OPEN ACCESS

Saudi Journal of Business and Management Studies
Abbreviated Key Title: Saudi J Bus Manag Stud
ISSN 2415-6663 (Print) |ISSN 2415-6671 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Excavating Important Attributes and Brands Alluring Prospects to Buy Smartphone

Dr. Soumya Mukherjee[1], Dr. Mrinal Kanti Das[2*], Dr. Dipak Saha[3], Mr. Uttiya Kar[4]

[1]Associate Professor, Department of Management Studies, Techno India (Hooghly Campus), Chinsura, West Bengal, India
[2]Assistant Professor & Head, Department of Commerce, Kanchrapara College, Kanchrapara, North 24 Parganas, West Bengal, India
[3]Professor, Department of Business Administration, Institute of Engineering & Management, Kolkata
[4]Assistant Professor, Department of Business Administration, JIS College of Engineering, Kalyani, Nadia, West Bengal, India

DOI: 10.36348/sjbms.2023.v08i04.001 | **Received:** 22.03.2023 | **Accepted:** 26.04.2023 | **Published:** 30.04.2023

***Corresponding author:** Dr. Mrinal Kanti Das
Assistant Professor & Head, Department of Commerce, Kanchrapara College, Kanchrapara, North 24 Parganas, West Bengal, India

Abstract

A radical shift has been witnessed in consumer buying behavior worldwide due to the outbreak of COVID-19. With the increasing demand for smartphones across the globe, there is a need for marketers to identify the taste and preferences of the prospects. In this study, we have made an effort to understand prospects' views on the attributes of smartphones. An attempt has been made to understand the desirable combinations in the light of reputed brands the prospects are seeking before making a commitment. We even tried to rank different brands using the Multi-Attribute Decision Making (MADM) technique to help the marketers for framing marketing strategies to compete in this volatile market.

Keywords: Consumer Behavior, Pandemic, Smartphone, Influencing Attributes, Conjoint Analysis, TOPSIS.

1. INTRODUCTION

Nowadays, the mobile phone has become the lifeline of every individual. There are almost 6.37 billion Smartphone users across the globe. By 2025, the expected rise in terms of the number of users will be 7.33 billion (Forecast figures by Ericsson & The Radicati Group). To our astonishment, the usage of mobile phones has been increasing by 25 million per quarter even in third-world countries like India (The Economic Times News, Oct 26, 2021), which reflects only our dependency on smart devices in our daily life. Moreover, the pandemic has enforced even the non-users to get accustomed to this smart device.

The COVID-19 pandemic has changed the shape of our lifestyle. Economic crisis tells upon our lives in such a way that we have to adopt different means of life. This pandemic situation has radically brought a change in all sectors worldwide and as a consequence people have no other means but to start thinking, living, and reacting differently. Third-world countries are not an exception to this situation. Even this pandemonium opens up certain avenues. People are enforced to be tech-savvy. Smartphone has almost become the part and parcel of our life. Taking this as a silver lining, we made a convincing attempt to analyze the buying behavior of the customers in lieu of the above-mentioned electronic gadgets.

In this current scenario, the buying decision depends a lot on the price of the product, perceived quality, and value proposition (Rai, 2020). Even the buying behavior of the customers revolves around both internal as well as external factors before making a buying decision (Gogoi, 2013). Since smartphones evolve to be an essential means of our daily life to get connected with the rest of the world, the target segments are becoming a bit skeptical about their selection. With the advancement of the technology of the smartphone, the preference, needs, and purchase intentions of customers are changing day by day (Mokhlis & Yaakop, 2012). Osman *et al.,* (2012) also highlighted the changing behavior of the people with the innovative technology of smartphones. Thus it has become difficult for marketers to assume the buying behavior of prospects of smartphones. A radical change in consumer behavior has been witnessed by the mobile phone industry with the introduction of different

features, prices, quality, style, etc. As a consequence, it has become a dire need for marketers to understand the different factors which would influence the target segment as well as to help them gain a competitive advantage.

We tried to find out the attributes in the post-pandemic era and the combination set which plays an influencing role before making a buying decision for this device. Since it is a highly volatile and competitive market, these parameters need to be understood to get a realistic picture of the smartphone market. Based on the probable combination, we would also like to shed light on the offerings of different brands of smartphones and their ranking to the prospects. All of these would give space to the marketers not only to identify their positioning in this new normal scenario but also to improve the product to get an edge over the competitors.

2. BACKGROUND OF THE STUDY

The outbreak of pandemic has become a menace in our life. Despite creating a mess, we can foresee a silver lining. We witnessed the benefits of digitalization in every sphere of life. Thus, the smartphone has become a boon in our life to get us connected with the outer world – from family to the professional world. As a consequence, there is a steady rise in demand in the market. The taste and preferences of customers have been changing at every point in time. It has, thus, become an absolute necessity for marketers to understand the combinations of different levels of attributes for product design. Considering the worth of product design, we have employed the choice-based conjoint analysis. Based on these premises, the assumptions of our study are as under:

1) The smart device can be categorized in terms of levels of attributes.
2) There is a probable utility at the attribute level.
3) The appeal of the smartphone is the sum of the utility of its attribute levels.
4) People are inclined to choose products having more utility.

Thus, we try to shed light on how the previous researchers gave a theoretical foundation on such a relevant topic. Moreover, it would also help us to establish the originality and relevance of our study.

2.1. Evolution of Mobile as a Commodity

The advent of mobile communication technologies has become a revolution in our daily life. It gained momentum with the wireless telegram in the 1890s and gradually shifted to stationary telephone systems from 1910 to 1980. The concept of analog mobile systems comes into the picture dates back to the 1980s followed by the digital mobile systems from the 1990s. The multimedia systems developed in the year 2000 make the mobile service more effective and comprehensive to the users (Steinbock, 2005). Mobile phones ensure freedom of communication to the people irrespective of the location. This device facilitates the communication process beyond imagination as it manages to overcome the barriers of time and place as well. The use of this technology first started on April 3, 1973, in the United States of America in New York (Cooper, 2015). The different unique features of mobile phones have changed the shape of our life with time and thus, put our life at ease. Taking this as an opportunity, the marketers start employing this device as a promotional tool for establishing a brand (Yuan & Cheng 2004). Its effectiveness has reached such an extent that it has become the part and parcel of our life (Howard, 2003; Scharl *et al.,* 2005). Due to technological advancements, the unique features of mobile phones make them so customized that it has become a part of identity for the users (Smutkupt *et al.,* 2010). The elasticity of demand for mobile phones has itself made it an enticing commodity. Thus, we witness steady growth in the volume of the market. With the rise of the global market, stiff competition is noticed which enforces the marketers to give adequate attention to the product design to make the device more acceptable to the target segment.

