



# Customer segmentation using the K-Means Clustering algorithm in Foreign Banks in Indonesia

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## ABSTRACT

This research aims to employ the K-Means clustering algorithm to segment customers in foreign banks operating within the Indonesian market. The primary objective is to enhance marketing strategies and customer service by identifying distinct customer groups based on their banking behaviours and preferences. By analysing demographic, transactional, and psychographic data, the study seeks to uncover patterns that can facilitate personalized offerings and targeted communication strategies. Overall, this research contributes to the optimization of marketing efforts and the enhancement of customer satisfaction in the competitive landscape of foreign banking in Indonesia. Through effective segmentation and targeted value propositions, foreign banks can strengthen their market position and foster long-term relationships with diverse customer segments. Overall, this research contributes to the optimization of marketing efforts and the enhancement of customer satisfaction in the competitive landscape of foreign banking in Indonesia. Through effective segmentation and targeted CVPs, foreign banks can strengthen their market position and foster long-term relationships with diverse customer segments.

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## 1. INTRODUCTION

The emergence of foreign banks in Indonesia has ushered in a new era in the nation's financial landscape, characterized by heightened competition, unprecedented opportunities, and multifaceted challenges (Shirkhorshidi, 2015). According to data from the Financial Services Authority (OJK), the Indonesian banking sector has experienced remarkable growth in recent years, with foreign banks playing an increasingly pivotal role in this expansion (Asim, etl, 2020). Between 2015 and 2020, the assets of foreign banks operating in Indonesia surged by an impressive result, highlighting their growing influence in the market and their significant contribution to the sector's evolution (Angelie, 2017).

These international institutions have not only broadened the spectrum of available financial products and services but have also played a vital role in modernizing and globalizing Indonesia's banking sector (Ariati, 2020).. With their extensive expertise, technological prowess, and vast resources, foreign banks have been instrumental in catalyzing innovation and driving efficiency improvements across the industry (Atyanto, 2019). As a result, Indonesian consumers now have access to a diverse array of banking options, ranging from traditional brick-and-mortar banking services to

cutting-edge digital solutions, offering unparalleled convenience and flexibility in managing their financial affairs (Christy, 2021).

In this rapidly evolving environment, understanding customer segmentation within foreign banks has become increasingly imperative (Danurisa, 2020). Indonesia's diverse population, spanning various demographic and socio-economic groups, presents both opportunities and challenges for foreign banks seeking to penetrate the market (Daulay, 2020). By segmenting customers based on their behaviors, preferences, and needs, banks can tailor their offerings and strategies to better serve their diverse clientele and gain a competitive edge in the market (Essayem, 2022).

The K-Means Clustering algorithm stands out as a sophisticated analytical tool that offers a powerful method for segmenting customers based on multivariate data (Gattorna, 2020). Leveraging this algorithm, foreign banks operating in Indonesia can identify distinct customer segments with similar characteristics, enabling them to develop targeted marketing campaigns, personalized product offerings, and tailored communication strategies that resonate with each segment (Handojo, 2023). This nuanced approach allows banks to effectively address the unique needs and preferences of different customer groups, thereby enhancing customer satisfaction and fostering long-term loyalty (Hidayatullah, 2021).

Moreover, customer segmentation is not merely a one-time exercise but rather an ongoing process that demands continuous monitoring and adjustment (Huang, 2020). As customer preferences and behaviors evolve in response to changing market dynamics and socio-economic trends, banks must adapt their segmentation strategies accordingly to ensure relevance and effectiveness (Ibrahim, 2022). This dynamic approach to segmentation enables banks to stay agile and responsive in an ever-changing market environment, thereby maintaining their competitive edge and staying ahead of the curve.

In addition to marketing and communication purposes, customer segmentation also plays a crucial role in product development and innovation (Imani, 2022). By gaining a deeper understanding of the unique needs and preferences of different customer segments, banks can design and launch new products and services that address specific market gaps and opportunities. For example, segmenting customers based on their digital banking preferences may reveal a growing demand for mobile payment solutions, prompting banks to invest in developing user-friendly mobile apps and payment platforms that cater to this emerging need (Jain, 2020).

