

Identifying Customer Segmentation and Persona of Online Transportation Companies in Jabodetabek Using K-Means Clustering Analysis for a More Effective Marketing Strategy

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Abstract: *The demand for online transportation services in Jabodetabek has surged in recent years, driven by urbanization and the need for efficient mobility. This study aims to identify market segmentation through clustering, enabling online transportation companies to uncover detailed consumer personas and develop precise value propositions. Data was collected from 413 respondents via an online survey within the Jabodetabek area and processed with KNIME software. The analysis identified three (3) distinct user groups/clusters: The Minimum Budget Conscious Users, Value-Seeking Occasional Users, and The Established Loyalist Gentleman. Among these, The Established Loyalist Gentleman, characterized by higher income levels and frequent service usage, emerged as the ideal target segment. To attract this segment, personalized marketing strategies focusing on part of the 4Ps marketing mix are proposed. Key initiatives include Comfort and Safety Assurance, offering premium vehicles that are safe, clean, and well-maintained, along with professional drivers for a superior travel experience. Enhanced App Features include advanced safety tools like real-time trip tracking, emergency buttons, and driver identity verification to increase user trust. Ease of Booking ensures a user-friendly app interface with one-click booking and saved routes for convenience. Flexible payment methods and Special Premium Services, such as exclusive discounts for frequent or long-distance trips, further enhance loyalty. These strategies cater to the preferences of this high-value segment, fostering stronger engagement and driving long-term growth in the competitive online transportation market.*

INTRODUCTION

The Greater Jakarta metropolitan area, commonly referred to as Jabodetabek, encompasses

Jakarta and its surrounding cities, namely Bogor, Depok, Bekasi, Tangerang, and South Tangerang. This region represents Indonesia's largest urban agglomeration and one of the most densely populated metropolitan areas globally. Based on data from Wikipedia, with approximately 10.5 million residents in Jakarta, 3 million in Bekasi, 2.4 million in Depok, 1.8 million in Tangerang, 1.3 million in South Tangerang, and 1.1 million in Bogor, Jabodetabek has become a central hub for economic and social activities. The rapid growth of this population, driven by significant urbanization from across the country, has placed immense pressure on the region's infrastructure, particularly its transportation systems. In 2000, an estimated 29.2 million daily trips were recorded in the region, with the majority relying on buses (52.7%), private cars (30.8%), motorcycles (14.2%), and trains (2%). However, these transportation patterns have shifted significantly over the years as technology and urban mobility demands have evolved.

In recent years, the demand for online transportation services in the Greater Jakarta area (Jabodetabek) has experienced rapid growth. Online transportation, especially transportation by car, has become a practical alternative that connects users with drivers through internet-based applications. In the Jabodetabek area, two major players, Go-Jek and Grab, dominate the online transportation market, particularly after Uber exited the Southeast Asian market in 2018. Competition among operators in the online transportation segment was also evident from a YLKI survey 2017, which revealed that Gojek received the highest consumer preference rating at 72.6%, followed by Grab at 66.9%, Uber at 51%, and MyBlueBird at only 4.4%.

There were rapid shifts in the market share positions of online transportation operators. In 2018, Uber gradually experienced a decline in market share in Southeast Asia, including Indonesia. Eventually, Uber acknowledged its defeat, surrendered in the competition, and decided to withdraw from the market by selling its assets to Grab (Detik, 2018). On April 8, 2018, Uber transitioned its services to the Grab platform (Kompas, 2018), which strengthened Grab's market share and briefly positioned it as the market leader in Indonesia. Additionally, a business collaboration between Gojek and Bluebird was established in Q2 2017, integrating app-based transportation with an official taxi service.

After five years, a survey conducted by the Research and Development Agency (Balitbang) of the Ministry of Transportation (Kemenhub) in 2022 involving 2,655 respondents residing in Jabodetabek who use online transportation services (with a sampling error margin of less than 5%) revealed that the majority of the public primarily use back to the Gojek app. The survey noted that 59.13% of respondents chose the app developed by this domestic decacorn company. Following Gojek, Grab was used by 32.24% of respondents, Maxim by 6.93%, InDriver by 1.47%, and others by 0.23%. The market share distribution is presented in Figure 1 as follows.