2.2. Attributes of Smartphone

Steady development and growth have been witnessed in the smartphone industry not only in terms of market size but also with respect to different models. The tastes and preferences of the prospect are getting reformed each day. To capitalize on the market, it is of absolute necessity for the marketers to understand the focus of the potential customers to meet their demands. *Shivaratri (2016) in her study highlighted certain attributes like* RAM, Memory, Camera, Battery backup, Colour, and size are of immense importance *to get affirmative responses from the prospects. To her,* RAM and camera quality are the important attributes to pay heed to product development to convince both the new and existing customers. *Ladipo et al., (2018) concentrated their study on* students' buying decisions *on* smartphone attributes *in a city in Nigeria. They concluded that technology, application, and price are the motivating attributes to entice the students community toward smartphones.* Karjaluoto *et al.,* (2005) *emphasized on* customer buying decision process and certain factors that play a pivotal role to influence the target group. *According to them, innovative services, price, design, brand, and basic properties, multimedia play a key role to convince the prospects of Finland towards the device and enforce them to do the commitment.* Montenegro and Torres (2016) identified certain attributes to influence the buying motives of the target segment of Malaga in Spain. Design, memory, battery capacity, camera, display, and multimedia are the prime attributes that the prospects are looking for before making a buying decision. Gupta (2016) made an intensive study on attribute preferences of smartphones in the states of Andhra Pradesh and Karnataka using choice-based

conjoint analysis. This study reflected that the buying behavior of consumers in these two states depends upon the specific attributes - Brand, Operating System, Back Camera, Front Camera, Price, and Technology. Lavuri *et al.,* (2019) tried to examine the preference which entices buyers toward branded smartphone devices. They explored the influencing attributes of prospects like price, brand name, mobile features like processing power, design, camera, and style of mobile before making a purchase decision. Elammari and Cavus (2019) explored the factors affecting significantly the buying behaviors of the students with respect to smartphones. The researchers considered price, brand image, product features, and social influence as independent variables to assess the effect on purchase intention. The findings of the study pointed out that product features, brand image, and social factors influence the buyers the most. Lazim and Sasitharan (2015) highlighted the factors, which instigated the consumers to buy a smartphone. According to their study, the attributes of the mobile phone which influence the prospect the most are high-speed processing system, style, smoothness, price, brand, application, software, and convenience factors. Rahim *et al.,* (2016) studied the factors influencing the purchase intention of mobile sets. They concluded that the factors which have a significant influence to allure the target segment are brand image, social factors, product attributes factors, and product sacrifice. Sujata *et al.,* (2016) made an extensive effort to identify the factors which have a noteworthy contribution with respect to the purchase intention of the buyers. Through this study, they tried to identify five factors - hardware factors, technology factors, basic factors, financial factors, and brand factors. Their findings established the fact that the features of technical factors, OS version, and hardware factors have a positive contribution to the buying behavior of young students.

2.3. Influence of Brand Image on buying Smartphones

Khurshid and Khurshid (2018) intended to examine how brand name influences consumers in the purchase decision of mobile phones. This study was conducted within the age group of 18-29 in the urban areas of the city Rawalpindi, Pakistan. This study concluded that the brand name influences consumers in their decision-making while buying a mobile phone. Akkucuk and Esmaeili (2016) tried to explore how smartphone brands instigate consumers in their purchase decision. The researchers conducted this study in the Istanbul district of Turkey among students from a prestigious university. The study established the fact that brand awareness and brand loyalty have a positive influence on the consumers, whereas perceived quality and brand association do not seem to have a significant impact on buying decisions. Gautamand Shrestha (2018) specifically tried to explore the significant impact of brand equity on buying behavior of consumers with respect to mobile phones. This study was carried out in Kathmandu. The study concluded that brand loyalty and brand awareness evolved as the motivating factors for prospects of smartphones. Hasan (2017) investigated how brand image, brand loyalty, and perceived quality have a significant role in the buying behavior of consumers of the smartphone. The study was conducted in the Klang Valley of Malaysia. The findings of the study suggested that brand image plays a decisive role over purchase intention while brand loyalty acts as a mediator between brand image and purchase intention. Perceived quality appears to be an insignificant factor. Nguyen *et al.,* (2020) concentrated their research in Ho Chi Minh city of Vietnam to assess the impact of brand image, personalities, and lifestyle on the purchase decision of smartphone users. The findings of the study highlighted that the effects of all the factors have a significant influence on buying decisions for framing promotional strategies. Imtiaz (2021) investigated the factors which have a noteworthy contribution to the purchase decision of mobile phones. They considered brand image and product price as independent variables and purchase decisions as the dependent variable. The findings of the study revealed the fact that both the independent variables have a significant influence over the dependent variable.

2.4 Literature Gap

According to the survey conducted by Deloitte's Global TMT (Technology, Media and Entertainment, Telecom) in 2022, it has been predicted that the smartphone market in third-world countries like India is expected to reach 1 billion users by 2026 (The Economic Times, Feb 22, 2022). Despite its steady rise, marketers have to toil harder than ever to put a firm foot in the competitive market. The noteworthy attributes will alone not help the cause. It has been noticed rigorously that the earlier researchers pay heed in developing a thorough knowledge only about attributes. In certain cases the levels have been considered, but not with the required emphasis. It is true that to grow and excel in the competitive market, it is of absolute necessity to be more specific in our consideration. To relatively understand the need and preferences of the target customers, we have decided to evaluate the combinations that the prospective customers are looking for. Even we have made a modest attempt to execute the proximity of combinations of attributes in the light of eminent brands and their position as reflected in the competitive market.

