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A Study of Smartphone Sustainable Business in the Chinese Market through Conjoint Analysis

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Abstract

Purpose: This study focuses on the Chinese smartphone market to estimate product attributes influencing Chinese customers' preference for developing new smartphones through conjoint analysis. **Research design, data and methodology:** The online questionnaire survey is processed among Chinese potential smartphone customers. Conjoint analysis including traditional conjoint analysis (TCA) and choice-based conjoint analysis (CBCA), is used to analyze the useful data of 500. **Results:** Results indicate that price is the most important predictor while screen size is the least for Chinese customers' preference whether the method is TCA or CBCA. However, the importance of brand, capacity, CPU, and screen design is different. Moreover, based on each smartphone attribute level's utility, the new products with the best combinations are different compared with both methods. Finally, the predicted market shares of the top 3 products are the same with maximum utility rule model between TCA and CBCA. However, when considering with the new best combined product, they are significantly different. **Conclusions:** Managers should recognize the differences between TCA and CBCA and select the best method to develop new smartphones for sustainable business in the Chinese competitive market based on the important attributes of price, brand, capacity, CPU, screen design, and size.

Keywords : Smartphone Selection Attributes, Traditional Conjoint Analysis, Choice-Based Conjoint Analysis, Smartphone Sustainable Business

JEL Classification Code : C35, D12, M31

1. Introduction

With the development of information and Internet technology, people use smartphones to conduct various activities such as education and entertainment online. As a result, smartphone has an important influence on human's daily life (Ahmad et al., 2019; Djatmiko & Pradana, 2016). In particular, China is currently playing a critical leadership role in the global smartphone market due to her competences of manufacture and consumption. According to Maximize

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Market Research (2023), the market size of Chinese smartphones grows increasingly, and it is expected to be approximately US$862.1 billion by 2029. The rapid growth of the Chinese smartphone market provides good opportunities for domestic and foreign companies. In order to gain an important advantage in the Chinese fierce competitive market, it is necessary for companies to explore the attributes of smartphones which may satisfy Chinese customers and develop new products sustainably.

One of the well-known methods to develop a new product is conjoint analysis. Conjoint analysis is usually used in an environment which is similar to the actual purchasing behavior to calculate the utility of virtual new products and predict the market share. Thus, scholars used conjoint analysis to develop new products in various fields such as aviation services and online banking services (e.g., Bruning et al., 2009; Dauda & Lee, 2015). However, there is a lack of research focusing on the smartphone industry. Moreover, as cited by Agarwal and Green (1991) and Lee (2012), conjoint analysis can be generally divided into traditional conjoint analysis (TCA) using a full profile and choice-based conjoint analysis (CBCA). Recently, compared to TCA, although researchers prefer CBCA which is applied in many different fields (e.g., Alfaro & Chankov, 2022; Demirciftci et al., 2023; Mansuy et al., 2020), in the existing study of new smartphone development, most scholars still focused on TCA to develop new products based on the selection attributes (Kim, 2005). It is necessary to use various scales to collect data and explore the implicated results. Furthermore, some other researchers cited the differences between TCA and CBCA in industries such as restaurants (e.g., Ahn et al., 2011). However, there are no empirical study for the Chinese smartphone market. Therefore, this study focuses on the Chinese market to estimate the importance and utility of the smartphone selection attributes and predict the virtual products' market share through TCA and CBCA. This study would provide useful implications for managers to do a sustainable business of smartphones in the Chinese market.

2. Literature Review

2.1. The Chinese Smartphone Market

With the fourth industrial innovation, Internet technology is rapidly developing, and the penetration rate of smartphones is increasing day by day. The population in China is about 1.4 billion and their demands for smartphones is increasing more rapidly with the development of economy. According to the data presented by Statista (2023), the number of smartphone users in China reached 1.040 billion at the end of 2022 and it is expected to be 1.211 billion by 2027. As the number of Chinese smartphone users increased, the shipment of smartphones increased from 213 million in 2012 to 285.8 million in 2022, but it decreased by 13.2% compared to 329.3 million in 2021 (Statista, 2023). This can be interpreted as the negative impact of COVID-19 on the market, which started at the end of 2019. However, in 2023, the measures regarding COVID-19 were terminated and the shipment of smartphones increased from 2.037 hundred thousand in January to 12.477 hundred thousand in October, reaching 230 million over the 10 months (Luo, 2023). Sales of smartphones reached US$359.7 million in 2022 and it will continue to increase at a compound annual growth rate (CAGR) of 13.3% from 2022 to 2029 (Maximize Market Research, 2023).