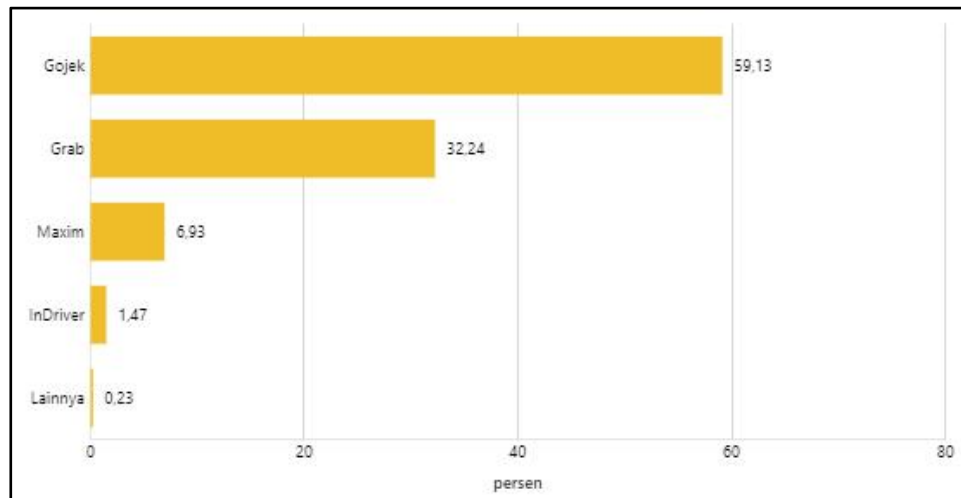


Figure 1. Market Share of Online Transportation Platform in Jabodetabek (2022)

These shifts highlight the fierce rivalry and the growing need for operators to adapt through continuous innovation and targeted strategies. The figure below (Figure 2) highlights the shifting dynamics of online transportation services in Indonesia from 2017 to 2024, with Gojek consistently leading the market after overcoming initial competition with Grab. The **Top Brand Index**, as shown in the chart, not only reflects brand preference but also mirrors the market share dynamics between these two dominant players. In 2018, Grab gained momentum, but its index declined steadily after 2019, while Gojek's dominance strengthened, maintaining an upward trend since 2020. This suggests that Gojek has successfully captured a larger share of the market through strategic adaptations and local market insights, while Grab's declining performance reflects challenges in maintaining its competitive position. Meanwhile, Maxim remains a minor player with a negligible share, underscoring the duopoly-like rivalry between Gojek and Grab in shaping the online transportation landscape. The competition also underscores challenges such as low customer retention rates and price sensitivity, which call for more effective and tailored marketing approaches to meet the diverse needs of Jabodetabek's consumers and sustain long-term growth in the region.

