Product attributes and purchase intention for smartphones: a moderated mediation model

Chun-Mei Chen
Department of Business Administration,
China University of Technology,
No. 56, Sec. 3, Xinglong Rd., Wenshan Dist.,
Taipei City 116, Taiwan (R.O.C.)
Email: doris888@cute.edu.tw

Hsian-Ming Liu*
Department of Financial Management,
National Defense University,
No. 70, Section 2, Zhongyang North Road, Beitou,
Taipei 112, Taiwan (R.O.C.)
Email: hsiamin.liu@gmail.com
*Corresponding author

Bao-Yi Ann
Department of Business Administration,
China University of Technology,
No. 56, Sec. 3, Xinglong Rd., Wenshan Dist.,
Taipei City 116, Taiwan (R.O.C.)
Email: anboy@cute.edu.tw

Abstract: This study was conducted to explore how smartphone addicts decide to adopt a smartphone brand with the related variables of product attributes, brand image, customer perceived value and purchase intention, and find out whether there exists a mediation and moderated mediation effect. The factors to influence the purchase decision of smartphone brands were investigated in order to measure the satisfaction levels of eight product attributes and to verify the indirect and moderated mediation effects by path analytic methods. This research collected 600 valid questionnaires through face-to-face market surveys with a total of 420 usable responded data. The empirical results proved that the satisfaction of product attributes is positively related to purchase intention, and brand image positively mediates the relationship between the satisfaction of product attributes and purchase intention. The perceived value positively moderates the relationship between the satisfaction of product attributes and purchase intention through brand image. Moreover, when the value of the perceived value is higher, the positive relevance between product attributes and brand image will be strengthened. The findings for strategic implications and how to enhance the purchase intention are provided for the addicts, mobile operators, smartphone manufacturers and the academia for further study.

Keywords: brand image; mobile; perceived value; product attributes; purchase intention; smartphone.
1 Introduction

The development of mobile communication from 3G technology to 4G/LTE (long-term evolution) is specially facilitated with smartphone devices to satisfy the customer multimedia demands. The portable convenience of smartphones, which are connected anytime and anywhere through internet transmission, has become an indispensable tool for our personal daily lives. In Q3 2014, Taiwan’s smartphone penetration for all mobile handsets reached 96% (2.45 mn/2.55 mn), and was ranked third worldwide only following HK and Singapore (IDC, International Data Corp., Q3 2014). Moreover, the average time on the mobile internet per day for Taiwan users is the most in the world and the monthly average transit bandwidth is 14GB (gigabytes) in 2014 (Millward Brown websites). Investigating Taiwan’s mobile users in order to find out the influence factors for the purchase decision of smartphone brands is a critical focus to be referred for the global mobile industry. The major consideration focus is not the purchase price but the choice of a favourite smartphone from different features and options. Because the delivery of high-quality service is essential for the enterprises’ survival, how the satisfaction level of product attributes affects the decision on purchase intention deserves to be further explored. The above-mentioned industry background and development inspire and formulate this research’s motivation.

The following studies were explored from diverse viewpoints to examine the product attributes, perceived value, brand image and purchase intention in the service industries. Sweeney and Soutar (2001) identified four consumption values of emotional, social, quality/performance and price/value for money to significantly help in explaining attitudes and behaviour. Muller, Judd and Yzerbyt (2005) defined both mediated moderation and moderated mediation by examining whether treatment effects on an outcome are mediated and/or moderated. Zhao, Lynch and Chen (2010) reconsidered for
testing mediation and interpreting the indirect effect and the direct effect rather than the one-dimensional classification (full, partial, and none). Nam (2013) indicated that the ‘functional attributes’ for the most critical usage of smartphones is real-time communication rather than telephone or internet search. Tsai and Ho (2013) verified the significant positive effect on perceived usefulness and perceived ease of use, and suggested to develop diverse and intuitive design features on smartphones for attracting the users’ attention and affection. Han and Windsor (2013) found that a user’s perceived playfulness and the user’s perceived added value of gaming applications on smartphones both have significant positive effects. Kang, Hur and Son (2014) investigated the extent to which the perceived usefulness, perceived ease of use, perceived enjoyment and social influence of smartphones affected word-of-mouth, as well as the moderating role of customer socio-demographic characteristics. Wang and Tsai (2014) investigated the relationships of brand image, perceived quality, perceived risk, perceived value and purchase intention, and found that the brand image does indeed increase the customers’ purchase intentions. Chang and Hur (2015) empirically tested cultural differences between the components of unified theory of acceptance, use of technology (UTAUT) and trust from mobile phone service users in Korea and the USA. Chen and Ann (2016) measured the service quality of the 7P’s marketing mix, and found that when the satisfaction level of the product is higher, then both the manufacturer’s efficiency and loyalty are higher.