3. OBJECTIVES OF THE STUDY

Dyer and Ha-Brookshire (2008) figured out that today's business environment is more competitive, volatile, and complex. Due to this turbulent business environment, marketers are not solely concentrating on promotion, but also enforced to deliver value to the customers. It has, thus, become indispensable for marketers to identify the factors behind the purchase intention of the target audience of smartphones. Various

studies are being conducted to identify the attributes which persuade the prospective customers the most. In third-world countries like India, price and product features play a pivotal role in the purchase of mobile (Sata, 2013; Karjaluoto, 2005; Wilska, 2003). In this study, we would try to identify the attributes which play a phenomenal role to persuade the prospect in this new normal scenario. Considering these premises, our first objective of the study is:

i) To identify attributes that are more significant in respect to making a commitment toward smartphones in a new normal scenario.

With the technological advancements, the buyers' curiosity increases manifold and the demand also tends to rise at every instant (Steinbock, 2005). The dynamism only acts as a catalyst to the ever-rising competition since the taste and preferences of the prospects are getting changed over time. It has become a high hill task for marketers to get a foothold for a reasonable market share. To lure this commodity, the marketers must understand where the prospective buyers exhibit their interest (Uddin *et al.*, 2014). Moreover, the marketers also have a wide idea of how the pandemic brings an adverse impact on the economy across the globe. It is a dire need to understand which combinations the prospects are seeking before committing to make purchase decisions for the mobile phone (Mohankumar & Dineshkumar, 2008). In this study, we would like to shed light on which combinations are acceptable to the target segment. Conjoint Analysis would give us the aid to foster analytical thinking among the prospects. Based on these premises, our second objective is:

ii) To assess the most preferred combination of the customers in respect to the choice over the mobile phone.

By differentiating the product attributes, it would help the marketers to establish the brand and gives a base to the target segment to choose the brand instead of others. In paying heed to the combination generated through conjoint analysis, we would like to identify the brands and rank them accordingly. So our third objective is:

iii) *To categorically rank the select brands of smartphones that best suit the combinations evolved from this study*.

4. RESEARCH METHODOLOGY

This study has emphasized consumer buying behavior of smartphones, specifically highlighting on attribute preference of smartphones and their preferred brands of the handset. The study is focused on the consumers of third-world countries. We have selected specifically this region since it has a huge potential to grow in the coming days. The diversity allures us to carry out our research work in this area to shed light on the marketers about the untapped market opportunity.

4.1 Sample Size and Sampling Technique

This study is empirical and cross-sectional in nature. In this research work, we have given due emphasis to both primary and secondary data. To reach a reasonable conclusion, a judgmental sampling technique is strategically employed to extract the prerequisite data required for analysis. We resorted to this sampling technique as it gives us the privilege to access the target population of interest directly (Reddy & Ramasamy, 2016). The sample size considered for this study is 410 and they are from different parts of the select region. It is difficult to determine the exact sample size required to perform the conjoint analysis. Cattin and Wittink (1982) pointed out stated that the sample size may vary usually from 100 to 1,000, but the typical range may be considered as 300 to 550. Akaah & Korgaonkar (1988) are a bit skeptical in respect of performing conjoint analysis having sample sizes less than 100. A structured questionnaire is designed to get the relevant data from the respondents.

4.2 Data Analysis Tools

We have administered choice-based conjoint analysis and the TOPSIS method to reach a formidable result.

Conjoint analysis, a flexible and friendly approach for numerical improvements (Wittink & Cattin, 1989), is referred to as a multivariate technique (Luce & Tukey, 1964) to examine respondents' consideration among multi-attribute alternatives for computing consumers' utility functions (Green, 2001; Kroes, 1988; Louviere, 1988). Among the different types of conjoint analysis, the choice-based conjoint (CBC) technique is specifically employed to understand the preferences of consumers by using a discrete choice model (Cohen, 1997; Gustafsson, *et al.*, 2007; Hair *et al.*, 2010; Natter and Feurstein, 2002). For our study, the CBC technique is applied to understand the respondents' preferences for the combinations of attributes that help to identify their preferred brand or product.

TOPSIS, a useful technique, has wide acceptance for solving real-life situations involving multi-criteria or Multi-Attribute Decision Making (MADM) (Hwang & Yoon, 1981). Apart from representing human choice and depicting the best and worst alternatives, TOPSIS can easily be computed in a spreadsheet by reflecting the performance measure of all alternatives (Kim *et al.*, 1997). It may, thus, be said that TOPSIS is a utility-based method that figures out the distance between alternatives directly by considering the decision matrices and weights for evaluation (Cheng and Lin, 2002).

4.3 Demographic Profile of Respondents

Table 1 reflects the demographic profile of the respondents. The following table depicts that the

majorities of respondents were unmarried (66.83%) and belonged to the age group of 21-30 years (32.20%). They were mostly from the student community. In a nutshell, the demographic statistics reflect the heterogeneous group which would unfold the true picture of the society.

Table 1: Sample Demographics (N=410)

Demographic Variable	Item	Frequency	Percentage %
Age	Below 20 years	83	20.24
	21 - 30 years	132	32.20
	31 - 40 years	86	20.98
	41 -50 years	61	14.87
	51 -60 years	33	8.05
	Above 60 years	15	3.66
Gender	Male	214	52.20
	Female	196	47.80
Marital Status	Married	136	33.17
	Unmarried	274	66.83
Family Income (₹ per month)	Less than 50,000	139	33.90
	50,000 -1,00,000	156	38.05
	1,00,000 -2,00,000	70	17.07
	More than 2,00,000	45	10.98
Occupation	Student	115	28.05
	Business	70	17.07
	Service	107	26.10
	Professional	49	11.95
	Housewife	69	16.83

4.4 Selection of Attributes and their Levels of Smartphone

From the existing pieces of literature, we have selected our attributes for developing the best possible combinations. We have further adopted the Delphi technique to get the best possible notions about different labels inside the attributes. Based on that, we have selected the following labels and the attributes (Table 2) to generate the best possible combinations which would entice the prospects toward the product.

