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Smartphone Selection by Consumer Using SWARA and CODAS Technique

Oğuz Han AYKUT¹

¹ Asst. Professor, Erzincan Binali Yıldırım University, oaykut@erzincan.edu.tr, ORCID: 0000-0002-3243-9881

Abstract: The global smartphone sector is undergoing a continuous process of change, driven by increasing consumer expectations, intense competition, and rapidly advancing technology. Consequently, this dynamic structure influences consumers' smartphone preferences. In this context, the aim of this study is to determine the importance levels of the criteria that influence consumers' smartphone choices and to rank smartphone models according to the weights obtained. In line with this objective, the study is based on two fundamental research questions: First, "Which criteria are more important to consumers when choosing a smartphone?"; second, "How are smartphone models ranked according to the determined criterion weights?" In the study, the importance levels of the criteria were determined using the SWARA technique; the ranking of alternative models was performed using the CODAS technique. The findings have been interpreted from a marketing perspective. The results of the research reveal that the criteria consumers value most when choosing a smartphone are RAM capacity, price, battery power, and internal memory. In this context, the most suitable alternatives were found to be, in order, the Xiaomi Redmi Note 14 Pro, Xiaomi Redmi 13, and Xiaomi Redmi 14C. This research contributes to academic literature and practical applications by enabling the systematic examination of smartphone models based on consumer-focused criteria.

Keywords: Smartphone, Consumer Behavior, Consumer Preference, Multi-Criteria Decision Making (MCDM), SWARA, CODAS

Jel Codes: M31, C02, C44

SWARA ve CODAS Tekniği ile Tüketicilerin Akıllı Telefon Seçimi

Öz: Küresel akıllı telefon sektörü, artan tüketici beklentileri, yoğun rekabet ortamı ve hızla gelişen teknolojiyle birlikte sürekli bir değişim süreci yaşamaktadır. Dolayısıyla bu dinamik yapı, tüketicilerin akıllı telefon tercihlerine etki etmektedir. Bu bağlamda araştırmanın amacı, tüketicilerin akıllı telefon seçiminde etkili olan kriterlerin önem derecelerini belirlemek ve elde edilen ağırlıklar doğrultusunda akıllı telefon modellerini sıralamaktır. Bu amaç doğrultusunda çalışma, iki temel araştırma sorusuna dayanmaktadır: İlki, "Akıllı telefon seçiminde hangi kriterler tüketiciler için daha fazla önem ifade etmektedir?"; ikincisi ise, "Belirlenen kriter ağırlıkları doğrultusunda akıllı telefon modelleri nasıl sıralanmaktadır?" şeklindedir. Araştırmada, kriterlerin önem dereceleri SWARA tekniğiyle belirlenmiş; alternatif modellerin sıralaması ise CODAS tekniğiyle yapılmıştır. Bulgular ise pazarlama perspektifinden yorumlanmıştır. Araştırma sonuçları, tüketicilerin akıllı telefon seçiminde en fazla önem verdikleri kriterlerin RAM kapasitesi, fiyat, pil gücü ve dâhili hafıza olduğunu ortaya koymaktadır. Bu kriterler bağlamında en uygun alternatiflerin ise sırasıyla Xiaomi Redmi Note 14 Pro, Xiaomi Redmi 13 ve Xiaomi Redmi 14C olduğu bulunmuştur. Bu araştırma, tüketici odaklı kriterler doğrultusunda akıllı telefon modellerinin sistematik olarak incelenmesine olanak tanıyarak akademik literatüre ve uygulamaya yönelik alanlara katkı sağlamaktadır.

Anahtar Kelimeler: Akıllı Telefon, Tüketici Davranışları, Tüketici Tercihi, Çok Kriterli Karar Verme (ÇKKV), SWARA, CODAS

Jel Kodları: M31, C02, C44

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1. Introduction

In today's world, where technological innovations are accelerating, products are constantly undergoing transformation, and the actors involved in the production process are also forced to keep pace with this change (Aykaç, 2024). This rapid transformation process has led to the obsolescence of traditional marketing approaches (Türköl, 2020). The new marketing approaches that have emerged are influencing consumer behavior. In this new process, consumers care not only about what a product does but also about how it makes them feel and how much they can trust it. Therefore, products are becoming a dynamic value element that meets both functional and emotional expectations (Gill, 2008).

These expectations remain valid for high technology products such as smartphones, tablets, and computers, as they do for many other product groups (T. C. Sanayi ve Teknoloji Bakanlığı, 2025). The widespread potential use of high technology products in many sectors, such as information and software technologies, the defense and aerospace industry, pharmaceuticals and biotechnology, electronic and optical devices, energy technologies, nanotechnology, and new materials, clearly demonstrates the need for a more in-depth and specialized marketing approach specific to such products (Ali et al., 2023; Moore, 2014; Pascussi et al., 2023; T. C. Sanayi ve Teknoloji Bakanlığı, 2025).

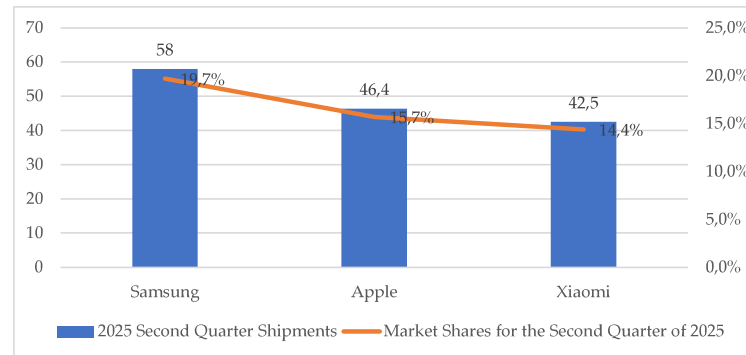
Due to their widespread use by consumers and increasing presence in everyday life, smartphones stand out among high technology products (Uslu, 2020). A smartphone is a mobile technological device that not only makes phone calls and sends text messages but also offers advanced functions beyond these (Blahnik & Schindelbeck, 2021, p. 146). Smartphone usage, which is generally considered within the scope of mobile phone usage, actually highlights the need to distinguish between the concepts of mobile phones and smartphones. In this regard, it would be useful to distinguish the term mobile phone into (1) basic mobile phones and (2) smartphones (Çakır & Demir, 2014).

