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Segmentation, targeting and positioning analysis using k-means clustering model: A case study of the laptop market in Indonesia

Tubagus Chandra Saputra[1], Savira Maghfiratul Fadhilah[2], Shidiq Umar Mangkuto[3], Jerry Heikal[4]
[1,2,3,4]Master of Management, Universitas Bakrie, JI. HR Rasuna Said Kav. C-22, Kuningan, South Jakarta, Jakarta, Indonesia

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ABSTRACT

In Indonesia's rapidly evolving laptop market, understanding consumer preferences is crucial for maintaining competitiveness. This study employs the K-Means Clustering algorithm to segment the laptop market based on variables such as age, income, expenditure, laptop price, main usage, and selection criteria. Data were collected from 271 respondents in the Jabodetabek area through an online survey. The analysis identified six distinct customer clusters: Edu-Tech Enthusiasts, Executive Civil Servants, Gov-Corp Society, Steady State Officials, Corporate Climbers, and Emerging Entrepreneurs. Each cluster exhibits unique characteristics and preferences, including preferred brands and price ranges. The findings emphasize the importance of targeted marketing strategies tailored to the specific needs of each segment. By leveraging these insights, laptop producers can optimize product offerings, pricing strategies, and promotional campaigns to enhance market share, customer loyalty, and profitability in Indonesia's competitive laptop industry.

Corresponding Author:

Tubagus Chandra Saputra,
Master of Management,
Universitas Bakrie,
JI. HR Rasuna Said Kav. C-22, Kuningan, Jakarta Selatan, Jakarta, Indonesia
Email: 2231011070@student.bakrie.ac.id

1. INTRODUCTION

In the rapidly advancing digital era, Indonesia's laptop industry faces significant challenges and opportunities. Customers are among the most valuable assets of a company, playing a crucial role in enhancing its market competitiveness and overall performance (Bi, 2019). Due to the abundance of formidable competitors in the business sector, companies are facing intensified rivalries as they strive to attract new customers and retain their existing clientele (Sarkar et al., 2024). Technological advancements and changing consumer needs have created a highly heterogeneous market with various brands, specifications, and features. The abundance of options presents a challenge for both consumers and producers. Consumers often struggle to find products that meet their needs and budget, while producers struggle to understand and fulfill diverse preferences. According to Kotler and Keller (2016), a deep understanding of consumer preferences and needs is essential for developing effective marketing strategies. This not only includes determining which products to develop but also marketing positioning and promotion strategies.

As the market grows, consumers face an increasing number of options, making it more challenging for producers to understand and effectively target their market. Armstrong et al. (2014)

highlight that markets are characterized by high heterogeneity. Consumers have diverse preferences and needs that range from technical specifications to design and price. This heterogeneity makes it difficult for producers to understand and accurately target their market. In the current highly competitive and rapidly changing business environment, with customers becoming more demanding, companies should select and focus on one or a few specific segments of the overall market (Aghdaie, 2014). Customer segmentation is a strategic approach that involves grouping customers based on shared characteristics or behaviors (Harahap et al., 2022). A lack of understanding can hinder a company's ability to design and implement targeted and effective marketing strategies.

In this situation, the application of the K-Means Clustering method can help companies address challenges related to difficulties in identifying distinct customer segments and tailoring marketing strategies. The main purpose of the K-means algorithm is to partition a dataset into K separate clusters, which are exclusive groups centered around the K centroids computed by the algorithm (Sinaga & Yang, 2020). By using the K-Means Clustering Model, companies can discover distinct market segments and design marketing strategies that are tailored to each one (Farhan & Heikal, 2024). The K-Means clustering algorithm was selected because it has demonstrated effectiveness in handling large and complex datasets (Miraftabzadeh et al., 2023). This method allows companies to group consumers based on similar preferences and behaviors, facilitating a deeper understanding of each segment. With a better understanding of each segment, companies can develop marketing strategies that are more targeted, relevant, and effective for each consumer group.