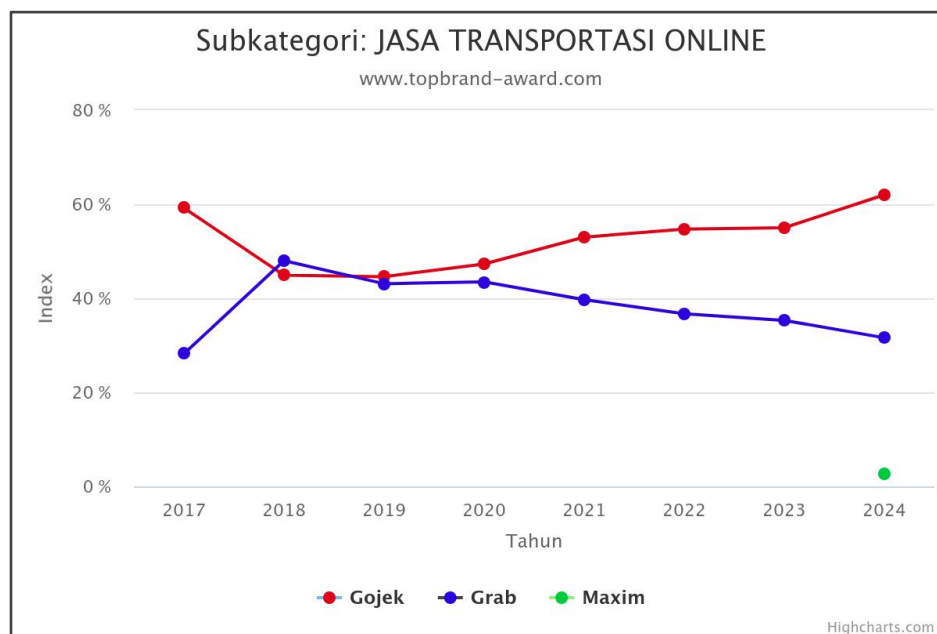


Figure 2. Top Brand Index of Online Transportation Platform

According to Kotler and Keller (2012), an effective marketing strategy must optimally integrate the segmentation, targeting, and positioning (STP) approach to better reach the market. This strategy can be implemented through the 4Ps framework: Product, Price, Place, and Promotion. **Product** addresses consumer needs through tailored goods or services, while **Price** focuses on setting competitive yet attractive costs. **Place** ensures efficient delivery and accessibility, and **Promotion** involves strategies to communicate and engage with customers. Together, the 4Ps align offerings with consumer needs and preferences. Each element within the 4Ps framework plays a crucial role in ensuring that the product or service delivers valuable value propositions to consumers. The primary goal of a marketing strategy is to communicate the value proposition, which represents the unique benefits provided by a company to fulfill the specific needs of its customers. In the context of Jabodetabek, Indonesia's largest metropolitan area, consumer segmentation becomes a vital element due to differences in needs, preferences, and behavior patterns influenced by demographic, economic, and technological factors.

Jennie (2015) highlights that Indonesian consumer, particularly millennials who dominate online transportation users, have distinctive traits such as low loyalty, price sensitivity, interest in communities, and an adaptive tendency toward technology. Therefore, online transportation companies must identify consumer segments more deeply through customer clustering analysis. This approach not only helps in understanding specific consumer needs but also provides a strategic foundation for developing more personalized and relevant marketing programs.

Customer clustering analysis has emerged as a powerful tool for understanding consumer preferences and behaviors in greater depth. By categorizing users into distinct groups based on patterns such as transaction frequency, monetary contribution, and geographical location, companies can develop targeted marketing programs that resonate with specific customer needs. In the context of Jabodetabek, where the population is highly diverse, clustering analysis is particularly valuable. It enables businesses to segment their market more effectively, ensuring that their offerings are relevant and appealing to different consumer groups.

The research aims to identify market segmentation through clustering, enabling online

transportation companies to uncover detailed consumer personas and develop online value propositions on top 4Ps marketing mix. By understanding these personas, companies can craft targeted marketing strategies that address specific consumer needs and preferences. This approach not only fosters customer satisfaction but also builds long-term loyalty. Ultimately, by aligning their strategies with the unique characteristics of the Jabodetabek market, online transportation companies can secure a significant competitive advantage in this diverse and rapidly evolving urban landscape.

RESEARCH METHOD

The primary data for this research was collected through an online survey using Google Forms. The questionnaire was designed to gather information about respondents' demographic characteristics and profiles, usage frequency, service preferences, as well as their experiences and satisfaction with online transportation. The survey was distributed via instant messaging. The collected data was processed using Knime software for initial cleaning and transformation. Subsequently, the data was analyzed using the K-means algorithm in Knime to cluster respondents based on similar characteristics. The results of this clustering analysis provide deeper insights into market segmentation, serving as a crucial foundation for developing effective marketing strategies.

KNIME is a data analytics and data science tool that builds data workflows of any complexity with highly accessible, no-code, drag-and-drop visual programming. It allows users to easily move and upskill from basic analytics tasks like automating spreadsheet tasks to more complex analytics like building machine learning models. In this research, the k-means clustering data will be processed by this tool. By leveraging machine learning algorithms like K-means clustering through Knime tool, companies can segment consumers based on their characteristics, preferences, and usage patterns. This approach enables businesses to deliver more targeted services, enhance customer satisfaction, and strengthen their competitive advantage.

K-means clustering is a widely used data analysis method in statistics and machine learning for grouping data into a specific number of clusters based on similar characteristics. This method is particularly useful for clustering unlabeled data, with the primary goal of uncovering patterns or structures within the data to support decision-making processes. The first step in the K-means clustering process is determining the required number of clusters, represented by the symbol K. The algorithm then randomly selects K points as the initial cluster centers, or centroids. The Euclidean distance between each data point and the centroids is calculated to assign each data point to the nearest cluster. Once all data points are assigned, the average position of the data within each cluster is calculated to update the centroids. This process is repeated iteratively until the centroids' positions stabilize or a certain iteration limit is reached. One of the main advantages of K-means clustering is its simplicity and effectiveness when working with large datasets. However, it also has limitations, such as its sensitivity to the initial selection of centroids and challenges in determining the optimal number of clusters. Additional evaluation techniques, such as the elbow method or silhouette score, are often used to identify the most appropriate value of K.