Basic mobile phones primarily perform fundamental communication functions such as voice calls, text messaging, and limited internet access. In contrast, smartphones, which stand out as social networking tools, are effectively used to access and share personal and social information thanks to their multimedia-based digital infrastructure (Rice & Katz, 2008). Smartphones have more advanced programming capabilities and connectivity options than basic mobile phones because they are more innovative devices (Chow et al., 2012; May & Hearn, 2005).

Smartphones offer their users a wide range of uses through various applications. Thanks to these mobile technological devices, users can perform many tasks just like on a computer, such as sending and receiving emails, accessing and editing office documents, spending time on social networks, playing games, or watching videos and movies (Işık & Kaptangil, 2018; Kuyucu, 2017; Nawaz et al., 2025). This situation significantly changes consumers' communication practices and media interaction patterns, while also paving the way for transformations that reshape businesses' marketing strategies (Gröne et al., 2009). Mobile technologies, which offer new opportunities to reach consumers, are creating significant impacts on modern management by increasing the effectiveness of marketing activities (Gülşen & Özdemir, 2019; Haghirian & Madlberger, 2005). In short, rapidly developing smartphones are increasingly influencing consumers' daily routine behaviors and have become one of the fundamental criteria of modern telecommunications technology (Alsmadi et al., 2024).

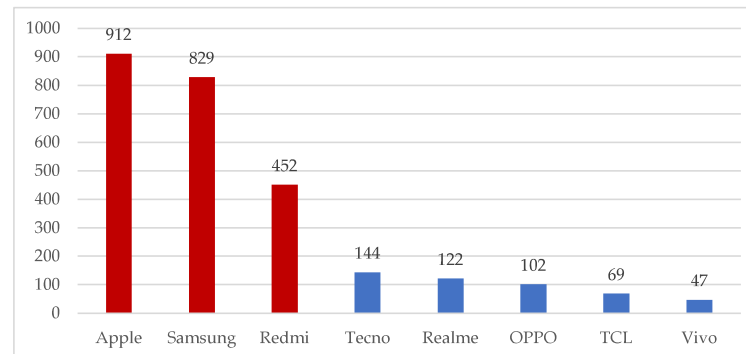
In recent years, the smartphone industry has become the focal point of the global market due to intense competition and constantly evolving product diversity. Over time, competition between major technology companies has intensified, and significant fluctuations in market share have been observed (Polat & Akan, 2020). Worldwide smartphone shipments recorded partial growth in the second quarter of 2025. According to a report released by the International Data Corporation (IDC) for the relevant period, global smartphone shipments increased by 1% year-on-year, reaching approximately 295.2 million units. When evaluated by brand, Samsung ranks first with 58 million shipments and a 19.7% market share. Apple ranked second with 46.4 million units

shipped and a 15.7% market share, while Xiaomi ranked third with 42.5 million units shipped and a 14.4% market share (IDC, 2025). The global smartphone shipment volume and market shares for the specified period are presented in Graph 1.



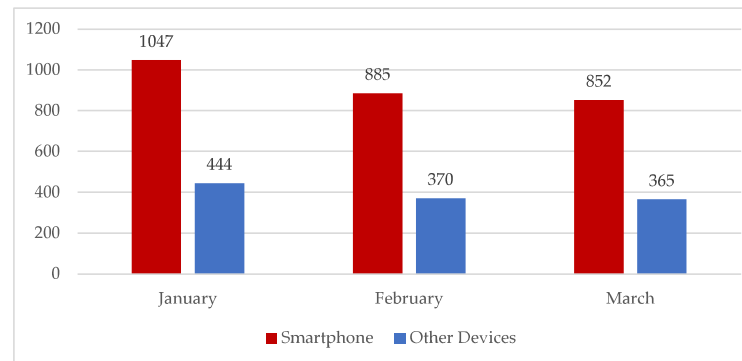
Graph 1. Worldwide Smartphone Shipments (Millions of Units) and Market Share (%) in the Second Quarter of 2025 According to IDC Data (Source: IDC, 2025.)

The widespread use of smartphones and the increase in data usage are observed in our country as well as globally. According to data from the Information and Communication Technologies Authority (BTK) of the Republic of Turkey, more than 2.9 million mobile devices were registered with IMEI in the first quarter of 2025. When evaluated by brand, approximately 73.5% of these devices were Apple, Samsung, and Xiaomi Redmi products (BTK, 2025). Graph 2 below shows the distribution of mobile devices registered with the BTK Mobile Device Registration System by brand during the relevant period.



Graph 2. Number of Mobile Devices Registered by Brand in Turkey in the First Quarter of 2025 According to BTK Data (Thousands) (Source: BTK, 2025.) Note: BTK has not yet released its second quarter report for 2025.

Devices with registered IMEI numbers are classified as smartphones and other devices (Internet of Things [IoT], modems, tablets), including imported or domestically manufactured products. As can be seen in Graph 3, the majority of registrations in the first quarter of 2025 belong to smartphones.



Graph 3. Number of Smartphones and Other Devices Registered with IMEI in Turkey in the First Quarter of 2025 According to BTK Data (Thousand Units) (Source: BTK, 2025.) Note: BTK has not yet released its second quarter report for 2025.