Therefore, K-Means Clustering is a valuable tool for enhancing the efficiency and effectiveness of digital marketing strategies, highlighting its uniqueness among various applications in related research (Ardiansyah et al., 2024). Customer retention focuses on preserving the loyalty of existing clients, whereas customer development seeks to enhance the value of their purchases. During the customer attraction phase, customer segmentation is a widely used technique to identify and select clients within each segment (Kamthania et al., 2018). Clustering enables researchers and marketers to group data into several clusters based on similar characteristics, which is very useful for simplifying a large and complex market into more manageable segments (Apriani & Heikal, 2024). Furthermore, identifying customer clusters with shared characteristics enables the personalization of marketing messages, enhancing customer engagement and improving responses to campaigns (Yusnidar et al., 2023).

Customer segmentation involves grouping consumers into distinct categories based on their shared characteristics (Shirole et al., 2021). Market segmentation using clustering methods like K-Means Clustering has proven effective in various industries. For instance, a study conducted by Ariati et al. (2023) successfully identified different customer segments in the UHT milk industry at Greenfield. The findings show that customer segmentation enables companies to understand the characteristics, preferences, and purchasing patterns of each segment. With this understanding, companies can optimize marketing strategies, promotion, and product development to meet the needs of each customer segment. Furthermore, customer segmentation is not a one-off task but an ongoing process that requires continuous monitoring and adaptation (Huang et al., 2020).

In this research, the primary focus is the market segmentation analysis of laptops using clustering techniques, specifically the K-Means algorithm. Indonesia presents a promising market for the laptop industry. Data from the Central Statistics Agency (BPS) (2023) indicated that as of 2021, 18.24 million Indonesians owned computers or laptops. Furthermore, laptops are the second-largest device used in Indonesia for accessing the internet, second only to mobile phones. The increasing number of laptop users in Indonesia mirrors the global growth in laptop sales. International Data Corporation (IDC) reported that global laptop sales in 2021 reached 348.8 million units, showing significant growth of 14.8% compared to the previous year.

Lenovo leads the market with a 24.1% share in 2021, followed by HP (21.7%), Dell (17.4%), Apple (8.5%), and Acer (7.1%) (Mukka & Dutt, 2024). Interestingly, despite all major vendors experiencing growth, Apple recorded the highest annual growth of 28.3%, indicating a shift in consumer preferences towards premium products.

Market segmentation is a fundamental concept in marketing that has become a primary focus in academic research and industry applications. Kotler and Keller (2016) define market segmentation as the process of dividing a market into distinct groups of buyers with different needs, characteristics, or behaviors that may require different products or marketing mixes. Effective market segmentation allows companies to understand consumer needs and preferences more deeply, enabling the development of more relevant and effective products and marketing strategies.

Business intelligence is vital in enabling companies to leverage technical skills to gain deeper insights into their customers. In outreach programs that utilize clustering methods, such as the k-means algorithm, customers with similar characteristics are grouped together (Dey, 2024). By implementing the K-Means Clustering method, companies can address these challenges and develop more effective, targeted, and profitable marketing strategies. This algorithm groups data into a predetermined number of clusters based on attribute similarity, with each resulting cluster interpreted as a market segment with distinct characteristics, providing valuable insights for strategic decision-making.

The K-Means algorithm has proven successful in market segmentation applications for various products. For instance, a study by Rose and Mawarni (2023) used this algorithm to identify different market segments for consumer products based on preferences and purchasing behaviors. This research aims to contribute to the literature by exploring the application of the K-Means algorithm within the laptop market context.