In the Chinese smartphone market, the popular brands with great market share are Apple, Huawei, Xiaomi, Vivo, OPPO, and Samsung (MarkWide Research, 2023). Generally, the foreign companies such as Apple and Samsung are superior in design and function of smartphones, but in the case of Chinese domestic companies such as Huawei and Xiaomi, lower price tends to be the key factor for success (Maximize Market Research, 2023). Therefore, for companies to take a competitive advantage in the Chinese smartphone market, it is necessary to continuously develop differentiated new products based on the significant factors which can satisfy Chinese customers' demands. The next section would review the selection attributes which are important in developing new smartphone products.

2.2. Smartphone Selection Attributes

Selection attribute is a feature that customers consider important when they purchase a product or service (Ahn et al., 2011; Gao et al., 2018; Mittal et al., 1999). Accordingly, the smartphone selection attribute can be defined as the important characteristic that influences customers' decision-making when purchasing a smartphone.

Since the smartphone selection attribute is a decisive factor in customer's consumption behavior, many studies have been conducted for a long time (Lee, 2014). Han (2011) points out that product quality, design, after service (A/S) management, price, and function are important factors for consumption satisfaction and value. Ling et al. (2007) focused on mobile phone size, design, and main menu to estimate college students' preferences for mobile phones. Yeh et al. (2016) explained smart customer loyalty with a focus on brands. Kim et al. (2016) reviewed factors influencing customer loyalty of Korean smartphone market which include product function, design, price, and image. Similarly, Djatmiko and Pradana (2016) emphasized the importance of brand image and additionally, they found that price is also important in making decisions to purchase Samsung smartphones. With an empirical study, Ahmad et

al. (2019) found that brand, battery, weight, system, RAM, capacity, and screen size are the determinants of consumption behavior.

Most of the literature above focused on price, color, CPU, design, screen size, brand, material, battery, capacity, and system to explore their impacts on customers' consumption behavior. It is limited to estimate the utility and predict the market share of the new products based on these selection attributes. Therefore, this study aims to examine the importance and utility of the new smartphone selection attributes through conjoint analysis which includes TCA and CBCA. Moreover, it is to predict the market share of the new products and compare their differences between TCA and CBCA.

2.3. Conjoint Analysis

Conjoint analysis, which is well-known in the field of psychology, was introduced into marketing in the early 1970s (Green & Rao, 1971). Since then, it has been used in various areas such as geography, urban planning, and sociology (Louviere, 1994). Currently, conjoint analysis is applied to develop new products. It is because the method is a technique for estimating the utility and customers' preference of the new products which can be developed under the condition that a particular product has several important attributes and each attribute has several levels or values (Agarwal & Green, 1991; Green & Srinivasan, 1978; Lee, 2012). In other words, the smartphone selection attributes influencing customers' decision have several levels or values. Based on this, a virtual smartphone profile can be made. With a survey data of Chinese customers, it is easily to calculate the utility and predict the new product's market share which is favorite by Chinese customers. In general, conjoint analysis includes TCA and CBCA. As compared to TCA, CBCA is the most widely used method.

2.3.1. Traditional Conjoint Analysis

TCA is a statistical method of showing multiple virtual profiles covering product selection attributes at once, asking each virtual profile's preference, and then estimating the utility of each attribute level (Green & Srinivasan, 1978; Lee, 2012).

TCA has a disadvantage in that it is difficult to accurately calculate individual customer utility because it is difficult for respondents to determine rankings as the number of attributes included in the virtual product profile increases (Ahn et al., 2011; Lee, 2012). To compensate for these shortcomings, CBCA is much more popular for researchers in many studies of different areas.

2.3.2. Choice-Based Conjoint Analysis

CBCA is a method based on product attributes of making several virtual product profiles into one choice set and then selecting the most preferred profile among them (Ahn et al., 2011; Eggers et al., 2021; Lee, 2012). If customers do not select anything from the product profile, they may be asked to select 'no choice' in each option set (Lee, 2012). Generally, parameters are estimated at the aggregate level based on the discrete choice model (Louveire & Woodworth, 1983). CBCA has a shortcoming that it is difficult to investigate the difference in utility of individual customer and the analysis results are difficult to be used for segmentation. However, CBCA is widely spreading due to the advantages as compared to TCA (Alfaro & Bankov, 2022; Demirciftci et al., 2023; Wallner et al., 2022).