Table 2: Influencing Attributes and labels

Attributes	Labels
Camera	13 MP + 8 MP
	48 MP + 16 MP
	64 MP + 20 MP
Price	₹10,000 - ₹15,000
	₹15,000 - ₹20,000
	₹20,000- ₹25,000
	Above ₹25,000
Storage	64 GB + 4 GB
	64 GB + 6 GB
	128 GB + 6 GB
	128 GB + 8 GB
Battery	4,500 mAh
	5,000 mAh
	6,000 mAh
Display	Super AMOLED
	AMOLED
	IPS LCD

5. DATA ANALYSIS AND FINDINGS

5.1 Findings of Conjoint Analysis

Initially, it was specifically needed to examine the correlation between observed and estimated preferences. In our study, the correlation between the observed and the estimated preference evolved out to 0.869. Social science usually considers any value ranges between 0.8 and 0.9 as significant enough to proceed with analysis (Domeyer *et al.*, 2017). The value of Pearson's R should range between -1 to 1, where -1 signifies a total negative linear correlation, 0 indicates

no correlation, and + 1 reflects a total positive correlation (Bonett and Wright, 2000).

Table 3: Correlations[a]

	Value	Sig.
Pearson's R	.869	.000
Kendall's tau	.647	.000
a. Correlations between observed and estimated preferences		

Kendall's tau, a non-parametric measure, was specifically employed to establish the relationship between columns of ranked data. Kendall's tau computes the value between 0 and 1, where 0 signifies no relationship and 1 resembles a perfect relationship (Kendall, 1938). In our study, the value emerges as 0.647 which signifies that there is a strong relationship exists between the rankings. Thus, Pearson's R-value and Kendall's tau value (Table 2) truly establish the validity and reliability of the data.

The overall statistics (Table 4) helps the researchers to frame the true picture of the preference of the customers. It reflects where the customers tend to concentrate more on the choice. The degree of preference is reflected in the utility estimate. The higher value of the utility estimate points out the fact that the customers are more inclined to it. If a big negative value crops up in overall statistics, it truly identifies the fact that the customers are very skeptical about it. With respect to price, it has been found that customers are keen to opt for any mobile ranging from ₹10,000/ to ₹15,000/. They are even extended to pay anything between ₹15,000/ and ₹20,000/. The prospects seem to be very cautious about the choice if they are enforced to pay anything more than ₹25, 000/. For Camera, it has been found that the prospects are satisfied enough with 48 MP rare camera and 16 MP front Camera. It even points out the fact that the target audiences are always inclined to get the best Storage facility and Camera. For storage, they are willing to opt for 8 GB RAM and 128 GB for Internal Storage. 6000mAh battery is the utmost desire of the prospect to make the optimum usage. It also points out the fact that they are not so much concerned about the display of mobile sets. To categorically point out, super AMOLED is their prime choice. In a nutshell, utility estimates depict what prospects want with respect to the combination.

Table 4: Utility Estimate of labels under Different Attributes

Attributes	Labels	Utility Estimate	Std. Error
Camera	13 MP + 8 MP	1.403	.789
	48 MP + 16 MP	2.255	.789
	64 MP + 20 MP	-3.658	.942
Price	₹10,000 - ₹15,000	-2.264	.485
	₹15,000 - ₹.20,000	-4.529	.970
	₹20,000- ₹25,000	-6.793	1.455
	Above ₹25,000	-9.057	1.940
Storage	64 GB + 4 GB	1.863	.485
	64 GB + 6 GB	3.725	.970
	128 GB + 6 GB	5.588	1.455
	128 GB + 8 GB	7.450	1.940
Battery	4,500 mAh	1.132	.756
	5,000 mAh	2.264	1.511
	6,000 mAh	3.396	2.267
Display	Super AMOLED	-.757	.756
	AMOLED	-1.515	1.511
	IPS LCD	-2.272	2.267
(Constant)		12.478	2.516

(Source: Generated through SPSS using Conjoint analysis)

The importance score is computed specifically in terms of percentage. It, thus, depicts the fact which factor is more relevant to the others for the customers before choosing a smartphone. Table 5 specifically highlights the fact that the customers consider price as the most influencing attribute before selecting the device. The prospects would only consider other attributes if it fits their budgets. Apart from Price, they are also eager to pay heed to Storage and the Camera. For attributes like battery, the customers are looking for optimum usage, so they are inclined to better battery capacity. In this study, attribute like Display appears to be not so appealing for the prospects.

Table 5: Averaged Importance Scores of Attributes

Attributes	Averaged Importance Score
Camera	24.565
Price	28.683
Storage	26.851
Battery	12.061
Display	7.840

To sense the study in another logical way, the 3D plot is hereby given to depict an overall picture of the conjoint analysis.