Market segmentation, is a powerful technique in market research, enables businesses to group their customers into distinct segments based on shared characteristics, thereby facilitating targeted and personalized approaches. It is particularly through techniques like K-Means Clustering, offers producers insights into understanding consumer needs and preferences. This is crucial in competitive markets like laptops, where accurate consumer understanding can help companies develop more appealing products and effective marketing strategies (Perdhana & Heikal, 2024). By understanding market segments, producers can offer products tailored to specific consumer needs and launch targeted marketing campaigns. This will not only increase operational efficiency but also enhance customer satisfaction, leading to better customer retention, and ultimately, increased sales. Moreover, market segmentation helps companies allocate marketing resources more efficiently. With an understanding of each customer segment's characteristics and preferences, companies can tailor promotional, distribution, and product development strategies to better reach their target audience, avoiding resource waste and maximizing marketing impact (Resti & Heikal, 2023). As a result, market segmentation not only enhances customer satisfaction but also improves marketing cost efficiency for companies.

This research contributes significantly to the understanding of Indonesia's laptop market by applying the K-Means Clustering algorithm, effectively revealing distinct consumer segments. Laptop producers can enhance resource efficiency and customer engagement by tailoring marketing and product development to these segments. The insights gained also aid in optimizing sales strategies and informing policy development for a competitive market. This strategic focus is crucial for boosting profitability and aligning product offerings with consumer expectations, fostering sustained growth in the dynamic digital marketplace.

This research aims to provide valuable insights for laptop producers to optimize their strategies and better navigate the highly competitive market. By understanding different market segments and their characteristics and preferences, producers can adjust product offerings, pricing strategies, and promotional campaigns to be more relevant and appealing to each customer segment. Ultimately, this is expected to increase market share, customer loyalty, and company profitability within the highly competitive laptop industry in Indonesia. Effective market segmentation also enables companies to identify new market opportunities and target previously underserved potential customer segments, providing comprehensive market insights and fostering adaptive and sustainable strategies to address future competition and changing consumer preferences. The innovation of this research lies in its ability to provide a detailed profile of the target segment, including factors such as income, age, and preferred social media platforms. This allows producers to create a distinct buyer persona for each customer type, helping them to identify

which products to prioritize for sale. As a result, marketing efforts can be optimized to maximize profitability.

2. RESEARCH METHOD

This study utilizes quantitative methods and a correlational approach to assess the extent to which variations in demographics and purchasing behavior correlate with preferences for different laptop features. This is done to deeply understand how these factors interact and influence consumer purchasing decisions.

The target population for this study includes laptop users residing in the Jabodetabek area. To meet the established research objectives, purposive sampling is used, allowing researchers to select respondents based on specific criteria thought to provide the most relevant information to the research hypothesis (Sugiyono, 2016). The criteria for selecting respondents are individuals of productive age who actively use laptops in their daily activities. The minimum sample size chosen for this study is 271 respondents, which is considered sufficient to yield representative and valid results.

Primary data in this study is collected through an online survey using Google Forms. The questionnaire is designed to collect information about the demographic characteristics of respondents, laptop purchasing behavior, and preferences for specific features such as screen size, storage capacity, and laptop brands. The distribution of the questionnaire is conducted through social media platforms and online forums frequently visited by the target respondents. The collected data is then processed using SPSS software for initial data cleaning and necessary data transformation. Subsequently, for further analysis, the data is processed using the K-means algorithm in SPSS to classify respondents into groups or clusters based on their similar characteristics. The results of this cluster analysis provide a better understanding of market segmentation, which is crucial in formulating effective marketing strategies.

3. RESULTS AND DISCUSSIONS

Respondent Profile

Demographic variables such as age, gender, family, education level, and income were the segmentation's most accessible and standard variables (Nica et al., 2019). Demographic segmentation assists business owners in defining their marketing strategies more effectively. For instance, a company targeting teenagers would likely employ a digital marketing approach, while a more traditional marketing strategy might be better suited for reaching middle-aged customers. This approach is among the most common techniques used to understand and analyze customer behavior and market segments (Mulyo & Heikal, 2022).