The handset customers care about the product features when adopting a favourite smartphone. Hence, this study adopted product attributes to replace service quality to measure the customer satisfaction level. The prior studies for the direct relationships among service quality, perceived value, customer satisfaction and behavioural intentions have been empirically demonstrated in the physical marketplace (Cronin, Brady and Hult, 2000; Hellier et al., 2003). The key factors, such as the variables of product attributes, enterprise brand image and customer perceived value, to affect the purchase intention could be included (Cronin, Brady and Hult, 2000; Sweeney and Soutar, 2001; Sánchez-Fernández and Iniesta-Bonillo, 2007; Stephen et al., 2007; Kuo et al., 2009; Ko, Lee and Lee, 2011; Wang and Tsai, 2014). The prior studies on the topic of mediation effect or moderation effect had been extensively discussed (MacKinnon et al., 2002; Muller, Judd and Yzerbyt, 2005; Edwards and Lambert, 2007; Chang and Wang, 2011; Hayes, 2013; Kang, Lee and Lee, 2014). Thus, there might exist a mediation effect or moderated mediation effect which helps to understand user adoption of a smartphone brand.

Based on the above-studied background and motivation, the purpose of this study focuses to validate the influence factors on smartphone brand adoption to serve as a reference to wireless carriers (mobile operators), smartphone manufacturers and academia for further study. The structure of this paper is as follows. Section 2 addresses the theoretical background studied description of product attributes, brand image, perceived value and purchase intention. Section 3 covers the research materials and methods utilised including market survey questionnaires and hierarchical regression analysis. Section 4 proposes the empirical results. Section 5 presents the discussion. And finally, Section 6 offers the concluding remarks and recommendations for further study.
2 Theoretical background

As consumers are independent individuals, their different preferences and the emphasis on choosing particular smartphone properties are diversified. For the purpose of measuring the customer satisfaction level of product attributes, the users of the top four smartphone manufactures of Apple, Samsung, HTC and Sony are adopted as studied samples. This study focuses on various subjects such as how to distinguish the attributes satisfaction from the customer viewpoint, and how to further enhance the customer perceived value, upgrade the brand image and promote the purchase intention.

2.1 Product attributes

The product attributes will affect a consumer purchase intention and have been taken as an important buying criterion. Aaker and Shansby (1982) proposed that the product attributes could be distinguished to be tangible (physical in nature) or intangible (not physical in nature). The tangible attributes are characteristics such as the appearance of size, colour, weight, the functions of material composition and after-sales service. The intangible attributes may include characteristics such as price, reliability, beauty and an indefinable or elusive pleasing quality. Nogee (2011) analysed that there are several critical factors that drive smartphone success including having a powerful browser, offering a wide variety of apps, presenting an easy to navigate user interface, providing a good keyboard or touch screen and other ‘intangible attributes’ such as having a fashionable exterior design.

From the above literature, the product attributes are the characteristics of raw materials or finished goods which make it distinct from other products, including size, colour, functionality, components and features that affect the product’s appeal or acceptance in the market. For clearing the attributes constructed to follow Aaker and Shansby (1982), a product attribute is categorised into tangible attributes and intangible attributes for this study. The question items are in order from PA 1 to PA 8 to measure the satisfaction level of product attributes. Please refer to Appendix 1 for more detail.

2.2 Brand image

The main smartphone manufacturers have made effort to enhance their company brand image in order to attract customers to purchase their smartphones. There are three types of benefits viewed as consequences from the purchase or consumption of a brand: functional benefits, symbolic benefits and experiential benefits (Park, Jaworski and MacInnis 1986). Fredericks and Slater (1998) highlight in their study that brand image is a factor associated with customer perceived value, and the decision of customer perceived value is derived from the brand image.