2.3.3. Existing Research of Conjoint Analysis

Conjoint analysis can derive the importance of the selection attributes of a product and each attribute level's utility in a situation similar to the actual purchase environment, so researchers used this method in various fields. Bruning et al. (2009) investigated selection characteristics of aviation services through conjoint analysis to develop new products. In online banking services, Dauda and Lee (2015) reviewed customers' acceptance of technology using conjoint analysis. Silayoi and Piece (2007) focused on the Thailand market and conducted a study by approaching conjoint analysis to estimate the package attributes for improving customer awareness. Tano et al. (2003) used conjoint analysis to focus on the West African market and examine the characteristics of cattle preferred by farmers. Choi et al. (2020) studied preference for mobile payment services in the Korean market using conjoint analysis.

Recently, scholars usually use CBCA to conduct their studies due to the advantages as compared to TCA discussed before. Gao et al. (2018) focused on the Chinese beer industry and developed new products most preferred by customers through CBCA. Zhang et al. (2021) focused on the tourism industry and investigated the relationship between social media picture posting and preference through CBCA. Mansuy et al. (2020) studied the properties of determining the preference of an electrical and electronic equipment (EEE) using CBCA. Payini et al. (2022) focused on CBCA to estimate Indian female consumers' wine selection. In the aviation industry, Alfaro and Chankov (2022) reviewed the customers' perceived value of environmental sustainability by CBCA. Wallner et al. (2022) studied strategies that can improve customers' preference for innovative products based on CBCA. Demirciftci et al. (2023) approached CBCA to examine customers' intentions to purchase a casino buffet. Kim and Park (2023) used CBCA and studied the value of mobile phone communication services in the Korean market.

On the other hand, some other scholars have compared conjoint analysis with other statistical techniques with

empirical studies. For example, in a study of the tourism industry, especially the preference of luxury shopping destinations, Hung et al. (2019) surveyed Chinese customers and compared the result differences between conjoint analysis and traditional item measurement. Halme and Kalio (2011) compared CBCA to Hierarchical Bayes to explain customer preferences. Ahn et al. (2011) compared the result differences between TCA and CBCA to investigate restaurant preferences for Korean customers.

In the smartphone industry, Kim (2005) focused on the Korean market and used TCA to estimate the attributes of new products that may satisfy customers' demands. Similarly, Ji and Cho (2009) surveyed college students based on TCA and found out the attributes of new mobile phones preferred in the Korean market. Since these studies are concentrated in the Korean market, there is a limit to explain the situation in the Chinese smartphone market, which is fiercely competitive in recent years. Most of the current studies above have mainly used CBCA to investigate new product development in various fields, but there is no research to compare the difference in results with TCA and CBCA in the Chinese smartphone market. Thus, this study aims to calculate the importance of smartphone selection attributes and the utility of each selection attribute level in the Chinese market using TCA and CBCA which may be great for new product development. Moreover, through simulation analysis, the market share of the virtual new products would be predicted, and the difference would be explained.

3. Research Methods

3.1. Smartphone Selection Attributes and Levels

The most important in conjoint analysis is to determine the number of product attributes and levels (Ahn et al., 2011). It is important to configure the number of attributes and levels because the estimation error increases. Especially when the number of attributes and each attribute level is too small or too large, it is difficult to reflect the characteristics. Therefore, generally, it is appropriate to determine the number of product attribute levels between 2 and 4 (Dauda & Lee, 2015). The expert opinion surveys, group interviews, and questionnaires are the best methods which are helpful for determining the number of product attributes and levels (Cattin & Witink, 1982).