Furthermore, customer segmentation can inform pricing strategies, risk management practices, and regulatory compliance efforts within foreign banks operating in Indonesia. By categorizing customers based on their risk profiles and financial behaviors, banks can better assess creditworthiness, manage loan portfolios, and comply with regulatory requirements. This granular approach to risk assessment not only helps mitigate potential losses but also ensures fair and equitable treatment of customers across different segments, thereby fostering trust and loyalty.

In the competitive landscape of Indonesia's banking sector, foreign banks face stiff competition not only from other foreign players but also from giant local banks. Established local banks such as Bank Mandiri, BRI, BCA, and BNI have a strong presence in the market, with extensive branch networks and loyal customer bases. To compete effectively, foreign banks must differentiate themselves by offering innovative products, superior customer service, and tailored solutions that resonate with Indonesian consumers (Kotler, 2016).

Moreover, understanding consumer behavior in Indonesia is essential for foreign banks to succeed in the market. Indonesian consumers exhibit diverse preferences and behaviors when it comes to banking services, influenced by factors such as cultural norms, technological adoption, and socio-economic status. For example, while urban consumers may prefer digital banking solutions for their convenience and accessibility, rural consumers may prioritize face-to-face interactions and personalized service, reflecting the country's diverse socio-economic landscape (Kumar, 2016).

In addition to retail banking opportunities, Indonesia offers significant investment opportunities for foreign banks, particularly in areas such as infrastructure financing, SME lending, and digital banking innovation. With Indonesia's robust economic growth and large population,

foreign banks have the opportunity to tap into emerging market segments and drive financial inclusion initiatives that benefit both consumers and the broader economy (Laroche, 2020).

Furthermore, it's imperative for foreign banks to navigate and adhere to regulatory frameworks established by the Financial Services Authority (OJK) in Indonesia. The OJK regulates and supervises all banking activities in the country to ensure stability, transparency, and consumer protection within the financial sector. Foreign banks must demonstrate compliance with these regulations while also aligning their strategies with the OJK's expectations for sustainable growth and responsible banking practices. By fostering a strong regulatory environment and promoting ethical conduct, the OJK plays a pivotal role in maintaining trust and confidence in Indonesia's banking system, thereby facilitating the smooth operation of foreign banks and fostering a conducive environment for long-term success and growth (Wang, 2022).

In conclusion, customer segmentation emerges as a cornerstone strategy for foreign banks navigating the intricate landscape of Indonesia's banking sector (Pedregrosa, 2020). This multifaceted process stands as a linchpin in not only defining the strategic trajectory but also in dictating the operational efficacy of foreign banks within the Indonesian market. By delving into the intricacies of customer segmentation and harnessing the power of cutting-edge analytical tools and methodologies, banks can glean profound insights into the intricate tapestry of customer behaviors and preferences (Pramesti, 2020). These insights, in turn, empower banks to craft highly targeted marketing campaigns and bespoke communication strategies that resonate deeply with the diverse array of customer segments, thereby fostering enhanced engagement, loyalty, and satisfaction (O'Hern, 2020).

In essence, customer segmentation serves as the bedrock upon which foreign banks can build their strategic foundations and operational frameworks within the Indonesian banking sector. Through a judicious blend of analytical acumen, market intelligence, and strategic foresight, foreign banks can harness the transformative power of customer segmentation to unlock a myriad of opportunities, drive sustained growth, and ultimately emerge as trailblazers within Indonesia's vibrant banking ecosystem (Rajagopal, 2017).

## 2. RESEARCH METHOD

The research method employed in this study is a mixed-method approach, combining both quantitative and qualitative techniques to comprehensively understand customer segmentation within foreign banks operating in Indonesia.