A corporate brand image is a valuable intangible form of capital that is hard to imitate and can help an organisation to achieve sustainable and superior financial performance (Roberts and Dowling, 2002). Driesener and Romaniuk (2006) reviewed three commonly used methods: brands can be rated, ranked or all those with a characteristic can be named the ‘pick-any’ method. Corporate image can be defined as the perceptions of an organisation reflected in the associations held in the consumers’ memory, which distinguish the organisation from other competitors (Elgin and Nedunchezhiyan, 2012).
From the above-referenced literature, the features of brand image are composed of product scope, product attributes, quality or value of the product, uses, country of origin and other traits. As a result, the related construct of brand image proposed for this study is composed of quality level, symbolic image and experiential image. For the question items in order from BI 1 to BI 8 to measure the brand image level, please see Appendix 1 for more detail.

2.3 Perceived value

For the related construct of perceived value, most literature studies focus on the measurement of exploring the product recognised value from the consumers’ viewpoint. Dodds and Monroe (1985) proposed the relationship model of price, perceived quality and perceived value, and they mentioned that perceived value is an important factor in the consumer purchasing decision process. Some other researchers defined perceived quality as the result of satisfaction (Anderson and Sullivan, 1993), whereas others have proven the relation between perceived quality and satisfaction (Parasuraman, Zeithaml and Berry, 1994). Parasuraman and Grewal (2000) indicated that perceived value is an important index for those customers in a position to repurchase.

Lovelock et al. (2002) explored that the perceived value is the result of mutual swaps between perceived costs and perceived benefits, and it is an important index for repurchasing activities for the customers. Sweeney and Soutar (2001) induced the construct of perceived value, which includes the four dimensions of quality, emotional value, social value and price to figure out the PERVAL scale. Previous research studies in conventional retailing have concluded that perceived quality has a positive effect on customer satisfaction (Cronin, Brady and Hult, 2000). Perceived quality is simply the customer’s overall assessment of the standard process of receiving customer services (Hellier et al., 2003).

Heinonen (2004) suggested that the perceived value is conceptualised as a function of benefits and sacrifices of technical, functional, temporal and spatial value dimensions. Kuo et al. (2009) constructed structural equation modelling to prove the relationship among service quality, perceived value, customer satisfaction and post-purchase intention in mobile added-value services. Chang and Wang (2011) explored the research framework of green purchase intentions to examine the relationship between customer satisfaction and loyalty by exploring the moderating effects of customer perceived value.

The concept of perceived value implies an interaction between a consumer and a product. The related concept of perceived value is composed of quality, monetary price, non-monetary price, affection response, reputation and other factors. In the process of consuming the product/service, how to satisfy the consumer perceived value with pleasure and furthermore how to build a good impression on the company will bring brand loyalty. From the literature explored above, the related constructs of perceived value proposed by this study are composed of perceived quality, emotional value and social value. The question items are in order from PV 1 to PV 8 to measure the level of perceived value, please see Appendix 1 for more detail.
2.4 Purchase intention

The association of the above-mentioned ‘brand image’ and consumer purchase intention is closely related. Several studies in the marketing literature have primarily investigated the relation between perceived quality and purchase intention (Alexandris, Dimitriadis and Markata, 2002; Cronin et al., 2000). Hellier et al. (2003) showed that re-purchase intention is the repeated process of buying goods and services from a particular store or place, and the main reason is due to the experiences after shopping. Kuo, Hu and Yang (2013) indicated that both consumer inertia and satisfaction positively influence repeat purchase intention, and that consumer inertia is more influential than satisfaction. In other words, when customers perceive better quality along with perceived product value, they then form purchase intention to result in purchase activities.

Although customers have the purchase intention to buy a smartphone, they might finally give up because the price is too expensive or due to poor promotional programs. Hence, the related construct of purchase intention proposed by this study is composed of purchase inclination, repurchase intention and recommendation intention as well as the related variables to measure the concept of loyalty. The question items are in order from PI 1 to PI 5 to measure the level of purchase intention. Please see Appendix 1 for more detail.

2.5 Theoretical framework and hypotheses

This paper has tried to combine a series of relevant constructs based on the prior studies to better comprehend the purchasing decisions for smartphone users. Stephen et al. (2007) examined the effects of brand image including functional, social, appearance and experiential which are positively related to overall satisfaction, and the overall satisfaction did influence the customers’ loyalty. Zeithaml (1988) proposed a perceived value to affect the relationship between quality and purchases. Sánchez-Fernández and Iniesta-Bonillo (2007) explored the concept of perceived value to imply an interaction between a consumer and a product.