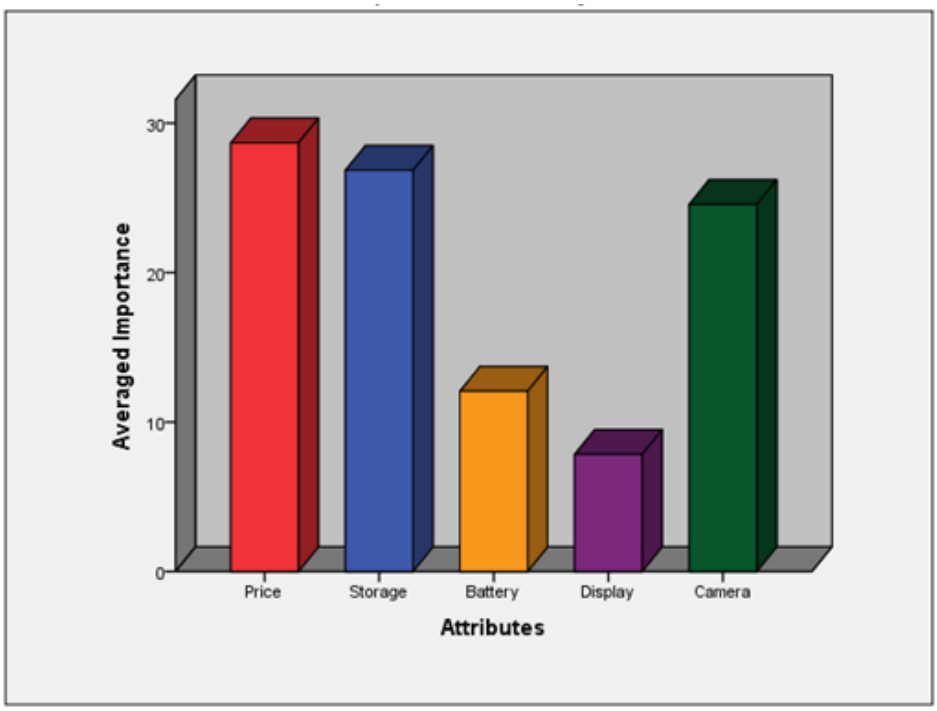

Figure 1: Importance Summary

The utility score (Table 6) reveals the best possible combinations the customers seek before committing to the smart device. The higher the value of the utility score, the higher the chance for the customers to get inclined to it. The probable best three combinations of the customers are No.10, No 20, and No 8. They also show an indifferent attitude rather than apathy towards the combination - No 26 and No 12.

Table 6: Utility Scores of Different Combinations

SL No	Combinations	Utility Score
1	(₹10,000 - ₹15,000)+(128 GB + 6 GB)+4,500 mAh+(48 MP + 16 MP)+Super AMOLED	18.432
2	(₹15,000 - ₹20,000)+(64 GB + 4 GB)+5,000 mAh+(48 MP + 16 MP)+Super AMOLED	13.574
3	(₹15,000 - ₹20,000)+(64 GB + 6 GB)+4,500 mAh+(13MP + 8 MP)+ AMOLED	12.694
4	Above ₹25,000+(128 GB + 6 GB)+6,000 mAh+(64 MP + 20 MP)+AMOLED	7.232
5	(₹20,000 - ₹25,000)+(128 GB + 8 GB)+4,500 mAh+(13 MP + 8 MP)+AMOLED	14.155
6	(₹10,000 - ₹15,000)+(64 GB + 4 GB)+6,000 mAh+(13 MP + 8 MP)+ AMOLED	15.361
7	(₹10,000 - ₹15,000)+(64 GB + 4 GB)+4,500 mAh+(13 MP + 8 MP)+ Super AMOLED	13.855
8	(₹10,000 - ₹15,000)+(128 GB + 6 GB)+5,000 mAh+(48 MP + 16 MP)+AMOLED	18.806
9	(₹10,000 - ₹15,000)+(64 GB + 4 GB)+5,000 mAh+(13 MP + 8 MP)+AMOLED	14.229
10	(₹10,000 - ₹15,000)+(128 GB + 8 GB)+5,000 mAh+(48 MP + 16 MP)+AMOLED	20.668
11	Above ₹.25,000+(64 GB + 4 GB)+5,000 mAh+(13 MP + 8 MP)+Super AMOLED	8.194
12	(₹15,000 - ₹20,000)+(64 GB + 4 GB)+5,000 mAh+(64 MP + 20 MP)+AMOLED	6.903
13	(₹20,000 - ₹25,000)+(64 GB + 4 GB)+4,500 mAh+(48 MP + 16 MP)+AMOLED	9.42
14	Above ₹25,000+(64 GB + 4 GB)+4,500 mAh+(48 MP + 16 MP)+Super AMOLED	7.914
15	(₹20,000 - ₹25,000)+(128 GB + 6 GB)+5,000 mAh+(13 MP + 8 MP)+Super AMOLED	14.183
16	(₹10,000 - ₹15,000)+(128 GB + 8 GB)+4,500 mAh+(64 MP + 20 MP)+Super AMOLED	14.381
17	(₹10,000 - ₹15,000)+(64 GB + 6 GB)+6,000 mAh+(13 MP + 8 MP)+Super AMOLED	17.981

SL No	Combinations	Utility Score
18	Above ₹.25,000+(64 GB + 6 GB)+4,500 mAh+(48 MP + 16 MP)+AMOLED	9.018
19	(₹20,000 - ₹25,000)+(64 GB + 4 GB)+6,000 mAh+(48 MP + 16 MP)+IPS LCD	10.927
20	(₹15,000 - ₹20,000)+(128 GB + 8 GB)+6,000 mAh+(48 MP + 16 MP)+Super AMOLED	20.293
21	(₹15,000 - ₹20,000)+(128 GB + 6 GB)+4,500 mAh+(13 MP + 8 MP)+IPS LCD	13.8
22	Above ₹.25,000+(128 GB + 8 GB)+5,000 mAh+(13 MP + 8 MP)+IPS LCD	12.266
23	(₹10,000 - ₹15,000)+(64 GB + 6 GB)+5,000 mAh+(48 MP +16 MP)+IPS LCD	16.186
24	(₹10,000 - ₹15,000)+(64 GB + 4 GB)+4,500 mAh+(64 MP + 20 MP)+ IPS LCD	7.279
25	(₹20,000 - ₹25,000)+(64 GB + 6 GB)+5,000 mAh+(64 MP + 20 MP)+Super AMOLED	8.391
26	Above ₹ 25,000+(64 GB + 6 GB)+6,000 mAh+(64 MP + 20 MP)+AMOLED	5.369
27	(₹15,000 - ₹20,000)+(128 GB + 8 GB)+6,000 mAh+(13 MP + 8 MP)+IPS LCD	17.926
28	(₹20,000 - ₹25,000)+(128 GB + 8 GB)+6,000 mAh+(13 MP + 8 MP)+IPS LCD	15.662
29	(₹15,000 - ₹20,000)+(128 GB + 6 GB)+6,000 mAh+(13 MP + 8 MP)+Super AMOLED	17.579

(Source: Generated through SPSS using Conjoint analysis)

5.2 Findings of the TOPSIS method

In our study, the set of alternatives is A = {Xiaomi, Samsung, Realme, Vivo, Oppo} and the set of evaluation criteria is C = {MRP, Internal Storage, RAM, Rear Camera, Front Camera, Battery, Display}.To develop the decision matrix, the display is considered the only qualitative attribute (as referred to in Table 2).