### **Quantitative Method:**

The quantitative aspect of the study utilizes the K-Means clustering algorithm, a widely recognized method for grouping data points into distinct clusters based on similarity. K-Means begins by randomly selecting initial cluster centroids, around which clusters are formed. Each data point is then assigned to the nearest centroid, partitioning the data into K clusters. After this assignment step, centroids are recalculated as the mean of all data points in each cluster, moving them to the center of their respective groups (Rahim, 2021). These steps are iteratively repeated until convergence, typically when centroids no longer change significantly. The final centroids represent cluster centers, and each data point belongs to the cluster with the nearest centroid. K-Means aims to minimize within-cluster variance, making it efficient for moderate-dimensional datasets. However, it may struggle with clusters of varying shapes or densities. Despite its limitations, K-Means remains a powerful tool for exploratory data analysis and pattern recognition, widely applied in fields like data mining, image processing, and market segmentation.

### **Qualitative Method:**

In addition to quantitative analysis, qualitative methods are employed to gain deeper insights into customer behavior and preferences. This involves conducting interviews with the target customer segment identified through the clustering analysis. Through interviews, researchers can explore nuanced aspects of customer preferences, motivations, and challenges that may not be fully captured

through quantitative data alone. By combining quantitative findings from the clustering analysis with qualitative insights from interviews, the study aims to provide a holistic understanding of customer segmentation within foreign banks operating in Indonesia.

**Sampling and Data Collection:**

The study population comprises customers of foreign banks operating in Indonesia. To ensure representative sampling, a sample size of 400 respondents was determined using probability sampling techniques. The data collection method involved surveys to gather information on customer demographics, banking preferences, and satisfaction levels. Surveys provide a structured approach to collecting quantitative data from a large sample size, allowing researchers to analyze trends and patterns within the customer population (Sugiono, 2020).

**Research Method Section:**

The research method section outlines the approach taken to conduct the study. It begins by defining the study population as customers of foreign banks operating in Indonesia. The rationale for determining the sample size and the methodology used for data collection, such as surveys, is explained. Additionally, the section highlights the use of the K-Means clustering algorithm for quantitative analysis and the incorporation of qualitative interviews to enrich the findings. By employing a mixed-method approach, the study aims to provide a comprehensive understanding of customer segmentation within foreign banks in Indonesia, combining quantitative rigor with qualitative depth (Rust, 2020).

**3. RESULTS AND DISCUSSIONS**

This is to presents the findings of the study and engages in a discussion of the results. It starts by elucidating customer preferences among different foreign banks in Indonesia, providing insights into the distribution of customers segment across these banks. The subsequent discussion delves into the cluster analysis conducted using the K-Means Clustering algorithm. Three variables—Customer Characteristics, Product Preferences, and Service Satisfaction—are analysed to segment customers effectively. The results are interpreted to understand the distinct customer segments within the foreign banking sector, enabling banks to tailor their offerings and services accordingly.

By providing a comprehensive explanation in each section, the paper offers a thorough understanding of customer segmentation within foreign banks in Indonesia. This allows policymakers, bank executives, and researchers to gain insights into customer behaviour and preferences, facilitating informed decision-making and strategic planning (Shirole, 2021).

**Customer Segmentation in Foreign Banks**

The table below presents the distribution of customer preferences among foreign banks in Indonesia, based on data.

Table 1. Customer Segmentation in Foreign Banks based on balance Change in Cluster Centers

Iteration	1	2	3	4	5	6	7	8
1	1.000	7.491	11.455	.000	.707	6.218	10.910	10.309
2	.000	.000	.000	.000	.000	.000	.000	.000

Convergence achieved due to no or small change in cluster centers. The maximum absolute coordinate change for any center is .000. the current iteration is 2. The minimum distance between initial centers is 87.367.