The global smartphone market is undergoing constant transformation due to rapidly advancing technology, increasing consumer expectations, and intense competition (Song, 2010). This dynamic environment plays a decisive role in shaping consumers' smartphone preferences. During the selection process, consumers place great importance on numerous criteria, including price, RAM capacity, internal memory, performance, camera quality, battery life, screen size, weight, design, software support, after-sales services, and brand image (Cordella et al., 2021; Dilek, 2018; Flores-Martin et al., 2024; Rakib et al., 2022).

Therefore, correctly identifying these issues provides businesses with a competitive advantage while also offering significant benefits to consumers. A selection process based on systematically defined criteria helps consumers make more informed and reliable decisions. This allows consumers to save time and money by choosing the alternative that best suits their needs and expectations. Furthermore, reducing the risk of consumers choosing the wrong product increases their post-purchase satisfaction levels, while evaluations made using objective methods offer them a transparent choice. Ultimately, this approach contributes to both consumers obtaining greater benefits and businesses increasing their competitive strength.

Considering the above-mentioned points, smartphones serve as an appropriate example for determining the selection criteria for high technology products. Therefore, the research focuses on smartphones from the wide range of high technology products. This research aims to determine the importance levels of the criteria that play a role in consumers' smartphone preferences and to rank smartphone models according to the weights obtained. The research contributes to the literature by addressing smartphone selection using multi-criteria decision-making methods, enabling manufacturers and marketing managers to develop competitive strategies based on the findings, and helping consumers make more informed and rational purchasing decisions. Additionally, the research is unique in that it models the decision-making process in a comprehensive and systematic manner by weighting consumer priorities in smartphone selection using SWARA and ranking them using CODAS. In this context, the main questions of the research are as follows:

- **RQ 1:** Which criteria are more important in choosing a smartphone?
- **RQ 2:** How are smartphone models ranked using the Combinative Distance-Based Assessment (CODAS) method based on the criterion weights determined by the Step-wise Weight Assessment Ratio Analysis (SWARA) method?

2. Literature Review

This section of the research briefly discusses studies that evaluate and rank smartphone selection based on various criteria using different Multi-Criteria Decision Making (MCDM) techniques found in national and international literature. It also includes studies that apply the SWARA and CODAS techniques together to different selection and ranking problems.

Hu & Liao (2013) used the Analytical Hierarchy Process (AHP) technique to identify the criteria that consumers consider important when purchasing smartphones. According to the findings, hardware and software features were determined to be the most important criteria for consumers. Mobile commerce and entertainment functions were found to be the least important criteria for consumers.

Bayhan & Bildik (2014) used the AHP technique from the MCDM methods in their study. The findings showed that the most suitable model for consumers was the General Mobile Discovery Elite. The Apple 5S model ranked last.

Keçek & Yüksel (2016) aimed to rank smartphone alternatives using the AHP and Preference Ranking Organization Method for Enrichment Evaluation (PROMETHEE) techniques from the MCDM methods. The results obtained showed that the Samsung S6 Edge Plus model was the most preferred model. It was also determined that after-sales service was the most important criterion in purchasing a smartphone.

Percin & Pancaroğlu (2019) used Structural Equation Modeling (SEM) and AHP techniques in their study to propose an effective MCDM model for smartphone selection. The study found that cost, physical and technical features, and quality criteria have statistically significant effects on smartphone selection.

Maghsoodi et al. (2019) aimed to determine the most suitable cement material for dam construction using SWARA and CODAS techniques. Within the scope of the study, thirteen selection criteria were considered, and six different types of cement were evaluated. According to the findings, the most important criterion was C4, and the most suitable alternative was A1.

Ulutaş (2020) used both SWARA and CODAS techniques in selecting a courier company. In this context, six courier companies were evaluated, and six selection criteria were considered. The research results show that the most important criterion is on-time delivery, and the highest performance score belongs to company CC1.

Bacziewicz et al. (2021) used four different techniques (Characteristics Objects Method [COMET], Technique for Order Preference by Similarity to Ideal Solution [TOPSIS], VlseKriterijumska Optimizacija I Kompromisno Resenje [VIKOR], and PROMETHEE II) to compare sixteen phone models based on criteria such as price, memory, RAM, camera, and year of manufacture. According to the findings, the best phone differed in each method, while all methods yielded the same result for the worst models. The study revealed that users place greater importance on the phone being a new model, having powerful memory, and having a good camera when choosing a phone; price alone is not a decisive criterion.

The study conducted by Bayram (2022) aimed to comparatively analyze the financial performance of privately capitalized banks operating in our country using SWARA and CODAS techniques. Ten banks were examined within the scope of the research. Eight different financial ratio evaluation models were included as performance criteria. The findings show that banks with codes A4, A1, and A5 have higher performance scores compared to other alternatives. On the other hand, banks with codes A6 and A9 were found to have relatively lower performance.

In the study conducted by Özden & Erişlik (2022), the CODAS technique was applied as a decision-making tool for smartphone selection. Based on expert opinion, the ten distinguishing factors that users value most in phone selection were determined as decision criteria. According to the findings, the smartphone model providing the highest benefit was found to be the Samsung S21 Ultra, while the model providing the least benefit was the Apple iPhone 13 Pro Max.

Lam et al. (2024) used both AHP and TOPSIS techniques to determine which criteria undergraduate students prioritize when choosing a cell phone and which brands they prefer. The findings indicate that Apple is the most preferred brand, while Vivo is the least preferred brand. Furthermore, it was concluded that criteria such as processor, battery, RAM, price, brand, and ease of use were highly important.