In this study, the authors reviewed previous studies on smartphone attributes and conducted a focus group interview (FGI) on five highly specialized employees working at smartphone companies. The authors selected important selection attributes and made a questionnaire for price, screen size, brand, carrier, material, screen pixel system, CPU, capacity, battery capacity, battery usage time, screen design, color, smartphone size, weight, and camera pixel. A preliminary survey was conducted on 82 Chinese customers who had purchased smartphones or had higher intentions to purchase them in the near future. According to the results of the frequency analysis, six smartphone selection attributes described in Table 1 were chosen: price (70.73%), brand (53.66%), capacity (59.76%), CPU (51.22%), screen design (48.78%), and screen size (36.59%). The levels of each selection attribute are consisted of three prices (3,000~4,999 yuan, 5,000~7,999 yuan, more than 8,000 yuan), two brands (Chinese brand, other brand), three capacities (128G, 256G, 512G), two CPUs (2.8GHz, 3.2GHz), two screen designs (flat, folder), and two screen sizes (6.1 inches, 6.7 inches).

Table 1: Smartphone Selection Attributes and Levels

Attributes	Levels		
Price	3,000~4,999 yuan	5,000~7,999 yuan	Over 8,000 yuan
Brand	Chinese brand	Others	-
Capacity	128G	256G	512G
CPU	2.8GHz	3.2GHz	-
Screen design	Flat	Fold	-
Screen size	6.1 inch	6.7 inch	-

3.2. Profile Construction and Data Collection

In this study, a total of 144 (3×2×3×2×2×2) virtual product profiles can be configured in consideration of the derived smartphone select attributes and levels. However, it is impossible to present all these virtual products to the respondents to select the most preferred profile. When the number of virtual product profiles is too large, orthogonal design is used to extract suitable and minimal product profiles to measure the main effect and minimize the interaction effect between levels of each attribute (Ahn et al., 2011). With orthogonal design, the number of virtual product profiles in this study was reduced to 16. Based on the 16 virtual product profiles, the questionnaire items required for TCA and CBCA were designed. In TCA, preference for each profile was measured on a 9-point Likert scale (1 = very unfavorable, 9 = very favorable). On the other hand, in CBCA, several profiles of all virtual products were grouped to create a single set and proceeded by selecting one of the most preferred profiles for the respondents. Generally, it is recommended that a set of choices can be constructed from 8 to 20 (Johnson & Orme, 1996). Therefore, with the consideration of the validity and reliability in this study, the questionnaire was composed by including three profiles in each selection set (Malone & Lusk, 2017).

The questionnaire constructed in this study was preliminarily surveyed on 100 Chinese smartphone customers and according to the polite survey results, the measurement questions were modified. With the revised questionnaire, a total data of 755 were collected through the online survey site WenJuanXing which is well known in China, of which 500 (74.07%) were used for the subsequent analysis, excluding the data lack of response integrity.

4. Technological Results

4.1. Statistical Characteristics of the Respondents

Frequency analysis was conducted to find out the demographic characteristics of the respondents. The results are summarized in Table 2. According to the results of gender, there are 313 women (62.6%) among the total respondents which is more than 187 men (37.4%). In the age group, 231 of all the customers aged 18-25 (46.2%), 142 aged 26-30 (28.4%), 91 aged 31-40 (18.2%), and 36 over 41 (7.2%). In the distribution of educational background, the number of university graduates is the largest with 242 (48.4%), followed by college graduates 133 (26.6%). About the participants' occupations, 148 of the respondents are students (29.6%), 104 engineers (20.8%), 63 salesmen (12.6%), 29 researchers (5.8%), 27 businessmen (5.4%), and others such as housewives and public officials 129 (25.8%). The distribution of the average monthly income is as follows: 134 with less than 3,000 yuan (26.8%), 119 with more than 3,000 yuan and less than 4,999.999 yuan (23.8%), 95 with more than 5,000 and less than 6,999.999 yuan (19.0%), 87 with more than 7,000 and less than 9,999.999 yuan (17.4%), 65 with more than 10,000 yuan (13.0%). Among all the participants, 189 have married (37.8%) as compared to those not yet 303 (60.6%).

4.2. Results of Conjoint Analysis

The importance of the smartphone's selection attributes and the utility of each attribute level were analyzed through TCA and CBCA, and the results were shown in Table 3. In the analysis of the importance of smartphone selection attributes, price is the most important whether the method is TCA (30.46%) or CBCA (35.24%). Unfortunately, it is found that the screen size was the least important regardless of the statistical analysis techniques. In addition, the importance ranking of each selection attribute in TCA is price (30.46%), capacity (19.61%), design (17.6%), brand (16.20%), CPU (8.45%), and screen size (7.70%), which were different from the results of CBCA.