In this study, the demographic characteristics of the respondents revealed a significant gender distribution, with the majority being women, accounting for 271 respondents or 63.8%. Meanwhile, male respondents numbered 98, making up 36.3% of the sample. The age range of participants varied from 16 to 50 years, with an average age of 25.49 years. The majority of respondents fell within the 21 to 28-year age group, which comprised 50% of the total, indicating a broad demographic variation that could influence the study's results due to different needs and preferences associated with age.

Regarding education, the levels varied significantly among respondents, with the majority holding a Bachelor's degree, representing 44.65% or 121 respondents. High school graduates accounted for 39.48% or 107 respondents, while those with a Diploma made up 9.59% or 26 respondents. Postgraduate and junior high school education levels were represented by 3.69% (10 respondents) and 2.58% (7 respondents), respectively. This distribution suggests that most respondents had a relatively high level of education, which could affect their knowledge and perceptions of the research topic.

The respondents' occupations were diverse, with the majority working as private sector employees, totaling 82 individuals. This was followed by students and government employees, each accounting for 77 and 46 respondents, respectively. Entrepreneurs numbered 25, state-

owned enterprise employees 22, and homemakers 17. The variety in employment status provided diverse insights into the research topic, as each occupational group might have different perspectives and experiences.

From an economic perspective, the distribution of respondents' income and expenditure is as follows:

Table 1. Economic characteristics of respondents

Monthly Income	Qty.	%	Monthly Spending	Qty.	%
< Rp5.000.000	110	40.59	> Rp 3.000.000	149	54.98
Rp5.000.000 - Rp10.000.000	108	39.85	Rp3.000.000 - Rp5.000.000	80	29.52
Rp10.000.000 - Rp20.000.000	38	14.02	Rp5.000.000 - Rp10.000.000	28	10.33
Rp20.000.000 - Rp50.000.000	12	4.43	Rp10.000.000 - Rp20.000.000	8	2.95
> 50.000.000	3	1.11	> 20.000.000	6	2.21

Source: Primary Data (2024), processed

The majority of respondents fall into the low to middle income groups, with expenditures relatively proportional to their incomes. This indicates that most respondents may have a limited budget for non-essential expenditures.

The distribution of respondents' domiciles shows variation that includes several main areas in Jakarta and its surrounding buffer zones such as Bogor, Depok, Tangerang, Bekasi, Karawang, and areas outside Jabodetabek. Here are the details of the respondents' domicile distribution:

Table 2. Geographic characteristics of respondents

Domicile	Qty.	%
Jakarta	91	33.58
Bogor	51	18.82
Tangerang	43	15.87
Depok	33	12.18
Bekasi	32	11.81
Outside Jabodetabek	21	7.41

Source: Primary Data (2024), processed

The majority of respondents are from the Jakarta area, making up a third of the total respondents. Other areas around Jabodetabek such as Bogor, Tangerang, Depok, and Bekasi also have significant representation. The remainder are respondents residing outside the Jabodetabek area.

Cluster Analysis with K-Means

This study uses x variables to group 6 laptop market clusters in Indonesia according to the respondents' professions using K-Means Clustering. These variables include age, income, expenditure, laptop price, main usage, and considerations in choosing a laptop. Before running the K-Means Cluster test, the research data was converted into "dummy variables" to facilitate the grouping process. The following are some clusters identified using K-Means:

Cluster 1: Edu-Tech Enthusiast, this group includes students around 25 years old who do not have a steady income and rely on pocket money. They are highly aware of the value of technology in supporting their academic activities, making them very selective in choosing laptops that are not only affordable but also efficient for educational purposes. Students in this cluster tend to have relatively low monthly expenses, between Rp1-3 million, reflecting their limited budget as consumers. They prioritize laptops priced between Rp5-10 million, offering an ideal combination of performance and portability, allowing them to easily carry the device to campus or other learning places. Asus is the preferred brand for this group, known for offering high-performance laptops at reasonable prices. This preference indicates the students' tendency to seek reliable devices for multitasking without exceeding their budget constraints. Overall, Edu-Tech Enthusiasts look for practical solutions that meet their academic needs while fitting within their financial limitations, demonstrating a pattern of smart and planned purchasing.