Ko, Lee and Lee (2011) indicated that extrinsic cues such as brand image are more important than intrinsic cues in post-purchase contexts, and the price played a significant role in moderating the relationships between product attributes, perceived value and repurchase intentions. Dai, Midha and Koong (2014) proposed a conceptual model to find that both the technical and functional quality of e-services and mobile services have a strong impact on consumers’ trust and satisfaction and in turn positively influence their loyalty towards service providers. Gumussoy (2016) applied a structural equation modelling technique to indicate that user satisfaction is the primary predictor of their loyalty, continued usage intention and purchase intention, and can be predicted by flow, efficiency and fulfilment.

One assumption for this study is because satisfied product attributes will increase a company’s brand image to the customer, it will further enforce the customer perceived value to improve the purchase intention. The variables’ relationship among product attributes, brand image, perceived value and purchase intention, and which is a mediator or a moderator deserve to be explored for the process of adopting a smartphone. The related variables crossed with hypotheses were proposed to confirm the mediation effect and the moderated mediation effect as shown in Figure 1.
Hypotheses: 

H1: The satisfaction of product attributes is positively related to purchase intention.

H2: Brand image positively mediates the relationship between the satisfaction of product attributes and purchase intention.

H3: Perceived value positively moderates the relationship between the satisfaction of product attributes and purchase intention through brand image.

3 Method

3.1 Materials

With the technical trend of information and communication technology (ICT) application services, the development of smartphone devices has become a global focus for paying attention to in related industries. The main reasons for driving significant growth for smartphones are the improved larger screens and lower mobile subscription data rates. As of 2015, the worldwide sales of smartphones reached 1.44 billion which is 75% of the worldwide 1.92 billion mobile phones sales (IDC, International Data Corp., March 2016).

The growth and decline of the smartphone market share has changed rapidly with time. The mobile operators could combine the promotional program with smartphone brands to meet the mobile subscriber needs. Hence, it is necessary for the business development of smartphone manufacturers and mobile operators to compare the distribution of different smartphone brands in global and Taiwan markets. The global market share of the top seven smartphone brands has increased from 66% in 2014 to 70.8% in 2015; please see Table 1 (Gartner, Inc., February 2016).

<table>
<thead>
<tr>
<th>Brands</th>
<th>2014 (%)</th>
<th>2015 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung</td>
<td>24.7</td>
<td>24.8</td>
</tr>
<tr>
<td>Apple</td>
<td>15.4</td>
<td>17.5</td>
</tr>
<tr>
<td>Huawei</td>
<td>5.5</td>
<td>8.4</td>
</tr>
<tr>
<td>Xiaomi</td>
<td>5.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Lenovo</td>
<td>6.5</td>
<td>5.4</td>
</tr>
</tbody>
</table>
In the Taiwan area, the distribution of the smartphone market share is different from the global market. This paper mainly explored what factors affect subscribers in adopting smartphone brands, which are ranked in Taiwan’s smartphone brand market share. This study investigated Taiwan’s top four leading smartphone market share of HTC (21.4%), Samsung (20%), Apple (16.3%) and Sony (15.8%) in 2015 H1 in order to explore the purchase intention when adopting a smartphone brand as shown in Table 2 (MIC (Market Information Center) in Taiwan, July 2015).

### Table 2 2015 H1 Taiwan’s smartphone market share

<table>
<thead>
<tr>
<th>Brands</th>
<th>Market share (Taiwan)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2014 (%)</td>
</tr>
<tr>
<td>HTC</td>
<td>22.9</td>
</tr>
<tr>
<td>Samsung</td>
<td>25.4</td>
</tr>
<tr>
<td>Apple</td>
<td>18.2</td>
</tr>
<tr>
<td>Sony</td>
<td>12.6</td>
</tr>
<tr>
<td>ASUS</td>
<td>4.1</td>
</tr>
<tr>
<td>Xiaomi</td>
<td>5.1</td>
</tr>
<tr>
<td>LG</td>
<td>4.6</td>
</tr>
<tr>
<td>Others</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Source: MIC (Market Information Center) in Taiwan (July 2015)

### 3.2 Data collection

Identifying whether product attributes are indeed a determinant of better purchase intention and to further exploring whether this impact could be mediated and moderated by brand image and perceived value are the goals of this report. This study employs market survey data from Taiwan’s smartphone users to investigate this issue when adopting a smartphone. The structured questionnaire was designed to measure the satisfaction level of product attributes, perceived value, brand image and purchase intention for the most frequently used phone models in Taiwan. For ensuring the authenticity of the materials, data were collected by face-to-face interviews to acquire the smartphone addicts’ actual desires and thoughts to mitigate the weaknesses of the market survey.