Unal et al. (2024) aimed to determine the importance levels of criteria influencing green restaurant choice in their study. Within this scope, an assessment was conducted to understand sustainability-focused consumer behavior. The study analyzed the assessments of five experts using the SWARA method. The findings indicate that hygiene, price, and environmental awareness are the most decisive criteria in green restaurant selection.

Güler & Polatgil (2024) evaluated 44 electric vehicle models available for sale in Turkey based on 11 different criteria. Expert opinions were used to weight the criteria, and the AHP-SWARA methods were employed. The findings reveal that the most important criterion for experts is battery capacity.

Santoso & Widodo (2025) used the AHP technique to determine the most suitable option among smartphones with 6 GB of RAM. Samsung, Oppo, Realme, and Redmi brands were evaluated based on price, design, battery power, and processing power criteria. According to the findings, Realme was identified as the most preferred brand, followed by Redmi, Oppo, and Samsung.

Aktepe et al. (2025) analyzed the copper teapot selection process based on consumer preferences in the geographically indicated copperware sector in Erzincan province using SWARA-CODAS methods and evaluated the results from a marketing perspective. The findings indicate that the most important criterion in copper teapot selection is product thickness. Additionally, it was determined that alternative A2 is the most suitable option.

Chen & Lui (2025) aimed to identify the factors and strategies that promote green tourism and environmentally conscious consumer behavior within the framework of the circular economy. In the study, the importance weights of the criteria were determined using the PF-SWARA method, while the ranking of the strategies was performed using the PF-COPRAS method. The findings revealed that sustainable resource use, ecosystem restoration, and environmental regulations are the most critical factors, while encouraging technological innovation is the most effective strategy for developing green tourism.

When examining studies conducted on smartphone selection in the literature, it is observed that consumer preferences have a multidimensional structure and that criteria such as technical specifications, price, performance, and ease of use are evaluated together. It is noteworthy that a significant portion of these studies widely use multi-criteria decision-making methods such as AHP, TOPSIS, PROMETHEE, and similar approaches; through these methods, attempts are made to determine the criteria influencing consumer preferences and to rank alternatives. It is generally accepted in the literature that technical and economic factors such as RAM capacity, battery power, internal memory, and price are the key criteria that stand out in consumer decisions across different samples and periods. These findings show that, given the high-tech nature of smartphones, consumers focus on performance and the price-performance balance in their decision-making process.

However, it is observed that there are limited studies in the literature that address criterion weighting and alternative ranking stages in an integrated manner. In particular, there are very few studies that use SWARA and CODAS techniques together, and studies on the direct application of these methods to smartphone selection remain limited. Moreover, in some of the existing studies, criterion weights are based solely on expert opinions, and current market dynamics and consumer-focused data are not sufficiently taken into account. In this context, the current research aims to fill this gap in the literature by weighting the criteria that consumers value in smartphone selection using the SWARA method and ranking alternatives using the CODAS method, based on the current literature. Thus, the study offers a comprehensive approach from a methodological

perspective and provides a unique contribution to the literature by addressing consumer behavior within a quantitative and systematic framework.

3. Methodology

3.1 Research Purpose and Importance

The purpose of the research is to determine the importance levels of the criteria that influence consumers' smartphone choices and to rank smartphone models according to the weights obtained. This will reveal, through a holistic approach, which criteria consumers consider more important and how models compete based on these criteria.

The importance of the research can be considered from three perspectives. First, it contributes to the literature. This research adds methodological diversity to the field of consumer behavior by addressing the multi-criteria nature of smartphone selection using quantitative methods. Second, it contributes to practice. The findings are expected to help manufacturers and marketing managers develop strategies that provide a competitive advantage by focusing on the criteria prioritized by consumers. Thirdly, it is the social contribution. The research provides information that can support consumers in making informed and rational decisions. In short, this research is expected to contribute to both academic literature and the practical world by enabling the systematic analysis of smartphone models based on consumer criteria.

3.2. Research Scope and Limitations

The universe of the research consists of smartphones belonging to the Apple, Samsung, and Xiaomi Redmi brands, which are the best-selling brands in Turkey according to the report published by BTK in the first quarter of 2025. In determining the models, the "Best Sellers" category of Trendyol, the most visited e-commerce site in Turkey in 2025 (Magna Digital Pazarlama Ajansı, 2025; Marketing Türkiye, 2025), was used. The nine best-selling models from Apple, Samsung, and Xiaomi Redmi in this category were evaluated (Trendyol, 2025). Selecting alternatives from a single marketplace may result in other popular models being excluded from evaluation. Consequently, this limits the generalizability of the results obtained.

Similar studies in the literature were used to determine the criteria considered in the selection of smartphone brands and models (Baczekiewicz et al., 2021; Bayhan & Bildik, 2014; Özden & Erişlik, 2022). Within this framework, seven criteria were determined for the research. The findings obtained are only valid for the research sample and cannot be generalized to other brands, models, periods, and criteria.

3.3. Data Set and Method

The research dataset includes the criteria that consumers consider important when choosing a smartphone, as well as the smartphone brands and models with the highest sales on the Trendyol e-commerce site in Turkey. The technical specifications of the smartphones examined in the research were obtained from the official websites of the manufacturers and internationally widely used technical data platforms such as GSMArena. This approach ensured the accuracy and currency of the data on alternatives, thereby increasing the reliability of the data set.

The research addressed the multi-criteria decision-making process for smartphone selection using the integrated application of SWARA and CODAS techniques. First, the criteria to be considered in smartphone selection were determined in line with the relevant literature. The SWARA technique was used to calculate the relative importance levels of the identified criteria. At this stage, the criterion weights were determined based directly on consumers' perceptions and preferences. The data collection process was conducted face-to-face using a structured questionnaire. In this context, a group of eight consumers, experienced in smartphone use and capable of analytically evaluating the criteria, was asked to evaluate the identified criteria in order of importance and indicate the relative importance levels between successive criteria. The individual evaluations obtained were

combined to calculate the final criterion weights. In the final stage, the smartphone alternatives were ranked using the CODAS technique with the criterion weights obtained by the SWARA method. The profile of the decision-makers is presented in Table 1.