Step 1: Construction of a Decision Matrix

The decision matrix for our study is given in the table below.

Table 7: Decision Matrix D = $[x_{ij}]_{m\times n}$

Smartphone Brands	MRP	Internal Storage	RAM	Rear Camera	Front Camera	Battery	Display
Samsung (Galaxy F 22)	16999	128	6	48	13	6000	3
Xiaomi (Redmi Note 10)	17999	128	6	48	13	5000	2
Realme X (Polar White)	18999	128	8	48	5	3765	2
Vivo Y 50	18000	128	8	13	16	5000	1
Oppo A53 Moonlight Black	17990	128	6	13	16	5000	1

(Source: Websites)

Step 2: To get Normalized Decision Matrix we use the following formula

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}, \text{with } i = 1,\ldots,m;\ j = 1,\ldots,n$$

Table 8: Normalized Decision Matrix R = $[r_{ij}]$m×n

Smartphone Brands	MRP	Internal Storage	RAM	Rear Camera	Front Camera	Battery	Display
Samsung (Galaxy F 22)	0.422144	0.447214	0.390567	0.563731	0.43948	0.536281	0.688247202
Xiaomi (Redmi Note 10)	0.446977	0.447214	0.390567	0.563731	0.43948	0.4469	0.458831468
Realme X (Polar White)	0.471811	0.447214	0.520756	0.563731	0.169031	0.336516	0.458831468
Vivo Y50	0.447002	0.447214	0.520756	0.152677	0.540899	0.4469	0.229415734
Oppo A53 Moonlight Black	0.446754	0.447214	0.390567	0.152677	0.540899	0.4469	0.229415734

Step 3: Computation of the Weighted Normalized Decision Matrix.

Averaged importance scores of attributes are used to assign weights to the criteria are given below:

W = [w_1 (MRP) = 0.28, w_2 (Internal Storage) = 0.13, w_3 (RAM) = 0.14, w_4 (Rear Camera) = 0.13, w_5 (Front Camera) = 0.12, w_6 (Battery) = 0.12, w_7 (Display) = 0.08]

To get Weighted Normalized Decision Matrix, multiplying each column of Normalized Decision Matrix in Table 8 by weights w_j, of weight vector computed in step 3.

Table 9: Weighted Normalized Decision Matrix Ŕ = [r_{ij}×w_j]m×n

Brands	**MRP**	**Internal Storage**	**RAM**	**Rear Camera**	**Front Camera**	**Battery**	**Display**
Samsung (Galaxy F 22)	0.118200	0.058138	0.054679	0.073285	0.052738	0.064354	0.055059776
Xiaomi (Redmi Note 10)	0.125154	0.058138	0.054679	0.073285	0.052738	0.053628	0.036706517
Realme X (Polar White)	0.132107	0.058138	0.072906	0.073285	0.020284	0.040382	0.036706517
Vivo Y50	0.125161	0.058138	0.072906	0.019848	0.064908	0.053628	0.018353259
Oppo A53 Moonlight Black	0.125091	0.058138	0.054679	0.019848	0.064908	0.053628	0.018353259

Step 5: The calculation of Positive Ideal Solution (V_i +) and Negative Ideal Solution (V_j -)

The positive ideal solution (PIS) maximizes the benefit criteria and minimizes the cost criteria. On the other hand, a negative ideal solution (NIS) maximizes the cost criteria and minimizes the benefit criteria.

Table 10: Calculation of PIS (V_i +) and NIS (V_j -)

Ideal Solutions (+/-)	**MRP**	**Internal Storage**	**RAM**	**Rear Camera**	**Front Camera**	**Battery**	**Display**
V_i +	0.1182	0.058138	0.072906	0.073285	0.064908	0.064354	0.055059776
V_j -	0.132107	0.058138	0.054679	0.019848	0.020284	0.040382	0.018353259

Step 6: Calculation of Euclidean Distance from the Positive Ideal Solution and Negative Ideal Solution.

Table 11: Euclidean Distance from the PIS and NIS

Brands	Euclidean distance from Ideal best **(S_i+)**	Euclidean distance from Ideal worst **(S_i-)**
Samsung (Galaxy F 22)	0.021916	0.077616
Xiaomi (Redmi Note 10)	0.031314	0.066854
Realme X (Polar White)	0.055643	0.059368
Vivo Y50	0.066079	0.05047
Oppo A53 Moonlight Black	0.068539	0.047074

Step 7: Calculation of Performance Score and Rank

Table 12: Performance Score and Rank

Brands	Performance Score**(P_i)**	**Rank**
Samsung (Galaxy F 22)	0.779807	1
Xiaomi (Redmi Note 10)	0.681018	2
Realme X (Polar White)	0.516192	3
Vivo Y50	0.433039	4
Oppo A53 Moonlight Black	0.40717	5

6. RESULTS AND DISCUSSION

The emergence of a new normal situation has abruptly changed the buying habits of customers across the globe. The evolution of the financial crisis has even shifted the taste and preferences of the prospects. Our study focuses on identifying the attributes that customers are looking for before buying a smartphone. We have specifically identified that the prospects have become price sensitive before making a decision. They are even eager to develop an odd idea about storage and camera before being convinced to buy the same. They seem to be a little worried about the battery and display in making their choice. This study even explores the best possible combinations to allure the prospects. The best possible combination is (₹10,000 - ₹15,000) + (128 GB + 8 GB) + 5,000 mAh + (48 MP + 16 MP) + AMOLED. This combination reflects the true picture of the perception of prospects for selecting the smart device in the post-COVID scenario. Price (₹10,000 - ₹15,000) appears to be the leading attribute before making the purchase decision. The prospects even don't want to compromise with storage (128 GB + 8 GB) and camera (48 MP + 16 MP) before making the final call. Apart from the AMOLED display, they are also looking for a mobile set having a 5,000 mAh battery. The configuration reflects how volatile the market has become. It has become difficult for marketers to offer these sorts of attributes within this price range.