Table 2. Final Cluster Center

	Final Cluster Center							
	1	2	3	4	5	6	7	8
No	2	8	23	100	99	88	65	42
Age	65	65	43	49	18	81	29	41
Balance	25.000.000.000	5.000.000.000	500.000.000	500.000.000	5.000.000.000	1.000.000.000	100.000.000	250.000.000

Table 3. Percentage Segment

Percentage Segment in each Cluster		
Cluster	1 Ultra-High-Net-worth	3%
	2 High-Net-Worth	9%
	3 Matured Professional	20%
	4 Expatriate	1%
	5 Students	2%
	6 Small Business owner	19%
	7 Young Professional	28%
	8 Senior / retirees	18%

Cluster Analysis with K-Means

In this analysis, we seek to segment customers of foreign banks based on their demographic and financial profiles using K-Means Clustering. The segmentation will be based on the following variables: Customer Segments: This variable categorizes customers into different segments based on their financial status and life stage.

Percentage Distribution: This variable represents the percentage of each customer segment within the customer base of foreign banks. Before conducting the K-Means Cluster analysis, the data will be prepared by converting the percentage distribution into numerical values for clustering purposes.

The transformed data will be used to cluster customers into distinct groups, allowing us to identify similarities and differences among customer segments within the foreign banking industry. This segmentation can provide insights into customer preferences, behaviours, and needs, enabling banks to tailor their products, services, and marketing strategies to better meet the diverse needs of their customer base.

Cluster 1 – Ultra High Nett Worth



Figure 1. Ultra high net worth

The picture above is these are individuals with extremely high levels of wealth, typically exceeding tens of millions or even billions of dollars. They require specialized wealth management

services, investment advice, estate planning, and exclusive banking privileges, this segment constitutes 3% of the foreign bank's customer base.

The customer is Mr. Harsono, a 65-year-old ultra-high-net-worth individual, epitomizes success as an investor and entrepreneur. Despite his immense wealth, Mr. Harsono maintains a down-to-earth approach in certain aspects of his life. He is addicted to dining at Michelin-starred restaurants, indulging in the finest culinary experiences. A connoisseur of luxury, he has a penchant for Rolex watches, appreciating their timeless craftsmanship and prestige. Surprisingly, John prefers to ride a simple Toyota car, valuing functionality over extravagance. Additionally, he is a passionate Bordeaux wine lover, enjoying the complexities and sophistication of the finest vintages. These elements add depth to his character, showcasing a balance between opulence and simplicity in his lifestyle choices.

Cluster 2 – HNW



Figure 2. High net worth

The picture above is High-Net-Worth individuals have substantial assets and income, although slightly lower than UHNW individuals. They also seek personalized wealth management services, investment advice, and financial planning, this segment makes up 9% of the bank's customer base. The client is Mr. Widjaja navigated the rubber industry with navigated focus. His vision to extends beyond personal gain. It's about creating ripples of prosperity and empowering communities through fair distribution. Mr. Widjaja is connoisseur of Yamazaki Japanese single malt whisky, he is also having penchant for luxury, evident in his collection of Patek Phillippe watches. He is preferring comfort and service of Singapore Airlines for his journeys.

Cluster 3 – Matured Professionals



Figure 3. Matured Professionals

The picture above is These are individuals who are well-established in their careers and have reached a stable financial position. They require a range of banking services, including savings accounts, investment options, and retirement planning. This segment accounts for 20% of the bank's customer base.

The customer is Mr. Michael, a seasoned professional in his mid-forties, Mr. Michael with decades of expertise in accounting. Passionate about excellence, he navigates finance with confidence and precision. Michael's commitment to integrity and continuous improvement defines his journey, as he aims to make a meaningful impact in his field and community. You can find him networking on LinkedIn and sharing insights on Facebook. Outside of work, Michael's style is defined by his favourite clothing brands, Mont Blanc and Hugo.