Overall, K-means clustering is an invaluable tool for data exploration, market segmentation, consumer behavior analysis, and various other applications requiring data grouping. By understanding and applying K-means clustering, researchers and practitioners can uncover hidden patterns in data and make more data-driven decisions.

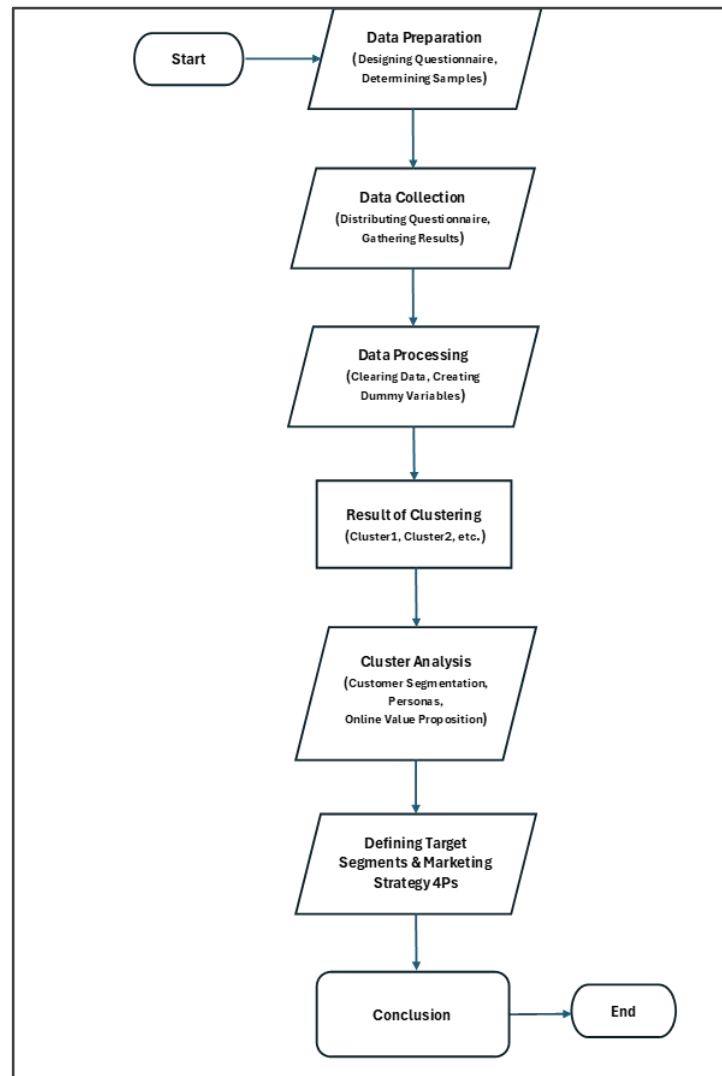


Figure 3. Research Process Flow

On the Cluster Analysis step, each cluster (cluster segmentation) will be designed with a unique Persona and online Value Proposition. The results of this clustering analysis provide deeper insights into market segmentation, serving as a crucial foundation for developing effective marketing strategies. The next step is selection of segment targets and then exploring for development of Marketing Strategy 4P (Product, People, Place and Promotion). This approach is expected to increase customer loyalty, enhance the user experience, and strengthen the company's competitive position in the growing online transportation market in the Greater Jakarta area.

RESULT AND DISCUSSION

Respondents Profile

Demographic variables refer to statistical characteristics used to describe populations and market segments. These variables include various factors such as age, gender, education level, income level, type of occupation, and geographic location. Understanding demographic variables is crucial in marketing research, as it allows companies to better identify and analyze consumer behavior and preferences. There is evidence of the influence of demographic factors on user

satisfaction with online transportation services (Ali, F., & Hameed, W., 2022). Responses from 452 respondents were gathered for this study. There were only 413 responses after the data was cleaned and filtered to only include those who lived in the Jabodetabek. The table below displays the demographic information of our respondents.