According to the results of each attribute level's utilities, in TCA, the product that has the greatest utility of each attribute level is price of 3,000-4,999 yuan (0.659), the Chinese brand (0.026), the capacity of 256G (0.175), CPU

Table 2: Statistical characteristics of the participants

Variables	Items	n	Percentage
Gender	Male	187	37.4
	Female	313	62.6
Age groups	18-25	231	46.2
	26-30	142	28.4
	31-40	91	18.2
	Over 41	36	7.2
Education	Below high school	78	15.6
	Collage	133	26.6
	University	242	48.4
	Graduate school	47	9.4
Occupation	Engineer	104	20.8
	Salesman	63	12.6
	Researcher	29	5.8
	Student	148	29.6
	Businessman	27	5.4
	Others	129	25.8
Salary monthly (RMB)	Less than 3,000 yuan	134	26.8
	3,000-4,999.999 yuan	119	23.8
	5,000-6,999.999 yuan	95	19.0
	7,000-9,999.999 yuan	87	17.4
	More than 10,000 yuan	65	13.0
Marriage	Single	303	60.6
	Married	189	37.8
	Others	8	1.6
Total		500	100.0

2.8GHz (0.039), flat screen (0.447), and screen size 6.1 inch (0.005). However, in CBCA, the product with greatest utility of each attribute level is price of 3,000-4,999 yuan (0.435), the Chinese brand (0.047), the capacity of 512G (0.185), CPU 3.2GHz (0.084), flat screen (0.348), and screen size of 6.7 inch (0.016). The results showed that in both methods, the greatest utilities, price of 3,000-4,999 yuan, the Chinese brand, and flat screen are the same, but the utilities of the detail attribute levels of capacity, CPU, and screen size are different between them.

Table 3: Results of Importance and Utility in Each Selection Attribute Level

Selection Attributes	Levels	Utility		Importance			
		TCA	CBCA	TCA	Ranking	CBCA	Ranking
Price	3,000-4,999 yuan	0.659	0.435	30.46%	1	35.24%	1
	5,000-7,999 yuan	0.018	-0.053				
	Over 8,000 yuan	-0.678	-0.382				
Brand	Chinese brand	0.026	0.047	16.20%	4	4.04%	5
	Others	-0.026	-0.047				
Capacity	128G	-0.335	-0.325	19.61%	2	22.03%	3
	256G	0.175	0.140				
	512G	0.160	0.185				
CPU	2.8GHz	0.039	-0.084	8.45%	5	7.27%	4
	3.2GHz	-0.039	0.084				
Screen design	Flat	0.447	0.348	17.60%	3	30.02%	2
	Fold	-0.447	-0.348				
Screen size	6.1 inch	0.005	-0.016	7.70%	6	1.41%	6
	6.7 inch	-0.005	0.016				

4.3. Results of Simulation Analysis

The market share of the 16 virtual smartphones in this study were predicted using the maximum utility rule model, and the results are shown in model 1 of Table 4. In TCA, the market share of the tenth virtual smartphone was the greatest at 16.603%. The tenth virtual smartphone's attributes are as follows: other brand, 215G capacity, CUP of 2.8GHz, flat screen, and 6.1 inch. The second highest market share estimate for the twelfth virtual smartphone (3,000-4,999 yuan, Chinese brand, 256G, 2.8GHz, flat screen, 6.7 inch) is 15.440%. The third greatest market share estimate for the second virtual smartphone (3,000-4,999 yuan, other brand, 512G, 3.2GHz, fold screen, and 6.7 inch) is 13.837%.

According to the market share results of CBCA, the top 3 virtual product profiles are found to be the tenth, the twelfth, and the second smartphones, similar to the TCA. In particular, the market share forecasts of the tenth and the twelfth are the same as 15.600%, ranking the first. The market share forecast of the second virtual smartphone is 14.800%, ranking the third. The top 1 market share of the virtual smartphone in TCA and CBCA is the tenth, and it is 16.603% in TCA, which is greater than that in CBCA. However, the market share of the twelfth and the second are found to be lower than that in CBCA.