This study has unfolded another interesting aspect concerning the brands and the combinations the marketers have been offering. For this study, we have selected the best five brands that more or less revolve around these attributes only. By applying TOPSIS, we even specifically explored the rank of those reputed brands. Samsung appears to be the best-selling brand followed by Xiaomi, Realme, Vivo, and Oppo. In a nutshell, the study has brought out that attributes play a significant role to excel in cut-throat competition. The marketers need to frame their strategy most innovatively to be the most popular brand among the prospects.

7. CONCLUSION AND MANAGERIAL IMPLICATION

The present study achieves new insights and offers some useful implications not only for academicians but also for marketers and policymakers. Attributes and levels always play a decisive role in respect to the acceptance of smartphones. Numerous reasons make the competitive market more complex and unpredictable. To rise to the occasion and establish its worth, marketers have to be more logical and systematic in their approach. It is of absolute necessity for them to understand the specific combinations that the prospective target audience is looking for. The specific approach enhances the probability of their success by helping them to design the product uniquely and giving the options as well to frame the marketing strategy aptly for sustainability. Moreover, the present study figures out the rank of the eminent brands by assessing their performance in the market. This performance, to a certain extent, depends upon the combinations which are being sought by the prospects. In a nutshell, the present research helps us to mingle up both the choice-based Conjoint Analysis and TOPSIS approach to concisely focus and match the possible combinations the different eminent brands are offering to satisfy the prospects in the best possible way. Thus, the novel and unique idea used in this study shed a new light on the marketers as well as researchers to determine the future course of action most diligently and aptly.

Appendix I: Conjoint Syntax used for this Study

CONJOINT PLAN = 'C:\Users\MrinalKanti Das\Desktop\Mobile_Combination.sav'
/DATA = 'C:\Users\MrinalKantiDas\Desktop\Customer_Preference.sav'
/SEQUENCE = Pref1 to Pref29
/SUBJECT = ID
/FACTORS = Price (LINEAR LESS) Storage (LINEAR MORE) Camera (LINEAR MORE) Battery (LINEAR MORE) Display (DISCRETE)
/PRINT = SUMMARYONLY
/PLOT = ALL

REFERENCES

1. Akkucuk, U., & Esmaeili, J. (2016). The impact of brands on consumer buying behavior: An empirical study on smartphone buyers. *International Journal of Research in Business and Social Science (2147-4478)*, *5*(4), 1-16.
2. Bonett, D. G., & Wright, T. A. (2000). Sample size requirements for estimating Pearson, Kendall and Spearman correlations. *Psychometrika*, *65*, 23-28.
3. Chandramouli, D. S. (2016). Consumer Choice of Smartphone Attributes: An Application of Conjoint Analysis. *The International Journal Research Publication's, www. theinternationaljournal. org*, *6*(6).
4. Cheng, C. H., & Lin, Y. (2002). Evaluating the best main battle tank using fuzzy decision theory with linguistic criteria evaluation. *European journal of operational research*, *142*(1), 174-186.
5. Cohen, S. H. (1997). Perfect union. *Marketing Research*, *9*(1), 12-17.
6. Cooper, M. (2015). History of Cell Phone. http://inventors.about.com/cs/inventorsalphabet/a/martin_cooper.htm, (April 25, 2015).
7. Domeyer, P. J., Aletras, V., Anagnostopoulos, F., Katsari, V., & Niakas, D. (2017). Development and validation of a tool to assess knowledge and attitudes towards generic medicines among students in Greece: the ATtitude TOwards GENerics (ATTOGEN) questionnaire. *PLoS One*, *12*(11), e0188484.
8. Dyer, B., & Ha-Brookshire, J. E. (2008). Apparel import intermediaries' secrets to success: Redefining success in a hyper-dynamic

environment. *Journal of Fashion Marketing and Management: An International Journal*.