The execution and response time of the questionnaires were adopted for the observation during the period from February to March in 2014 in the Greater Taipei metropolitan regions. To improve the representativeness of the sampling design, surveys
were gathered in numerous locations in public areas such as Taipei railway stations, city parks, National Taiwan University, Wan Fang Hospital, Taipei Ximending, Taipei Eastern Distinct, Taipei City Hall Bus Station, Jiantan MRT, Tamsui MRT and so on. The data were collected by face-to-face interviews with smartphone addicts to have a valid survey recovery ratio of 100%. There were a total of 600 respondents who had purchased and used smartphone models from Apple, Samsung, HTC and Sony. Finally, a total of 420 usable responded data to be distributed for HTC (29.1%), Samsung (27.2%), Apple (22.2%) and Sony (21.5%), which were relatively close to Taiwan’s market share rankings in Table 2.

3.3 Measures

The questionnaire was designed on the basis of the literature review described in the article. The scale for assessing the satisfaction of product attributes mainly consists of tangible and intangible attributes and is taken from existing scales of Aaker and Shansby (1982). Both tangible and intangible attributes contained a total of four questions for eight question items. Customers were asked to indicate the degree of satisfaction of their smartphone attributes on a scale ranging from 1 (very unsatisfied) to 5 (very satisfied). The tangible and intangible attribute measures had reliability scores of 0.780 and 0.775, respectively.

Brand image is included for functional value, symbolic value and experiential value. Using an eight-item scale (Park, Jaworski and MacInnis 1986), the customers rated brand image from functional value, symbolic value and experiential value by indicating the degree of their agreement on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). This scale had a reliability score of 0.819. For customer perceived value, it was measured from three sub-constructs including perceived quality value, emotional value and social value. Using an eight-item scale (Dodds and Monroe, 1985), the customers rated the extent to which they perceived the benefits through using the smartphone on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). This scale had a reliability score of 0.788.

Three aspects to evaluate purchase intention include purchase inclination, repurchase intention and recommendation intention. Using the five items (Wang and Tsai, 2014), the customer indicated their inclination and intentions for the smartphone. This scale had a reliability score of 0.813. Moreover, due to the all of the constructs being second-order constructs, the technique of item parcels is adopted to transform them from four second-order constructs with 29 items into four first-order constructs with 11 items to gain some advantages, including fewer parameters to be estimated, more stable parameter estimates and more definitive rotational results.

4 Results

4.1 Samples analysis

Both issues of how long a smartphone could be used for most users and what functions are delivered with high value still attract tremendous attention for smartphone manufacturers. According to the survey respondents, the utilised smartphone lifespan are
as follows: between 1 and 2 years accounted for 48.2%; more than 2 years accounted for 32.0%; between 6 months and 1 year accounted for 17.8%; and less than 6 months accounted for 2.0%. The acceptable prices for the smartphone users range from US$167 to US$660 which accounted for about 70% and more than US$1,001 accounted for only 0.5%. For the details on smartphone acceptable prices range, please see Figure 2.

**Figure 2** Smartphone acceptable price ranges

![Smartphone Price Ranges](image)

Regarding the frequently used functions of smartphones in Taiwan’s mobile market, the percentages of the frequently used smartphone functions are shown in Figure 3. The results indicated that the most frequently used function of smartphones is ‘browsing the internet’ which accounts for 20.4%. Next is ‘using LINE messenger’ which accounts for 17.3%. The third is ‘to play games’ which accounts for 10.6%. The fourth is ‘photography’ which accounts for 10.2%. For more detail, please see Figure 3.

**Figure 3** Percentages of frequently used functions

![Smartphone Function Usage](image)

In addition, although most users understand that overusing handsets may be detrimental to one’s health, the addicts may unconsciously spend more time checking their smartphones in their daily life. When the smartphone is not in hand for the addicts whether they will feel anxiety is interesting to be investigated. The survey respondents answered ‘feeling anxious’, ‘feeling much anxiety’ and ‘feeling great anxiety’ which accounted for 61.8%.

