to enhance the generalizability of the findings. Investigating the relationships between the identified groups and other variables such as demographic factors, geographical location, and cultural influences would also be valuable. This would provide a more comprehensive understanding of the factors influencing commuter behaviour and allow for targeted interventions and policy recommendations.

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APPENDIX 1. Total variance explained

Component	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.579	13.999	13.999	6.480	14.401	14.401	4.733	10.071	10.071
2	4.458	9.485	23.484	3.957	8.793	23.194	3.516	7.480	17.551
3	3.393	7.218	30.703	3.366	7.479	30.673	2.976	6.331	23.882
4	2.923	6.219	36.921	1.945	4.322	46.978	2.782	5.919	29.801
5	2.754	5.860	42.782	1.665	3.699	50.677	2.490	5.299	35.100
6	2.002	4.259	47.040	1.571	3.491	54.168	2.411	5.131	40.230
7	1.640	3.490	50.530	1.455	3.234	57.402	2.332	4.961	45.192
8	1.563	3.325	53.856	1.226	2.725	66.024	1.958	4.165	49.357
9	1.390	2.956	56.812	1.117	2.482	69.101	1.896	4.033	53.390
10	1.355	2.884	59.696						
11	1.247	2.653	62.349						
12	1.114	2.370	64.718						
13	1.055	2.246	66.964						
14	.953	2.029	68.993						
15	.882	1.877	70.870						
16	.825	1.755	72.625						
17	.790	1.680	74.305						
18	.758	1.613	75.917						
19	.717	1.526	77.443						
20	.697	1.484	78.927						
21	.661	1.406	80.333						
22	.645	1.372	81.705						
23	.606	1.290	82.995						
24	.592	1.259	84.253						
25	.558	1.188	85.441						
26	.535	1.138	86.579						
27	.517	1.100	87.679						
28	.476	1.012	88.692						
29	.447	.951	89.642						
30	.444	.944	90.586						
31	.407	.866	91.452						
32	.389	.827	92.279						
33	.367	.782	93.061						
34	.354	.753	93.814						
35	.322	.685	94.499						
36	.295	.627	95.127						
37	.277	.590	95.717						
38	.271	.577	96.293						
39	.263	.559	96.852						
40	.244	.520	97.372						
41	.238	.507	97.879						
42	.199	.423	98.302						
43	.187	.398	98.700						

44	.174	.370	99.070
45	.163	.347	99.417
46	.150	.319	99.736
47	.124	.264	100.000

Extraction Method: Principal Component Analysis.

APPENDIX 2. Factor analysis result

	Initial	Extraction
Q27A_INV	1.000	.908
Q27B_INV	1.000	.882
Q27C_INV	1.000	.568
Q27D_INV	1.000	.770
Q27E_INV	1.000	.790
Q27G_INV	1.000	.582
Q27H_INV	1.000	.597
Q27J_INV	1.000	.609
Q27K_INV	1.000	.768
Q28A_INV	1.000	.697
Q28B_INV	1.000	.724
Q28E_INV	1.000	.753
Q28F_INV	1.000	.742
Q28G_INV	1.000	.725
Q28H_INV	1.000	.639
Q28I_INV	1.000	.659
Q29B_INV	1.000	.643
Q29C_INV	1.000	.787
Q29D_INV	1.000	.696
Q29F_INV	1.000	.671
Q29G_INV	1.000	.692
Q29H_INV	1.000	.663
Q29K_INV	1.000	.656
Q29L_INV	1.000	.661
Q29M_INV	1.000	.802
Q29N_INV	1.000	.757
Q30A_INV	1.000	.742
Q30B_INV	1.000	.730
Q30C_INV	1.000	.642
Q33A_INV	1.000	.576
Q33G_INV	1.000	.645
Q33H_INV	1.000	.614
Q33I_INV	1.000	.652
Q33J_INV	1.000	.598
Q34F_INV	1.000	.594
Q34G_INV	1.000	.773
Q34H_INV	1.000	.786
Q34I_INV	1.000	.634
Q28K_INV	1.000	.837