9. Elammari, H. A., & Cavus, N. (2019). Investigating the factors affecting students' smartphone purchasing behaviors in the context of mobile learning. *International Journal of Emerging Technologies in Learning (Online)*, *14*(22), 111.
10. Kim, G., Park, C. S., & Yoon, K. P. (1997). Identifying investment opportunities for advanced manufacturing systems with comparative-integrated performance measurement. *International Journal of Production Economics*, *50*(1), 23-33.
11. Gautam, D. K., & Shrestha, S. K. (2018). Impact of brand equity on purchase intention of smart phones. *Asia-Pacific Journal of Business*, *9*(1), 1-18.
12. Gogoi, B. (2013). Study of antecedents of purchase intention and its effect on brand loyalty of private label brand of apparel. *International Journal of Sales & Marketing*, *3*(2), 73-86.
13. Green, P. E., Krieger, A. M., & Wind, Y. (2004). *Thirty years of conjoint analysis: Reflections and prospects* (pp. 117-139). Springer US.
14. Gupta, P. (2016). Attribute Preferences of the Smartphones Amongst the Smartphone Consumers of Andhra Pradesh and Karnataka Using Choice-Based Conjoint Analysis. *International Journal of Management and Social Science Research Review*. 1(26), 91-97.
15. Gustafsson, A., Herrmann, A., & Huber, F. (Eds.). (2007). *Conjoint measurement: methods and applications*. Springer Science & Business Media.
16. Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis: A global perspective*. Pearson.
17. Hasan, R., (2017). The impact of brand image on consumer purchase intention: a study of the smartphone industry in Malaysia, Master Thesis, International Islamic University Malaysia.
18. Howard, B. (2003). Go Mobile: Marketing takes to the wireless web. *Target Marketingmag. com*, *26*(12), 33-72..
19. Hwang, C. L., & Yoon, K. (1981). 1981Multiple Attribute Decision Making: Methods and Applications. *Lecture Notes in Economics and Mathematical Systems*, *186*(1).
20. Imtiaz, A., Punjani, S., & Khan, N. A. (2021). Impact of Brand Image Customer's smartphone buying decision. *Turkish Online Journal of Qualitative Inquiry*, *12*(4).
21. Karjaluoto, H., Karvonen, J., Kesti, M., Koivumäki, T., Manninen, M., Pakola, J., ... & Salo, J. (2005). Factors affecting consumer choice of mobile phones: Two studies from Finland. *Journal of Euromarketing*, *14*(3), 59-82.
22. Kendall, M. G. (1938). A new measure of rank correlation. *Biometrika*, *30*(1/2), 81-93.
23. Khurshid, S., &Khurshid, S. (2018). Brand Influence on Consumers' Behavior Towards Purchasing Mobile Phone. *Science International*. 30(3), 345-350.
24. Kim, K. H. S, Relkin, N. R, Lee, K. M, Hirsch, J.(1997). Distinct cortical areas associated with native and second languages. *Nature*, *388*, 171-174.
25. Kroes, E. P., & Sheldon, R. J. (1988). Stated preference methods: an introduction. *Journal of transport economics and policy*, 11-25.
26. Ladipo, P. K. A., Awoniyi, M. A., & Akeke, O. S. (2018). Influence Of Smartphone Attributes On Student's Buying Decision In Lagos State Tetiary Institutions. *Jurnal Manajemen dan Kewirausahaan*, *6*(1), 70-81.
27. Lavuri, R., Navulla, D., &Naik, M. N. (2019). Buying predilection of buyers towards branded mobile phones devices. *International Journal of Recent Technology and Engineering*, 8(3), 178-186.
28. Lazim, H. M., &Sasitharan, D. (2015). What factor persuade Malaysians consumer to purchase smartphone? *Journal of Technology and Operations Management*. 10(2), 38–50.
29. Louviere, J. J. (1988). Conjoint analysis modelling of stated preferences: a review of theory, methods, recent developments and external validity. *Journal of transport economics and policy*, 93-119.
30. Luce, R. D., & Tukey, J. W. (1964). Simultaneous conjoint measurement: A new type of fundamental measurement. *Journal of mathematical psychology*, *1*(1), 1-27.
31. Mohankumar, A. & Dineshkumar, U. (2008). A Study on Customer Purchase Behaviourtowards Mobile Phone with special reference to Erode city. *IOSR Journal of Business and Management*, 4-8.
32. Mokhlis, S., & Yaakop, A. Y. (2012). Consumer choice criteria in mobile phone selection: An investigation of Malaysian university students. *International Review of Social Sciences and Humanities*. 2(2), 203–212.
33. Montenegro, J. A. & Torres, J. L. (2016). Consumer preferences and implicit prices of smartphone characteristics, Working Papers, Universidad de Málaga, Department of Economic Theory, Málaga Economic Theory Research Center.
34. Natter, M., & Feurstein, M. (2002). Real world performance of choice-based conjoint models. *European Journal of Operational Research*. 137(2), 448-458.
35. Nguyen, N. L., Tran, T. T., & Vo, M. P. (2020). The Effect of Lifestyle, Brand Image and Personalities on Smartphone Purchase Decision of Consumers in Hochiminh City. *International Journal of Innovative Science and Research Technology*, *5*(3), 481-492.
36. Osman, M. A., Talib, A. Z., Sanusi, Z. A., Shiang-Yen, T., & Alwi, A. S. (2012). A study of the trend of smartphone and its usage behavior in Malaysia. *International Journal on New Computer*

Architectures and Their Applications, *2*(1), 274-285.

37. Rahim, A., Safin, S. Z., Kheng, L. K., Abas, N., & Ali, S. M. (2016). Factors influencing purchasing intention of smartphone among university students. *Procedia Economics and Finance*, *37*, 245-253.
38. Rai, B. (2020). The effect of demographic factors on consumer purchase intention in buying Television set in Kathmandu Valley: An empirical study. *Pravaha*. 25(1), 23–31.
39. Cheng, S., Chan, C. W., & Huang, G. H. (2002). Using multiple criteria decision analysis for supporting decisions of solid waste management. *Journal of Environmental Science and Health, Part A*, *37*(6), 975-990.
40. Sata, M. (2013). Factors affecting consumers buying behavior of mobile phone devices. *Mediterranean Journal of Social Sciences*. 4(12), 103-112.
41. Scharl, A, Dickinger A. & Murphy, J. (2005). Diffusion and Success Factors of Mobile Marketing. *Electronic Commerce Research and Applications*. 4(2), 159-173.
42. *Shivaratri, C. (2016).*Consumer Choice of Smartphone Attributes: An application of conjoint analysis. *Research Journal of Social Science & Management*. 6(6).
43. Smutkupt, P., Krairit, D. & Esichaikul, V. (2010). An Empirical Study of the Effects of Permission on Mobile Advertising Effectiveness. Technology Management for Global Economic Growth Conference, Thailand.
44. Steinbock, D. (2005). Mobile Revolution: The Making of Worldwide Mobile Markets. Kogan Page, London, GBR.
45. Sujata, J., Yatin, J., Abhijit, C., Noopur, S., &Ruchi, D. (2016). Factors affecting smartphone purchase among Indian youth: A descriptive analysis. *Indian Journal of Science and Technology*. 9(15), 1-10.
46. Uddin, M. R., Lopa, N. Z., & Oheduzzaman, M. (2014). Factors affecting customers buying decisions of mobile phone: A study on Khulna city, Bangladesh. *International Journal of Managing Value and Supply Chains*. 5(2), 21–28.
47. Wilska, T.A. (2003). Mobile phone use as part of young people's consumption styles. *Journal of Consumer Policy.* 26, 441–463. https://doi.org/10.1023/A:1026331016172.
48. Wittink, D. R. & Cattin, P. (1989), Commercial Use of Conjoint Analysis: An Update. *Journal of Marketing*. 53(3), 91-96.
49. Yuan, S. T. & Cheng, C. (2004). Ontology-Based Personalized Couple Clustering for Heterogeneous Product Recommendation in Mobile Marketing. *Expert Systems with Applications*. 26(4), 461-476.
50. Reddy, L. S., & Ramasamy, D. (2016). Justifying the judgmental sampling matrix organization in outsourcing industry. *Vidushi, July-December*..
51. Cattin, P., & Wittink, D. R. (1982). Commercial use of conjoint analysis: A survey. *Journal of marketing*, *46*(3), 44-53..
52. Akaah, I. P. (1988). A conjoint investigation of the relative importance of risk relievers in direct marketing. *J Advertising Res.*, 38-44.