Cluster 4 – Expatriates



Figure 4. Expatriates

The picture above is New immigrants or expatriates who need assistance with international banking services, foreign exchange, remittances, and cross-border financial solutions tailored to their unique circumstances. This segment accounts for 1% of the bank's customer base. The customer is Markus is a dynamic insurance executive from Germany, now thriving in Jakarta, Indonesia. With over a decade of industry experience, Markus is a strategic leader driving growth and innovation in his company. Beyond the boardroom, Markus enjoys savouring Paulaner beer while watching FIFA matches, indulging in his passion for Rolex watches, and navigating Jakarta with ease using the Gojek app.

Cluster 5 – Students

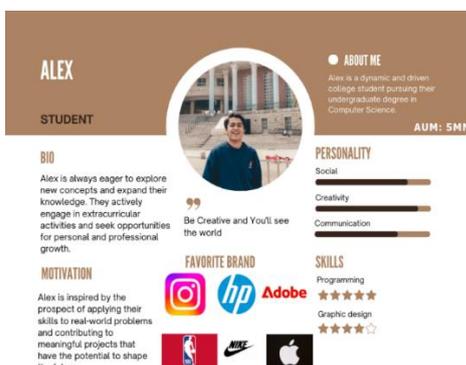


Figure 5. Students

The picture above is College or university students who require student banking services, including student loans, low fee checking accounts, and financial literacy education. This segment constitutes 2% of the bank's customer base. The customer is a 18-year-old college student from Indonesia named Alex, currently pursuing a degree in Computer Science. Driven by a passion for technology and innovation, Alex is proactive in seeking out opportunities for growth and personal development. With a natural curiosity and a strong work ethic, they embody the spirit of a lifelong learner, constantly striving to reach new heights in their academic and professional pursuits.

Cluster 6 – Seniors/retiree



Figure 6. Senior/retiree

The picture above is Retired individuals or seniors looking for retirement planning services, pension management, and products like annuities, long-term care insurance, and estate planning. This segment makes up 18% of the bank's customer base. The client is Mrs. Izabella. An 81-year-old retired executive with a passion for finance that defies age. Sharp and astute, she remains actively involved in the financial world, managing her investment portfolio with precision. Izabella's dedication to staying intellectually engaged and leaving a legacy for her high-achieving children sets her apart as a vibrant and inspiring figure in retirement. Outside of finance, Izabella enjoys the finer things in life, with a love for Seiko watches, TWG tea, and Louis Vuitton.

Cluster 7 – Young Professionals



Figure 7. Young Professionals

The picture above is Recent graduates or young professionals who require basic banking services like savings accounts, checking accounts, and perhaps student loans or entry-level credit cards. This segment represents 28% of the bank's customer base. The client is Steven an accountant, Steven aims to excel in her career while maintaining a fulfilling personal life. Sharing daily moments on Instagram, keeping fit at Fitness First, and staying connected with his favourite brands like Nike. He is also an Android enthusiast, always staying up to date with the latest tech trends.

#### Cluster 8 – Small business owners



Figure 8. Small business owners

The picture above is Entrepreneurs and small business owners who need business banking services such as business accounts, loans, lines of credit, and merchant services. This segment comprises 19% of the bank's customer base. The client is Intan, Intan promotes Indonesian fashion locally and internationally, often highlighting her favourite Hermes and Dior pieces. Intan aims to expand her boutique into a global brand, open additional location in major fashion capitals, and increase her influence by collaborating with international brands.

#### Customer Value Proposition

##### Ultra-High-Net-Worth Individuals (UHNW):

##### Background:

As an ultra-high net worth individual, Mr. Harsono epitomizes success as an investor and entrepreneur. Despite his immense wealth, Mr. Harsono maintains a down-to-earth approach in certain aspects of his life. He is addicted to dining at Michelin-starred restaurants, indulging in the finest culinary experiences. A connoisseur of luxury, he has a penchant for Rolex watches, appreciating their timeless craftsmanship and prestige. Surprisingly, Mr. Harsono prefers to ride a simple Toyota car, valuing functionality over extravagance. Additionally, he is a passionate Bordeaux wine lover, enjoying the complexities and sophistication of the finest vintages. These elements add depth to his character, showcasing a balance between opulence and simplicity in his lifestyle choices (Umar, 2020).