Additionally, an investigation was done to ask whether the addicts believe that the overuse of smartphones will damage their eyes and health. The respondents who answered in agreement of possible damage to health accounted for 45.7%. The general agreement attitudes to damage accounted for 26.7%. The strongly agree attitude to damage accounted for 22.3%. Disagreement attitudes to damage accounted for 4.5% and
strong disagreement attitudes to damage accounted for 0.8%. Hence, the agreement
titudes to believing that overusing smartphones may be detrimental to one’s health
accounted for about 95%.

4.2 Measurement

Table 3 presents the descriptive statistics and correlation for the studied constructs. Confirmatory factor analysis with product attributes, brand image, perceived value and purchase intention showed that relevant indices of the goodness of fit of hypothesis model, $\chi^2 = 133.736; df = 38$, the root mean square residual (RMR) = 0.022, the goodness
of fit = 0.931, root mean square error = 0.086, the comparative fit index (CFI) = 0.955, normed fit index (NFI) = 0.939 and non-normed fit index (NNFI) = 0.955, indicating that
the structure model of the theoretical framework provided an appropriate fit with the
actual data.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Mean</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Product attributes</td>
<td>3.692</td>
<td>0.495</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Brand image</td>
<td>3.492</td>
<td>0.603</td>
<td>0.903</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Perceived value</td>
<td>3.613</td>
<td>0.547</td>
<td>0.698</td>
<td>0.854</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Purchase intention</td>
<td>3.463</td>
<td>0.776</td>
<td>0.702</td>
<td>0.804</td>
<td>0.670</td>
<td></td>
</tr>
</tbody>
</table>

Table 4 presents that the standardised factor loadings ranged from 0.683 to 0.955 and that all of the loadings were significant. Moreover, the AVE estimate of constructs ranged
from 0.592 to 0.631, thus confirming the construct’s convergent validity.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Items</th>
<th>Mean</th>
<th>SD</th>
<th>Standardised loading</th>
<th>Cronbach’s alpha</th>
<th>Composite reliability</th>
<th>AVE estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product attributes</td>
<td>Tangible attributes</td>
<td>3.748</td>
<td>0.550</td>
<td>0.785**</td>
<td>0.757</td>
<td>0.758</td>
<td>0.610</td>
</tr>
<tr>
<td></td>
<td>Intangible attributes</td>
<td>3.636</td>
<td>0.554</td>
<td>0.777**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brand image</td>
<td>Quality level</td>
<td>3.707</td>
<td>0.612</td>
<td>0.859**</td>
<td>0.819</td>
<td>0.825</td>
<td>0.612</td>
</tr>
<tr>
<td></td>
<td>Symbolic</td>
<td>3.137</td>
<td>0.796</td>
<td>0.729**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Experiential</td>
<td>3.526</td>
<td>0.733</td>
<td>0.753**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived value</td>
<td>Perceived quality value</td>
<td>3.873</td>
<td>0.629</td>
<td>0.718**</td>
<td>0.788</td>
<td>0.834</td>
<td>0.631</td>
</tr>
<tr>
<td></td>
<td>Emotional value</td>
<td>3.707</td>
<td>0.577</td>
<td>0.955**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social value</td>
<td>3.211</td>
<td>0.747</td>
<td>0.683**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase intention</td>
<td>Purchase inclination</td>
<td>3.551</td>
<td>0.893</td>
<td>0.782**</td>
<td>0.813</td>
<td>0.8131</td>
<td>0.592</td>
</tr>
<tr>
<td></td>
<td>Repurchase intention</td>
<td>3.399</td>
<td>0.921</td>
<td>0.758**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recommendation</td>
<td>3.437</td>
<td>0.915</td>
<td>0.768**</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**$p < 0.01$.**

Next, the $\chi^2$ difference test is employed to verify the discriminant validity. The methodology of the $\chi^2$ difference tests is used to calculate the differences between the full
model, where all correlations are free to be estimated, and the restricted model, in which
the correlation of assessed constructs is constrained to be unity and others are allowed to
be free. If all estimates of the $\chi^2$ difference test for each pair of constructs are significant,
then discriminant validity is concluded to exist (Bagozzi, Yi and Phillips, 1991). Table 5
summarises the results of examining discriminant validity. The result confirms that all
estimates of the $\chi^2$ difference for any pair of constructs are significant at the 0.05 level
($\chi^2$ difference $> 3.84$), exhibiting that the scale of this study has a sufficient level of
discriminant validity. Therefore, the hypothesised measurement model is reliable and
meaningful to test the mediation and moderation effects among the constructs.