Cluster 2: Executive Civil Servant, this group includes senior civil servants around 50 years old. Members of this group have stable and relatively high incomes, reflecting their senior positions in the government structure. They show a mature preference for laptops, seeking devices that not

only support work efficiency but also offer high reliability and durability. Members of this cluster have expenditures balanced with their incomes, ranging from Rp10-20 million. They tend to choose laptops priced between Rp10-15 million, a price range that reflects the need for more premium devices without being overly expensive. This choice is based on the desire to have a reliable laptop to handle complex administrative tasks and resource-intensive applications. Dell is the dominant brand among this group, chosen for its strong reputation in producing durable, high-performance business laptops. This preference also indicates the group's tendency to prioritize brands that offer good technical support and adequate warranties, essential factors for professionals who rely on their laptops for daily work. Overall, Executive Civil Servants seek laptops that can be reliable work partners, ensuring they have the right tools to support their established careers, with an emphasis on performance, reliability, and after-sales support.

Cluster 3: Gov-Corp Society, this group includes female state-owned enterprise employees around 30 years old. Members of this group have a Bachelor's degree and reside in Jakarta, with a monthly income range of Rp5-10 million. They are very responsible in financial matters, as reflected by their monthly expenditures being lower than their incomes. In terms of choosing laptops, this group is highly selective, preferring products that not only support administrative activities but also can be relied upon as an investment in their professional environment. This is one reason this group tends to prioritize graphic reliability as an important feature in choosing laptop products, without neglecting the reliability of technical specifications. Asus is the primary laptop brand choice for this group.

Cluster 4: Steady State Official, this group includes civil servants around 30 years old who have established careers with moderate incomes between Rp5-10 million. Members of this group demonstrate maturity in financial management with good expenditure control, seeking a balance between cost and quality in their purchases. When choosing laptops, they prioritize devices that offer a solid combination of technical performance and appealing aesthetics. The ideal price range for them is Rp5-10 million, reflecting their desire to own reliable technology without paying a premium. This choice is influenced by their need for devices that can handle routine administrative tasks and also serve as a professional status symbol in the workplace. Lenovo is a frequently chosen brand by this group, known for its elegant design and stable performance. Their preference for Lenovo indicates a preference for brands that not only meet functional needs but also provide added value through attractive design and long-term reliability, important in a government work environment where professional appearance is highly valued. Overall, Steady State Officials seek laptops that reflect their professional status and support work efficiency with high reliability, integrating functional needs with a desire for satisfying aesthetics and product durability.

Cluster 5: Corporate Climber, this group consists of private sector professionals around 42 years old who have reached high levels in their careers with substantial incomes and expenditures, ranging between Rp10-20 million. Members of this cluster lead demanding lifestyles that often involve intensive use of technology, seeking laptops that not only support professional tasks but also reflect their social status. In selecting laptops, this group tends to choose high-range devices priced between Rp15-25 million. They prioritize high technical specifications and large storage capacities to meet work needs that often involve processing large data and intensive multitasking applications. Investing in higher-priced laptops is also seen as part of their professional appearance, with the latest technology often considered a symbol of success and sophistication. High-end MacBook and Lenovo are the most favored brands in this cluster, chosen for their build quality, advanced features, and strong ecosystems that support productivity and connectivity. The preference for these brands indicates that cluster members highly value innovation, reliability, and technical support that can enhance work efficiency. Overall, Corporate Climbers seek laptops that are not only work tools but also long-term investments that support their dynamic and fast-paced professional lifestyles. They prioritize performance, durability, and design in every purchasing decision, demonstrating how technology can be an integral part of their professional and personal identity.