Table 1. Demographics Characteristics of Respondents

Gender	Amount	Percentage	Age	Amount	Percentage	Education	Amount	Percentage	Job	Amount	Percentage
Men	181	44%	15-24 y.o	84	20%	< Senior High School	48	12%	Student/ Lecturer/Teacher	59	14%
Women	232	56%	25-34 y.o	89	22%	Diploma	29	7%	Employees	248	60%
Total	413	100%	35-44 y.o	106	26%	Bachelor	275	67%	Civil Servant/TNI/POLRI	21	5%
			45-54 y.o	84	20%	Postgraduate	61	15%	Entrepreneur	35	8%
			>55 y.o	50	12%	Total	413	100%	Others	50	12%
			Total	413	100%				Total	413	100%

Table 2. Economics Characteristics and Application Preferences of Respondents

Income per Month	Amount	Percentage	Online Transportation Spending per Month	Amount	Percentage	Application	Number of Installed
Don't have their own	69	17%	< Rp 100.000	155	38%	GOJEK	363
< Rp 4 million	37	9%	Rp 100.000-300.000	139	34%	GRAB	312
Rp 4-10 million	131	32%	> Rp 300.000	119	29%	MAXIM	45
Rp 10-20	78	19%	Total	413	100%	MYLUEBIRD	143
> Rp 20 million	98	24%				Total	863
Total	413	100%					

Cluster Analysis with K-Means

The following are the results of the K-means cluster analysis conducted using KNIME Analytics Platform tool as below:

Table 3. Number of Sample per cluster

NUMBER OF ONLINE TRANSPORTATION USER RESPONDENTS		
CLUSTER	NUMBER OF SAMPLE	PERCENTAGE OF SAMPLE
Cluster 1	163	39%
Cluster 2	152	37%
Cluster 3	98	24%
Total	413	100,0%

This study analyzed 413 users of Gojek, Grab, Maxim, and MyBlueBird. Using k-means clustering, we divided these users into 3 groups (clusters 1-3, as shown in Table 3). This helped us understand the different types of users. Cluster 1 was the largest group (39%), while cluster 3 was the smallest group (24%) (Table 3).

A complete breakdown of the clustering details is provided below:

Tabel 4. Final Table from 3 Clusters

CATEGORY	CLUSTER	CLUSTER 1	CLUSTER 2	CLUSTER 3	Comparison Variabel
GENDER	Male	0,350	0,467	0,541	Vertical
	Fenale	0,650	0,533	0,459	
AGE	15-24 years old	0,233	0,250	0,082	Horizontal
	25-34 years old	0,227	0,257	0,133	
	35-44 years old	0,252	0,178	0,388	
	45-54 years old	0,184	0,178	0,276	
	>54 years old	0,104	0,138	0,122	
EDUCATION	Elementary School-Senior High School (SD-SMA)	0,117	0,178	0,020	Horizontal
	Diploma	0,055	0,118	0,020	
	Bachelor's degree (S1)	0,718	0,572	0,724	
	Postgraduate (Master's or Doctoral degree)	0,110	0,132	0,235	
OCCUPATION/JOB	Students or Teachers or Lecture	0,166	0,197	0,020	Horizontal