On the other hand, according to the greatest utility of each selection attribute level, a new best combined smartphone is created. When introducing the new best combined smartphone, with the maximum utility rule model, there are great changes of the market share. The detailed results are summarized as follows in model 2 of Table 4. In TCA, when the new best combined smartphone appeared, the market share for the tenth virtual smartphone (3,000-4,999 yuan, other brand, 521G, 2.8GHz, flat screen, 6.1 inch) decreased by 1.829% from 16.603% to 14.774%, but it is still the greatest. The market share for the second virtual smartphone (3,000-4,999 yuan, other brand, 521G, 3.2GHz, fold screen,

6.7 inch) decreased from 13.837% to 13.828%, with the ranking rising form the third to the second. Furthermore, the seventeenth new best combined smartphone has attributes of 3,000-4,999 yuan, Chinese brand, 256G, 2.8GHz, and 6.1 inch flat screen, with a market share of 11.294%, ranking the third. The reason why the market share of the seventeenth new best combined smartphone does not appear the largest can be interpreted as a large deviation in customers' choice by using the average value of the attribute-level utility.

Interestingly, however, the market share after adding the eighteenth new best combined smartphone in CBCA showed that the eighteenth new best combined smartphone has the greatest market share at 17.600%. And the market share of the tenth virtual smartphone fails to the second, down from 15.600% to 13.000%. the market share of the sixteenth virtual smartphone (5,000-7,999 yuan, Chinese brand, 256G, 3.2GHz, flat screen, 6.1 inch) ranks the third at 11.800%.

Table 4: Simulation Analysis Results

Profile	Price	Brand	Capacity	CPU	Screen design	Screen size	Model 1		Model 2	
							TCA	CBCA	TCA	CBCA
1	5,000-7,999 yuan	Chinese	512G	3.2GHz	Flat	6.7 inch	7.668	12.200	7.666	8.000
2	3,000-4,999 yuan	Others	512G	3.2GHz	Fold	6.7 inch	13.837	14.800	13.828	10.600
3	3,000-4,999 yuan	Others	256G	3.2GHz	Fold	6.1 inch	8.052	5.600	7.742	5.600
4	3,000-4,999 yuan	Chinese	128G	3.2GHz	Fold	6.4 inch	1.305	3.600	1.294	3.400
5	5,000-7,999 yuan	Others	128G	2.8GHz	Fold	6.7 inch	1.890	2.200	1.890	2.200
6	5,000-7,999 yuan	Others	128G	2.8GHz	Fold	6.1 inch	3.097	2.000	3.097	2.000
7	3,000-4,999 yuan	Chinese	128G	2.8GHz	Flat	6.7 inch	6.386	0.800	6.365	0.800
8	Over 8,000 yuan	Others	128G	3.2GHz	Flat	6.7 inch	4.506	4.200	4.506	4.200
9	Over 8,000 yuan	Chinese	512G	2.8GHz	Fold	6.1 inch	2.537	1.200	2.535	1.000
10	3,000-4,999 yuan	Others	512G	2.8GHz	Flat	6.1 inch	16.603	15.600	14.774	13.000
11	3,000-4,999 yuan	Chinese	128G	3.2GHz	Fold	6.7 inch	2.110	1.000	2.099	0.600
12	3,000-4,999 yuan	Others	256G	2.8GHz	Flat	6.7 inch	15.440	15.600	8.779	10.200
13	Over 8,000 yuan	Chinese	256G	2.8GHz	Fold	6.7 inch	1.079	0.200	1.076	0.200
14	3,000-4,999 yuan	Chinese	128G	2.8GHz	Flat	6.1 inch	5.178	4.000	3.146	4.000
15	Over 8,000 yuan	Others	128G	3.2GHz	Flat	6.1 inch	4.003	4.800	4.003	4.800
16	5,000-7,999 yuan	Chinese	256G	3.2GHz	Flat	6.1 inch	6.310	12.200	5.905	11.800
17	3,000-4,999 yuan	Chinese	256G	2.8GHz	Flat	6.1 inch	-	-	11.294	-
18	3,000-4,999 yuan	Chinese	512G	3.2GHz	Flat	6.7 inch	-	-	-	17.600

5. Conclusions and Discussion

5.1. Academic Implications

The existing research rarely focused on the Chinese smartphone market to explain the importance of developing new products for sustainable business in China. This empirical study focuses on the rapidly developed industry of smartphone in China to find out the attributes and levels of smartphones preferred by Chinese customers for developing new products through conjoint analysis. In order to achieve the goal, a questionnaire survey was conducted on native Chinse customers and the analysis was conducted using TCA and CBCA, which in included in conjoint analysis. Therefore, this study has contributed to the literature in several ways.