Table 1. Profile of Decision Makers

Decision Makers	Gender	Age Range	Educational Level	Profession	Smartphone Usage Duration (Years)	Different Brand Experience (Number)
DM1	Male	45-54	Doctor's degree	Academician	15	5
DM2	Male	35-44	License	Self-employment	11	3
DM3	Female	35-44	License	Public Servant	10	4
DM4	Female	25-34	Associate degree	Private Sector Employee	8	3
DM5	Male	35-44	Postgraduate	Academician	13	4
DM6	Male	45-54	License	Public Servant	12	3
DM7	Male	25-34	Postgraduate	Student	9	4
DM8	Female	45-54	License	Academician	14	4

The criteria identified in the research, smartphone alternatives, and codes used in the analysis phase are provided in Table 2.

Table 2. Data Set

Criteria and Codes		Alternatives and Codes	
Code	Criterion	Code	Alternative
C1	RAM Capacity (GB)	A1	Apple iPhone 13 128GB
C2	Internal Memory (GB)	A2	Apple iPhone 15 256GB
C3	Main Camera Resolution (MP)	A3	Apple iPhone 16 Pro 128GB
C4	Screen Size (inch)	A4	Samsung Galaxy A16 128GB
C5	Price (TL)	A5	Samsung Galaxy A26 5G 256GB
C6	Weight (Gram)	A6	Samsung Galaxy A56 5G 256GB
C7	Battery Power (mAh)	A7	Xiaomi Redmi 13 256GB
		A8	Xiaomi Redmi Note 14 Pro 512GB
		A9	Xiaomi Redmi 14C 256GB

• SWARA Technique

SWARA is a method developed by Keršulienė et al. (2010) for calculating criterion weights in MCDM problems. In the SWARA technique, where evaluation is performed proportionally, the importance level of the criteria is determined by the decision-makers. This allows criterion weights to be estimated (Atan & Altan, 2020, pp. 274-275; Elmas & Özkan, 2021, p. 245; Keršulienė et al., 2010, p. 243).

The processing steps of this technique are as follows (Keršulienė et al., 2010):

Step 1: Criteria are ranked from the most important to the least important, starting with the criterion the decision-maker considers most important. The criterion deemed most important by the decision-maker does not have to be assigned a value of 1.00. This is because this method is based on relative comparisons between successive criteria rather than the absolute normalization of individual assessments (Stanujkic et al., 2015; Atan & Altan, 2020). However, although SWARA does not strictly require assigning 1.00 to the first criterion, in order to ensure consistency with common applications and avoid ambiguity, the highest-ranked criterion was normalized to 1.00 in this study.

Step 2: In this step, the relative average importance score for each criterion is calculated using Equality (1).

$$S_j = \frac{\sum_{k=1}^l p_j^k}{l}; j = 1, \dots, n \quad (1)$$

Step 3: In Step 2, based on the importance scores calculated, a size-to-size relationship is first established between the criteria, then a comparison is made, and finally S_j value is calculated.

Step 4: Using Equality (2), the coefficients K_j are calculated for all criteria, and the coefficient of the criterion with the highest S_j value is set to $K_j=1$.

$$K_j = S_j + 1; j = 1, \dots, n \quad (2)$$

Step 5: Using Equality (3), the adjusted weights (q_j) are calculated for all criteria. The adjusted weight for the criterion at the top of the list is taken as $q_j = 1$.

$$q_j = \frac{q_{j-1}}{K_j}; S_{j-1} > S_j \quad (3)$$

Step 6: In this step, the final weights w_j of the criteria are calculated using Equality (4).

$$w_j = \frac{q_j}{\sum_{j=1}^n q_j}; j = 1, \dots, n \quad (4)$$

• CODAS Technique

The CODAS technique developed by Keshavarz Ghorabae et al. (2016) is based on calculations that consider the distances of decision alternatives from the negative ideal solution. In this technique, the distances of decision alternatives from the negative ideal solution are calculated using two types of measures. First, alternatives are evaluated based on Euclidean distance. However, if these values are equal or very close, the Taxicab distance is used to distinguish between them. The alternative furthest from the negative ideal solution is considered the most suitable option (Baki, 2022, p. 223; Şeyranhoğlu & Kara, 2024, p. 191).

The steps of this technique are as follows (Keshavarz Ghorabae et al., 2016):

Step 1: At this stage, a decision matrix covering alternatives and criteria is created.

$$X = [x_{ij}]_{n \times m} = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix}; i = 0; m, j = 1, \dots, n \quad (5)$$

In the decision matrix created, x_{ij} (where $x_{ij} \geq 0$); i represents the alternatives, and j represents the criteria.

Step 2: The values in the decision matrix are normalized for benefit and cost criteria using the following equations.

For benefit criteria:

$$n_{ij} = \frac{x_{ij}}{\max x_{ij}} \quad (6)$$

For cost criteria:

$$n_{ij} = \frac{\min x_{ij}}{x_{ij}} \quad (7)$$

In Equality (6) and Equality (7), i represents the alternatives, while j represents the normalized performance value under the criteria.