	Employee or Staff	0,589	0,546	0,704	
	Civil Servants/The Indonesia Military/The Indonesian National Police	0,043	0,053	0,061	
	Entrepreneur or Self-employed	0,061	0,118	0,071	
	Other	0,141	0,086	0,143	
MONTHLY INCOME	Without a personal income or pension	0,215	0,178	0,071	Horizontal
	< IDR 4 million	0,104	0,125	0,010	
	IDR 4-10 million	0,325	0,401	0,173	
	IDR 10-20 million	0,166	0,184	0,235	
	> Rp 20 million	0,190	0,112	0,510	
THE USAGE RANKING	GOJEK usage ranking	2,454	3,974	3,143	Horizontal
	GRAB usage ranking	3,963	1,441	2,184	
	MAXIM usage ranking	0,245	0,243	0,255	
	MYBLUEBIRD usage ranking	0,485	0,033	3,112	
THE PREFERENCE CAR TYPE	Small Car (City Car)	0,221	0,217	0,235	Horizontal
	Mid-size Car	0,491	0,487	0,439	
	Large Car (Minivan/SUV)	0,135	0,105	0,163	
	No Preference Car type	0,153	0,191	0,163	
FREQUENT OF USAGE	Seldom or Infrequently	0,368	0,414	0,184	Horizontal
	1-3 x per month	0,454	0,362	0,347	
	1-3 x per week	0,178	0,224	0,469	
TIME OF USAGE	From 06.00AM to 10.00AM	0,067	0,046	0,235	Horizontal
	From 10.00AM to 03.00PM	0,184	0,178	0,184	
	From 03.00PM to 06.00PM	0,061	0,046	0,031	
	From 06.00PM to 12.00PM	0,074	0,112	0,071	
	From 00:00AM to 05:00AM	0,012	0,020	0,020	
	The time is variable, contingent upon necessity	0,601	0,599	0,459	
DISTANCE OF USAGE	< 5 km	0,160	0,118	0,102	Horizontal
	5-10 km	0,417	0,368	0,469	
	10-20 km	0,313	0,342	0,255	
	> 20 km	0,110	0,171	0,173	
EXPENSE OF MONTHLY USAGE	< IDR 100.000	0,442	0,434	0,173	Horizontal
	IDR 100.000- IDR 300.000	0,331	0,375	0,286	
	> IDR 300.000	0,227	0,191	0,541	
REASON FOR CHOOSING	Speed of service	0,196	0,257	0,245	Horizontal
	Affordable prices and promotions/bonuses	0,436	0,401	0,276	
	Passenger comfort and safety	0,368	0,342	0,480	
FITUR	Ease of ordering	0,779	0,822	0,908	Horizontal
	Location precision	0,767	0,836	0,867	
	Journey or route tracking	0,748	0,789	0,816	
	Payment Option and Methods	0,748	0,789	0,827	
	Driver ratings and reviews	0,626	0,671	0,704	
PAYMENT	Customer Service	0,699	0,776	0,796	Horizontal
	E-wallet	0,724	0,757	0,816	
	Cash	0,178	0,204	0,061	
RATING	Debit or Credit Card	0,098	0,039	0,122	Horizontal
	Drive Professionalism	0,515	0,566	0,520	
	Personal Data Security in an Application	0,331	0,408	0,265	
RIDE SHARING	Yes	0,110	0,118	0,071	Horizontal
	Never	0,890	0,882	0,929	
ECO TRANSPORTATION	Yes, equal price with non EV	0,883	0,882	0,959	Horizontal
	Not Interested	0,117	0,118	0,041	