Cluster 6: Emerging Entrepreneur, this group consists of private entrepreneurs around 36 years old with moderate incomes between Rp5-10 million. Cluster members are ambitious individuals continually striving to grow their businesses. They tend to have controlled expenditures,

showing a prudent approach in managing personal and business finances. This group seeks laptops that offer competent technical specifications at reasonable prices, ranging between Rp5-10 million, reflecting their need for cost efficiency without sacrificing quality. The chosen laptops often need to handle a variety of tasks, from business administrative management to design and presentation needs, which are vital in the entrepreneurial world. Brands like Acer and Lenovo are popular choices in this cluster because they offer good value for investment. Acer is known for its economical yet sufficiently powerful offerings for business applications, while Lenovo is valued for its reliability and durability. This choice indicates that entrepreneurs in this cluster prioritize performance and reliability, seeking devices that can reliably support daily business activities. Overall, Emerging Entrepreneurs view technology as an essential tool for achieving business growth and success. They prioritize laptops that can effectively support their professional needs while maintaining a budget balance, reflecting their dynamic and adaptive entrepreneurial characteristics.

Positioning Strategy

The following is an analysis of clusters based on the number of cases per cluster in the study.

Table 2. Number of cases per cluster

Cluster	1	86.000
	2	1.000
	3	112.000
	4	45.000
	5	9.000
	6	18.000
Valid		271.000
Missing		.000

Source: Primary Data (2024), processed

According to the K-Means cluster analysis, the results show that the cluster with the highest number of cases is cluster 3, consisting of 112 respondents. This group is predominantly made up of 25-year-old women with a bachelor's degree residing in Jakarta. Characteristically, this group comprises fresh graduates entering the professional environment. Dominated by state-owned enterprise employees, they have stable incomes and good financial control. When it comes to choosing laptops, this group is willing to spend more if they believe the value matches the investment return. This market is considered a primary segment for the laptop market in Indonesia due to their strong purchasing power and the highest number of cases according to the research results.

4. CONCLUSION

Based on the analysis and discussion conducted, it can be concluded that the laptop market in Indonesia has diverse preferences and needs represented by five different clusters. This conclusion highlights that the Indonesian laptop market is very dynamic, with specific needs according to the professional profile and requirements of each cluster, emphasizing the importance of targeted marketing strategies to efficiently reach these diverse market segments. The first cluster, EduTech Enthusiast, consists of selective students with a high awareness of the value of technology to support academics, choosing laptops that ideally balance performance and portability, with Asus being a popular choice due to its high performance at reasonable prices. The second cluster includes Senior Public Officials who rely on more premium devices that are not overly expensive, not only supporting work efficiency but also emphasizing performance, reliability, and after-sales support.

Furthermore, the fourth cluster, Steady State Official, includes civil servants who prioritize a combination of technical performance and aesthetics, with Lenovo often being the choice due to its attractive design. The fifth cluster, Corporate Climber, consists of professionals who have reached high levels in their careers and choose high-range laptops like high-end MacBook and Lenovo, reflecting the need for advanced technology and as a symbol of social status. Lastly, the sixth cluster, Emerging Entrepreneur, comprises private entrepreneurs seeking cost efficiency

without sacrificing technical specifications, with popular choices being brands like Acer and Lenovo.

Limitations of this study include a sample limited only to major urban areas in Indonesia, which may not fully represent consumer preferences in rural areas or other less urbanized regions. Additionally, the data collected depends on subjective surveys, which may be influenced by respondents' perceptions or personal preferences that are not entirely objective. Future research should broaden the geographic diversity of the sample to include a more extensive range of regions across Indonesia. Expanding beyond the Jabodetabek-dominated sample will help capture a wider spectrum of consumer behaviors and preferences, potentially unveiling unique market segments not represented in the current study.

This conclusion underscores that the Indonesian laptop market is highly dynamic, with specific needs according to the professional profile and requirements of each cluster, emphasizing the importance of targeted marketing strategies to effectively reach these diverse market segments.

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