Step 3: In the previous step, the normalized values are multiplied by the importance weights of the criteria to obtain the weighted normalized decision matrix. w_j (Where $0 < w_j < 1$) represents the weight of the j^{th} criterion.

$$R_{ij} = w_j n_{ij} \quad (8)$$

Step 4: The negative ideal solution is calculated using Equation (9) for all criteria.

$$ns = [ns_i]_{1 \times m}, \text{ where } ns_j = \min(i) r_{ij} \quad (9)$$

Step 5: Euclidean and Taxicab distances are calculated using Equations (10) and (11).
For calculating Euclidean distances:

$$E_i = \sqrt{\sum_{j=1}^m (r_{ij} - ns_j)^2} \quad (10)$$

For calculating Taxicab distances:

$$T_i = \sum_{j=1}^m |r_{ij} - ns_j| \quad (11)$$

Step 6: Considering the Euclidean and Taxicab distances between one alternative and another, the relative evaluation matrix is created using the following equations.

$$R_a = [h_{ik}]_{n \times n} \quad (12)$$

$$H_{ik} = (E_i - E_k) + (\psi(E_i - E_k) \times (T_i - T_k)) \quad (13)$$

Here, $k \in \{1, 2, 3, \dots, n\}$, and ψ denotes the threshold function based on the Euclidean distance between two alternatives.

$$\psi(x) = \begin{cases} 1 & \text{if } |x| \geq \tau \\ 0 & \text{if } |x| < \tau \end{cases} \quad (14)$$

The τ parameter in the equation is determined by the decision-maker and is generally recommended to be between 0.01 and 0.05. Reviews in the literature show that this parameter is mostly set to 0.02. If the Euclidean distance difference between two alternatives is less than the τ value, the comparison is made based on the Taxicab distance. In this research, the τ parameter was set to 0.02.

Step 7: Evaluation scores for all alternatives are being calculated.

$$H_i = \sum_{k=1}^n h_{ik} \quad (15)$$

Step 8: The evaluation scores of the alternatives calculated in the previous step are ranked from highest to lowest, and the alternative with the highest score is determined to be the best option compared to the others.

The primary reason for choosing the SWARA technique in the criterion weighting process is that the method requires less comparison based on the evaluations of decision-making consumers with smartphone usage experience and reduces the cognitive load on decision-makers. The CODAS technique, used in ranking alternatives, provides more discriminative results by considering the distances to the negative ideal solution. Due to these characteristics, the combined use of the SWARA and CODAS techniques strengthens the methodological consistency of the study. However, the SWARA technique is sensitive to the quality and number of the decision-maker group, as it involves subjective judgments based on decision-maker evaluations. Similarly, the τ threshold parameter used in the CODAS technique can influence the results. Therefore, the findings should be evaluated within the framework of the decision-maker group used and the parameter selection.

3.4. Research Ethics

This study has been prepared in accordance with research and publication ethics principles. The data used is publicly available. The data in question was obtained from "www.btk.gov.tr, www.trendyol.com, www.magnadigital.com.tr, www.gsmarena.com, and ww.marketingturkiye.com.tr." In addition, all sources used in the research are cited both in the text and in the bibliography.

4. Findings

4.1 Findings Related to the SWARA Method

The calculations related to the SWARA analysis were performed using Equations (1), (2), (3), and (4). The decision matrix of the SWARA analysis is presented in Table 3, and the findings are presented in Table 4. The first value in each cell of Table 3 indicates the criterion's order of importance from the decision-maker's perspective; the second value indicates the relative importance score given by the relevant decision-maker.

Table 3. SWARA Decision Matrix

Decision Makers Criteria	DM1		DM2		DM3		DM4		DM5		DM6		DM7		DM8	
C1	3	0.80	4	0.85	1	1.00	1	0.90	4	0.70	2	0.75	2	0.90	1	0.95
C2	4	0.70	3	0.90	5	0.70	3	0.80	5	0.65	4	0.60	4	0.70	3	0.80
C3	6	0.50	6	0.50	2	0.95	6	0.55	6	0.60	5	0.55	6	0.60	4	0.70
C4	5	0.60	5	0.80	4	0.75	5	0.60	2	0.95	7	0.05	3	0.80	6	0.50
C5	1	1.00	1	1.00	7	0.50	2	0.85	1	1.00	1	0.80	1	1.00	5	0.60
C6	7	0.30	7	0.20	3	0.80	7	0.50	7	0.30	6	0.10	7	0.50	7	0.40
C7	2	0.90	2	0.95	6	0.60	4	0.70	3	0.90	3	0.70	5	0.65	2	0.90

In accordance with the decision-maker assessments presented in Table 3, the comparative importance values of the criteria were first calculated. Then, using these values, the coefficient values and recalculated weight values were obtained. In the final stage, the final weight values of the criteria were calculated and ranked in order of importance. These values are presented in Table 4.

Table 4. Criteria Weightings

Criteria	The Comparative Importance of Average Value (S _i)	Coefficient Value (K _i)	Recalculated Weight Value (q _i)	Final Weight Values (w _i)	Priority Ranking
C1		1	1	0.166	1
C5	0.02	1.02	0.980	0.163	2
C7	0.05	1.05	0.930	0.154	3
C2	0.06	1.06	0.880	0.146	4
C4	0.10	1.10	0.800	0.133	5
C3	0.01	1.01	0.790	0.131	6
C6	0.23	1.23	0.640	0.106	7

Based on the analysis conducted using decision-maker evaluations, Table 4 shows that the most important criterion is C1, with a final weight of 0.166. C5 ranks second with a final weight of 0.163, C7 ranks third with a final weight of 0.154, C2 ranks fourth with a final weight of 0.146, the C4 criterion ranks fifth with a final weight of 0.133, the C3 criterion ranks sixth with a final weight of 0.131, and the C6 criterion ranks last with a final weight of 0.106.

4.2. Findings Related to the CODAS Method

The findings of the CODAS analysis are presented below. The decision matrix for evaluating alternatives based on the defined criteria is shown in Table 5.