Persona

Cluster 1

Cluster 1 with the name **The Minimum Budget Conscious Users** has a total of 39% of the total sample, which is 163 respondents. Customers in this cluster have female dominance without a personal income or pension. She primarily uses Grab and prefers medium-sized cars. Her usage frequency is low, ranging from 1 to 3 times per month, occurring during the daytime (10:00 am - 03:00 pm), afternoon (03:00 pm - 06:00 pm), or based on her needs (time usage is variable). She generally travels short distances of less than 5 kilometers and spends less than Rp 100,000 per month on online transportation. She values affordable prices and promotions or bonuses.

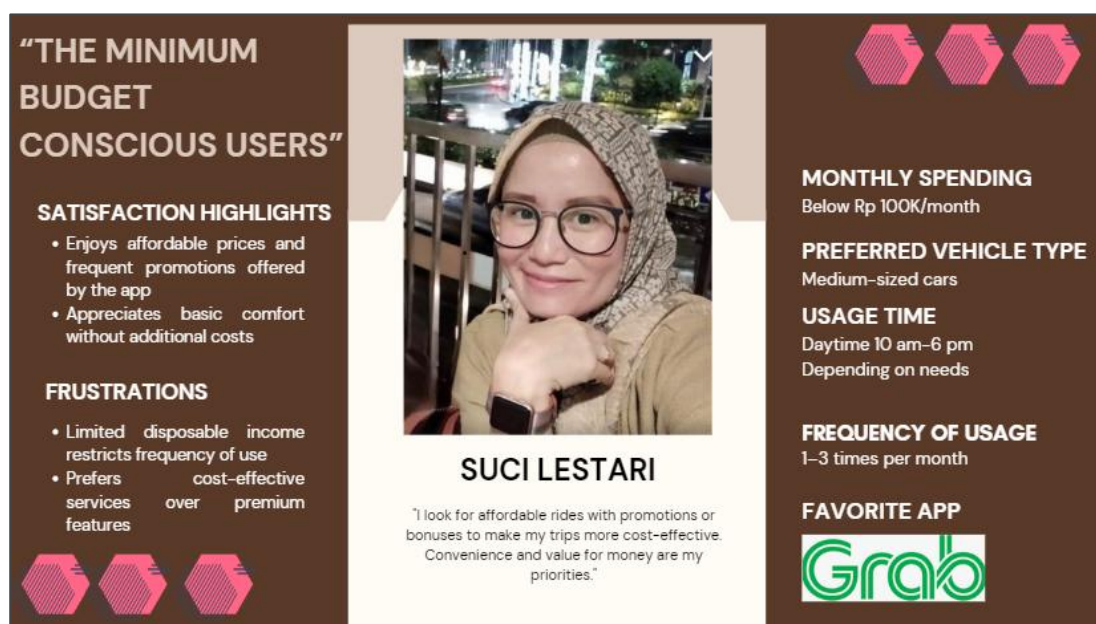


Figure 4. The Minimum Budget Conscious Users

Cluster 2

Cluster 2 with the name **Value-Seeking Occasional Users** has a total of 37% of the total sample, which is 152 people. The characteristics persona are a woman aged 15-34 years or above 55 years, with an educational background ranging from elementary school to a diploma. She works as a student, teacher, lecturer, entrepreneur, or is self-employed, earning less than Rp 10 million per month. She typically uses Gojek for her transportation needs, without any specific preference for car type. Her usage is primarily at night (06:00 pm - 00:00 pm) or during midnight to early morning hours (00:00 pm - 05:00 am), with travel distances usually ranging between 10-20 kilometers. Her monthly spending on online transportation is between Rp 100,000 and Rp 300,000, and she values the speed of service. She prefers cash payment methods. She expresses high satisfaction with Gojek, particularly appreciating the professionalism of the drivers. However, she is very concerned about personal data security within the app, uses ride-sharing services sparingly, and is not interested in environmentally friendly transportation services.



Figure 5. Value-Seeking Occasional Users

Cluster 3

Cluster 3 with the name **The Established Loyalist Gentleman** has a total of 24% of the total sample, namely 98 people. The characteristics persona are a man aged 35-54 years with a bachelor's or postgraduate degree. He works as an employee, civil servant, member of the Indonesian military, the Indonesian National Police, or in other similar professions, earning an income of more than Rp 10 million per month. He typically uses Bluebird and Maxim for transportation, preferring small cars (city cars) or large vehicles (minivans/SUVs). His usage times are primarily in the morning (06:00 am - 10:00 am) and afternoon (10:00 am - 03:00 pm), with travel distances ranging between 5-10 kilometers or exceeding 20 kilometers. His monthly spending on online transportation exceeds Rp 300,000, and he values the comfort and safety of the vehicle. He uses online transportation services 1-3 times per week and is highly attentive to the features provided in online transportation applications. He prefers to make payments using non-cash methods such as digital wallets or debit/credit cards. In terms of customer experience, he never uses ride-sharing services but is interested in environmentally friendly online transportation services, provided the tariffs are similar to other options.