Mr. Harsono's profile presents a unique opportunity for crafting a tailored Customer Value Proposition (CVP) that resonates with his specific needs, preferences, and pain points. As an ultra-high-net-worth individual, Mr. Harsono's financial landscape is characterized by complexity and a

demand for sophisticated financial services. Traditional banking offerings may fall short in meeting his expectations, necessitating a bespoke CVP that addresses his pain points and delivers tangible value. One significant pain point for individuals of Mr. Harsono's caliber is the challenge of managing immense wealth effectively. Despite his substantial assets, Mr. Harsono requires specialized wealth management services that go beyond conventional banking solutions. He seeks personalized investment advice, estate planning assistance, and exclusive banking privileges tailored to his unique financial goals and risk tolerance.

Additionally, Mr. Harsono's diverse interests and lifestyle preferences present opportunities for designing a multifaceted CVP. While he appreciates luxury in certain aspects of his life, such as dining at Michelin-starred restaurants and collecting Rolex watches, he also values simplicity and functionality, as evidenced by his preference for a modest car. Understanding these nuances is crucial for crafting a CVP that strikes the right balance between opulence and practicality, offering tailored solutions that cater to Mr. Harsono's diverse lifestyle choices.

Furthermore, Mr. Harsono's passion for Bordeaux wine underscores the importance of offering experiential value as part of the CVP. Providing access to exclusive wine tastings, vineyard tours, or curated wine collections can enhance his overall banking experience and foster a deeper sense of engagement and loyalty.

#### Product Target:

As an ultra-high net worth individual, your financial landscape demands unparalleled expertise and personalized attention. Our bespoke wealth management services are tailored to your exacting standards, offering exclusive access to a curated suite of investment opportunities, estate planning strategies, and concierge banking services. From intricate wealth preservation techniques to innovative succession planning solutions, we prioritize discretion, sophistication, and excellence in every aspect of your financial journey.

For individuals like Mr. Harsono, who value stability and security alongside opportunities for growth, our product offerings include a range of wealth preservation products designed to safeguard and grow your assets over time. These products prioritize capital preservation while aiming for reasonable gains with lower risk. Our multi-asset products combine diversified investment strategies across various asset classes, providing you with a balanced portfolio that can weather market fluctuations and economic uncertainties (Tsipsis, 2019).

Moreover, our comprehensive suite of wealth management services extends beyond traditional investment products to encompass personalized solutions for estate planning, tax optimization, and legacy management. Whether you're seeking to protect your wealth for future generations or optimize your financial legacy, our team of specialists is dedicated to providing strategic guidance and tailored solutions that align with your long-term goals and values.

With our dedicated team of specialists and global network, we provide the highest level of service and discretion, ensuring that your legacy is meticulously safeguarded and strategically enhanced for generations to come. Whether you're looking to preserve your wealth, grow your assets, or plan for the future, our wealth management services are designed to meet your unique needs and aspirations, empowering you to navigate the complexities of wealth with confidence and peace of mind.

#### 4. CONCLUSION

This journal aimed to better understand the diverse customer base of foreign banks operating in Indonesia through the application of the K-Means Clustering algorithm. By analyzing the given data, which includes the percentage distribution of various customer segments, we sought to identify distinct groups of customers based on their demographic and financial characteristics.

Ultra-High-Net-Worth Individuals: This segment represents a small but significant portion of the customer base, comprising individuals with exceptionally high levels of wealth and sophisticated

financial needs. Foreign banks must provide personalized wealth management services, investment opportunities, and exclusive banking privileges to cater to the unique requirements of this elite group.

By identifying and understanding these distinct customer segments, foreign banks operating in Indonesia can tailor their products, services, and marketing strategies to better meet the diverse needs and preferences of their target customers. Personalized banking experiences, targeted product offerings, and effective communication strategies can enhance customer satisfaction, increase customer retention, and drive business growth in the competitive banking industry.

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