Table 5. Decision Matrix

Alternatives	Criteria						
	C1	C2	C3	C4	C5	C6	C7
A1	4	128	12	6.1	35.999	173	3095
A2	6	256	48	6.1	54.999	171	3349
A3	8	128	48	6.3	78.299	199	3582
A4	6	128	50	6.7	9.850	200	5000
A5	6	256	50	6.7	13.819	200	5000
A6	8	256	50	6.7	22.699	198	5000
A7	8	256	108	6.5	8.539	205	5000
A8	12	512	200	6.67	18.018	180	5500
A9	8	256	50	6.88	8.949	205	5160

The values in the decision matrix have been normalized using Equality (6) and Equality (7). The normalized decision matrix obtained in this manner is presented in Table 6.

Table 6. Normalized Decision Matrix

Criteria Alternatives	C1	C2	C3	C4	C5	C6	C7
A1	0.3333	0.2500	0.0600	0.8866	0.2372	0.9884	0.5627
A2	0.5000	0.5000	0.2400	0.8866	0.1553	1.0000	0.6089
A3	0.6667	0.2500	0.2400	0.9157	0.1091	0.8593	0.6513
A4	0.5000	0.2500	0.2500	0.9738	0.8669	0.8550	0.9091
A5	0.5000	0.5000	0.2500	0.9738	0.6179	0.8550	0.9091
A6	0.6667	0.5000	0.2500	0.9738	0.3762	0.8636	0.9091
A7	0.6667	0.5000	0.5400	0.9448	1.0000	0.8341	0.9091
A8	1.0000	1.0000	1.0000	0.9695	0.4739	0.9500	1.0000
A9	0.6667	0.5000	0.2500	1.0000	0.9542	0.8341	0.9382

The weighted normalized values (r_{ij}) calculated using Equality (8) and Equality (9) and the negative ideal solution values (ns_j) are given Table 7.

Table 7. Weighted Normalized Decision Matrix and Negative Ideal Solution Values

Criteria Alternatives	C1	C2	C3	C4	C5	C6	C7
A1	0.0553	0.0365	0.0079	0.1179	0.0387	0.1048	0.0867
A2	0.0830	0.0730	0.0314	0.1179	0.0253	0.1060	0.0938
A3	0.1107	0.0365	0.0314	0.1218	0.0178	0.0911	0.1003
A4	0.0830	0.0365	0.0328	0.1295	0.1413	0.0906	0.1400
A5	0.0830	0.0730	0.0328	0.1295	0.1007	0.0906	0.1400
A6	0.1107	0.0730	0.0328	0.1295	0.0613	0.0915	0.1400
A7	0.1107	0.0730	0.0707	0.1257	0.1630	0.0884	0.1400
A8	0.1660	0.1460	0.1310	0.1289	0.0772	0.1007	0.1540
A9	0.1107	0.0730	0.0328	0.1330	0.1555	0.0884	0.1445
ns_j	0.0553	0.0365	0.0079	0.1179	0.0178	0.0884	0.0867

The distance of each alternative from the negative ideal solution was calculated using Equation (10) and Equation (11). The resulting Euclidean and Taxicab distance values are presented in Table 8.

Table 8. Euclidean and Taxicab Distance of Alternatives

Alternatives	Euclidean Value (E _i)	Taxicab Value (T _i)
A1	0.0265	0.0374
A2	0.0554	0.1199
A3	0.0619	0.0991
A4	0.1401	0.2432
A5	0.1121	0.2391
A6	0.0995	0.2283
A7	0.1798	0.3610
A8	0.2185	0.4934
A9	0.1660	0.3273

The relative evaluation matrix for alternatives was calculated using Equations (12), (13), and (14). This matrix is presented in Table 9.

Table 9. Relative Assessment Matrix

Alternatives	A1	A2	A3	A4	A5	A6	A7	A8	A9
A1	0.0000	-0.1115	-0.0971	-0.3194	-0.2874	-0.2639	-0.4769	-0.6480	-0.4294
A2	0.1115	0.0000	-0.0065	-0.2079	-0.1759	-0.1524	-0.3654	-0.5365	-0.3180
A3	0.0971	0.0065	0.0000	-0.2223	-0.1903	-0.1668	-0.3798	-0.5509	-0.3324
A4	0.3194	0.2079	0.2223	0.0000	0.0320	0.0555	-0.1575	-0.3286	-0.1101
A5	0.2874	0.1759	0.1903	-0.0320	0.0000	0.0127	-0.1895	-0.3606	-0.1421
A6	0.2639	0.1524	0.1668	-0.0555	-0.0127	0.0000	-0.2130	-0.3841	-0.1656
A7	0.4769	0.3654	0.3798	0.1575	0.1895	0.2130	0.0000	-0.1711	0.0138
A8	0.6480	0.5365	0.5509	0.3286	0.3606	0.3841	0.1711	0.0000	0.2185
A9	0.4294	0.3180	0.3324	0.1101	0.1421	0.1656	-0.0138	-0.2185	0.0000

The evaluation and ranking of alternatives (H_i index values) were performed using Equation (15) based on the calculation of Euclidean and Taxicab distances. The evaluation and ranking of alternatives are presented in Table 10.

Table 10. Assessment Score and Ranking of Alternatives

Alternatives	Assessment Score (H_i)	Ranking
A1	-2.6334	9
A2	-1.6512	7
A3	-1.7390	8
A4	0.2410	4
A5	-0.0580	5
A6	-0.2477	6
A7	1.6250	2
A8	3.1983	1
A9	1.2652	3

After evaluating and ranking the alternatives, A8 was determined to be the best alternative. The alternatives following A8 are, in order, A7, A9, A4, A5, A6, A2, A3, and A1.

5. Discussion and Conclusion

The purpose of this research is to determine the importance levels of the criteria that influence consumers' smartphone choices and to rank smartphone models according to the weights obtained. This will reveal which criteria consumers consider more important and how models compete in terms of these criteria.