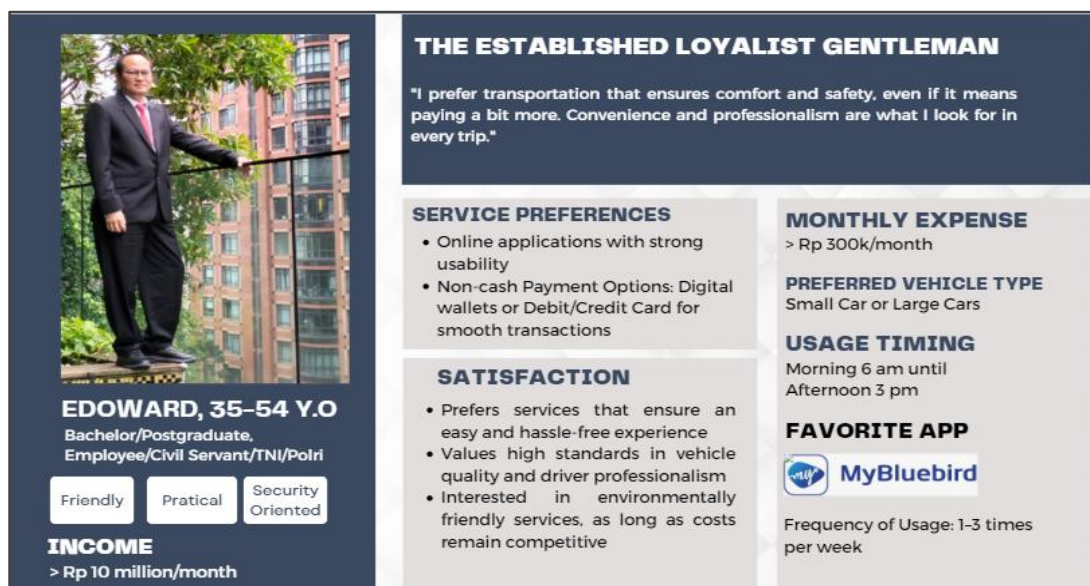


Figure 6. The Established Loyalist Gentleman

Segmentation Target Positioning

Cluster 3 "The Established Loyalist Gentleman" was selected as the target market segmentation with a productive age range between 35 to 54 years old. The cluster has more established incomes and tends to use online transportation services more frequently, with an average monthly expenditure of above Rp 300,000. Customers in this segmentation value ride comfort and safety. This cluster is an ideal target for marketing strategies that focus on improving user experience and offering services that suit their needs.

By targeting cluster 3, the positioning in the form of Online Value Proposition (OVP) must adjust to the needs and desires of this cluster. Based on the characteristics and preferences possessed by Cluster 3, some of the OVP on top 4Ps marketing mix that can be offered to attract the attention of this target segmentation include: **Comfort and Safety Assurance** that offer a selection of more comfortable, safe, clean and well-maintained premium vehicles (**product**) and professional drivers (**people**) that can provide a better driving experience; **Enhanced App Features** that provide more advanced safety features (**product**), such as real-time trip tracking, emergency buttons, and driver identity verification, to give users a sense of security; **Ease of Booking** optimizes the application interface to be more user-friendly, with one-click booking features and the option to save favorite routes, so users can book services quickly and easily (**place**). This positioning is also, of course, by offering various **Flexible Payment methods** (**product**) to users in making transactions and providing **Special Premium Services Offers** (**promotion**) with special package promotions or exclusive discounts for customers who travel frequently (loyal users), such as discounts for certain trips, and providing special offers for long-distance trips (more than 20 km), such as a flat rate or additional discounts based on a certain trip duration to further develop the loyalty program so that they feel valued and motivated to continue using the application.

CONCLUSION

To improve the effectiveness of marketing strategies, online transportation companies in Jabodetabek need to understand the market more deeply through clustering analysis (market

segmentation) using algorithms such as K-Means. This research categorizes consumers into three main clusters based on different characteristics, i.e. (1) **the Minimum Budget Conscious Users** (39% or 163 respondents) are predominantly women without personal income, who use online transportation infrequently (1-3 times per month) for short distances (<5 km) and spend less than Rp 100,000 per month. They prioritize affordable prices, promotions, and bonuses; (2) **the Value-Seeking Occasional Users** (37% or 152 respondents) are women aged 15-34 or above 55 years, earning less than Rp 10 million, who use services primarily at night for distances of 10-20 km, with monthly expenditures between Rp 100,000 and Rp 300,000. They value speed of service, cash payment methods, data security, and driver professionalism; lastly, (3) **the Established Loyalist Gentleman** (24% or 98 respondents) consists of men aged 35-54 years with incomes above Rp 10 million, who use online transportation more frequently (1-3 times per week) for medium to long distances (5-10 km or >20 km), spending over Rp 300,000 per month. This cluster emphasizes comfort, vehicle safety, advanced app features, and non-cash payment methods.

Among those clusters, the primary target is "The Established Loyalist Gentleman," since they are the most frequent users of online transportation services and have the highest spending, exceeding Rp 300,000 per month. Customers in this segment prioritize convenience, safety, and advanced app features.

Recommended value propositions within the top 4Ps marketing mix by focusing on product, place, people, and promotion that can be offered to this cluster include **Improved Comfort and Safety**, such as providing premium vehicles and ensuring driver professionalism; **App Feature Development**, such as features such as real-time trip tracking, emergency buttons, and driver identity verification; **Ease of Booking**, such as optimizing the app interface to be more user-friendly, **Enabling Quick Booking**; and **Special Offers and Discounts** that provide exclusive promotions for loyal customers. This approach is expected to increase customer loyalty, enhance the user experience, and strengthen the company's competitive position in the growing online transportation market in the Greater Jakarta area.

Given the prevalence of infrequent and occasional users in the data, it is recommended that future research target frequent users of ride-hailing services. This will improve the accuracy of segmentation and result in more customized package offerings.

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