First, this study has examined the importance of smartphone selection attributes and the utility of each attribute levels through TCA and CBCA, which has never been used in this filed. Thus, it provides a theoretical foundation to understand customers' responses on developing a new product. Consist with the findings of Ahn et al. (2011), the results related to the importance of selection attributes and the utility of each attribute level are different between TCA and CBCA. In TCA, the importance of the selection attributes is in the order of price, capacity, screen design, brand, CPU, and screen size. However, in CBCA, the importance of selection attributes is found to

differ slightly form TCA in the order of price, screen design, capacity, CPU, brand, and screen size.

Second, this research contributes to the extant literature by using maximum utility rule model to predict the market share of the virtual smartphones and the new products in the Chinese market, which has never been documented before. Regardless of the TCA and CBCA, the top three virtual product profiles with the greatest market share were the same. However, when considering the new best combined smartphones with the greatest utility of each attribute level, the results of CBCA showed that the market share of the new best combined smartphone is the highest. On the contrary, the market share of the new best combined product is not the greatest in TCA. It may be because the predicted market share of the new best combined product varies greatly according to the mean value of each attribute level's utility and the selection variance of the individual Chinese customer.

5.2. Managerial Implications

Based on the findings of this study, the useful implications can be presented for companies which are fiercely competing in the Chinese smartphone market.

First, price, brand, capacity, CPU, screen design, and screen size are important for Chinse customers' preferences. Thus, marketers should develop new products based on these critical attributes. In particular, Chinese customers are most concerned about price compared to other characteristics, so companies should focus on price differentiation strategies when entering the Chinese smartphone market. For example, in the case of Korean company Samsung, after establishing diplomatic relations between Korea and China in 1992, the company quickly entered the Chinese market and took a high market share due to their excellent design and function from the end of the nineth century to the mid-2000s. Especially, Samsung smartphone dominated the top spot in China with a market share of nearly 20%. However, although it ranked the first in the world with the market share of 22% in the first quarter of 2023 (Canalys, 2023a), it has gradually missed out on competitive advantage in the Chinese market from mid to late 2000 years to now, accounting from only 0.8% in the first quarter of 2023 (Canalys, 2023b). It is because the native Chinese companies such as Xiaomi, Vivo, and OPPO have grown rapidly due to low-cost strategies. However, the most important reason is about the problems of high price, low brand image and recognition, and the qualities associated with battery. As a result, according to the result of this study, companies can be a winner with strategies that developing competitive new products to satisfy Chinese customers. Moreover, when considering the factors of smartphone brand, capacity, CPU, screen design and size influencing Chinese customers' preference, it is necessary to establish a customer relationship management (CRM) system and sustain a long-term relationship with Chinese customers for taking an advantage in the Chinese market.

More importantly, TCA and CBCA are the great methods that can calculate the market share of a new best combined smartphone based the utility of the selection attribute levels. Thus, when developing new products, managers should consider the best scientific method to design the product. In other words, according to the results of the market share of the virtual smartphone and the new best combined smartphones in this study, related companies can develop smartphones with similar characteristics to enter the Chinese market for improving their competitive advantage in China.

5.3. Research Limitation and Future Study

This empirical study identified the attributes and levels of smartphones preferred by Chinese customers and presented interesting implications for practitioners, but it has several limitations. First, since the respondents of this study are concentrated in their 20s and 30s, it is difficult to understand the general characteristics of the Chinese smartphone market. In the future research, more meaningful results can be derived by increasing the number of data and investigating customers' preferences in different ages. Second, this study focused on price, brand, capacity, CPU, screen design, and size to estimate their impact on customers' smartphone preference. Future study should consider a wider range of smartphone selection attributes that affect customer consumption behavior to develop a new product. And then more implications can be presented to marketing managers. Finally, in CBCA, usually, 8-20 virtual product profiles suitable for each measurement item were recommended (Johnson & Orme, 1996). In this study, only three profiles were presented and analyzed in the selection set, so it seems to be a limitation. In the future research, it should compose four or five profiles for each selection set which would help develop new smartphones and the development of the smartphones industry.

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