Within the scope of the research, nine models belonging to Apple, Samsung, and Xiaomi Redmi, which are the most sold brands on Trendyol, the most preferred e-

commerce platform in Turkey, were evaluated. Similar studies in the literature were used to determine the criteria for selecting smartphone brands and models. Seven criteria were identified for this purpose. The study used the SWARA technique to determine the importance levels of the criteria influencing consumers' smartphone preferences and then used the CODAS technique to rank the alternative models.

Research findings reveal that the criteria consumers prioritize most when selecting smartphones are in order: RAM capacity (C1), price (C5), battery power (C7), and internal memory (C2). The results obtained are similar to those in the literature (Bayhan & Bildik, 2014; Lam et al., 2024; Özden & Erişlik, 2022). This shows that manufacturers and marketing managers need to focus on some key points in order to gain a sustainable competitive advantage. Technical specifications (RAM capacity, battery power, internal memory, etc.) are quite important for consumers when choosing a smartphone. Therefore, it is critically important for brands to develop products at different performance levels, taking consumer segments into account.

Research findings indicate that RAM capacity is more important than price, showing that mid-range and price-performance-focused smartphone users prioritize technical specifications that directly affect performance. Today, the increasing memory requirements of mobile applications, multitasking usage, and long-term usage expectations make RAM capacity a critical criterion for consumers. However, this finding should be interpreted with caution due to the limited sample size and the specific characteristics of the decision-maker group.

The research revealed that price is the second most important criterion in the purchase decision. Therefore, flexible pricing strategies and campaigns targeting different income groups will be decisive in consumer preferences. In addition, consumers' search for price-performance balance requires brands to highlight both the technical specifications and the total value offered by the product.

The relatively lower importance of camera resolution can be explained by the fact that megapixel value alone does not represent camera quality. In current consumer trends, elements such as camera software, image processing algorithms, and sensor quality are coming to the fore; this situation means that resolution value alone is not perceived as a decisive criterion.

Another finding of the study is that the Xiaomi Redmi Note 14 Pro (A8) model is the most suitable alternative based on the CODAS technique. This model is followed by the Xiaomi Redmi 13 (A7) and Xiaomi Redmi 14C (A9) models, respectively. This finding reveals that consumers who prioritize price-performance balance find emerging Chinese brands more advantageous in the global market. On the other hand, models from traditional leading brands such as Apple and Samsung did not rank highly. This situation shows that consumers are making more rational assessments in the face of high-priced products and turning to other alternatives.

This study, which combines SWARA and CODAS techniques, contributes to the marketing literature methodologically and also serves as a guide for smartphone manufacturers, consumers, and marketing strategists in terms of application. The findings indicate that price-performance-focused strategies are more effective in meeting consumer expectations in the highly competitive smartphone market. In this context, aligning product development, pricing, and communication strategies with consumer priorities is a critical success factor for long-term customer satisfaction and brand loyalty.

This research has some limitations due to its focus on specific brands and models, the limited number of criteria it includes, and the use of data from a single e-commerce platform (Trendyol). The exclusion of user experience and usability-related criteria, which are increasingly emphasized in consumer behavior literature, constitutes an important limitation of the study. Selecting alternatives only from among "best-selling" models led to the exclusion of other potential models from consideration, limiting the generalizability of the results. Additionally, relying on the evaluations of the decision-making group to determine the criterion weights can be considered another limitation in terms of

representing the entirety of consumer perceptions. However, the set of criteria and methodological approach used are valid within the context of the period and sample in which the study was conducted, and the results obtained may differ for different brands, models, periods, and consumer profiles. Although these findings cannot be generalized to all consumer segments, they validly represent price–performance-focused consumer preferences within the defined sample and period.

In future studies, the scope of the analysis can be expanded to include different brand and model groups; thus, how consumer preference structures differ based on brand segments can be examined comparatively using the SWARA–CODAS approach. Moreover, selecting alternatives based on specific price ranges rather than only “best-selling” models will contribute to a clearer presentation of preference differences based on price sensitivity. In determining criterion weights, the SWARA method can be applied using survey data obtained from a broader consumer sample rather than relying solely on the assessments of the decision-making group, and the results obtained can be compared using different weighting techniques (such as ENTROPY and BVM). By performing SWARA–CODAS analyses disaggregated by demographic variables, it is possible to quantitatively test how the priority structures of different consumer segments change. In studies that include the time dimension, dynamic comparisons using technical specifications and sales data from different years will enable the analysis of the evolution of consumer preference structures over time for high-tech products.

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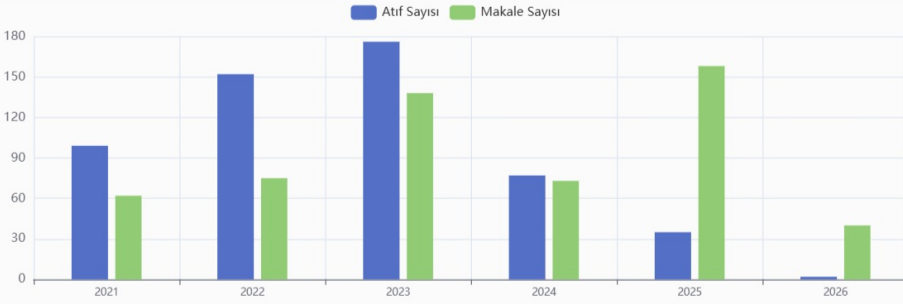
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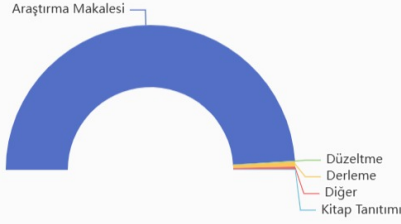
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