Table 5  Results of discriminant validity ($\chi^2$ difference test)

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Product attributes</th>
<th>Brand image</th>
<th>Perceived value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand image</td>
<td>12.178**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived value</td>
<td>68.466**</td>
<td>41.184**</td>
<td></td>
</tr>
<tr>
<td>Purchase intention</td>
<td>62.668**</td>
<td>63.997**</td>
<td>150.089**</td>
</tr>
</tbody>
</table>

**$p < 0.01$.

4.3 Hypotheses testing

A moderated mediation model can be tested in a number of ways (Edwards and Lambert,
2007; MacKinnon et al., 2002). MacKinnon et al. (2002) demonstrated that path analytic
methods have the greatest statistical performance in estimates evaluation. In addition, a
bootstrapping technique has been adopted to test the statistical significance of specific
indirect effects in the mediation model and moderated mediation model (MacKinnon,
2008). In this study, the hypothesised model reflects Edwards and Lambert’s (2007) first-
stage moderated model. That is, brand image mediates the relationship between the
satisfaction of product attributes and purchase intention, and customer perceived value
moderates the path from the satisfaction of product attributes to brand image. Thus, the
indirect effect of the satisfaction of product attributes is conditional on perceived value.
Therefore, hypotheses testing involve estimating the following equations:

\[ BI = a_0 + a_1 PA + a_2 PV + a_3 PA\times PV + e_1; \]  
\[ PI = b_0 + b_1 PA + b_2 BI + e_2. \]

In order to explore the relationship among PA, BI, PV and PI, four second-order
constructs with 29 items were employed. Due to the research model with large numbers
of constructs, Hair et al. (2009) suggested that the minimum sample size of this model
has to be over 500 observations. Moreover, the rule of thumb of sample size in structural
equation modeling (SEM) methodology indicated that each of the items required 10 to 20
times observed sample data. Thus, this study decided to collect 600 observed data and the
sample structure mainly depended on each firm’s market share in Taiwan’s smartphone
market (Please see Table 2). In addition, this study employed the confirmatory factor
analysis (CFA) technology of SEM to evaluate the model fit, reliability and validity due
to all of research variables belong to latent psychometric variables. As for hypotheses
testing, MacKinnon et al. (2002) suggested that path analytic methods have the greatest
statistical performance in estimates evaluation. Thus, this study used Hayes’s (2013)
PROCESS macro (Model 7) for SPSS to estimate regression coefficients and conditional indirect effects and obtained 95% bias-corrected bootstrapped confidence intervals for the testing of the conditional indirect effect.

As seen in Table 6, it can be seen that the direct effect of PA on PI is significant ($B = 0.267$, $p < 0.01$), providing support for Hypothesis 1. The result indicates that the greater the satisfaction of product attributes leads to a higher degree of consumer purchase intention. Next, for the PA-BI-PI model, Table 3 shows the mean level of perceived value, $PV = 3.613$, and Table 7 indicates that the first-stage effect ($a_1 + a_3 PV$) is 0.528 ($p < 0.05$), and the second stage ($b_2$) is 0.695 ($p < 0.01$). The indirect effect at the mean level of perceived value is the product of these effects, or 0.367. The bootstrapping method indicates that this indirect effect is significant ($p < 0.01$), thus supporting Hypothesis 2. The results of mediation testing identify PA and PI as being partially mediated by brand image.

**Table 6** Coefficient estimates for the moderated mediation model for PA

<table>
<thead>
<tr>
<th>Variable</th>
<th>First stage (BI)</th>
<th>Second stage (PI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff. (SE)</td>
<td>95% CI</td>
</tr>
<tr>
<td>Constant</td>
<td>$a_0$ 0.438 (0.403) [-0.355,1.231]</td>
<td>$b_0$ 0.049 (0.236) [-0.415,0.513]</td>
</tr>
<tr>
<td>PA</td>
<td>$a_1$ 0.236 (0.118)* [0.003,0.468]</td>
<td>$b_1$ 0.267 (0.089)** [0.552,0.839]</td>
</tr>
<tr>
<td>BI</td>
<td>$b_2$ 0.695 (0.073)** [0.092,0.442]</td>
<td></td>
</tr>
<tr>
<td>PV</td>
<td>$a_2$ 0.304 (0.126)* [0.055,0.551]</td>
<td></td>
</tr>
<tr>
<td>PA × PV</td>
<td>$a_3$ 0.081 (0.034)* [0.133,0.148]</td>
<td></td>
</tr>
</tbody>
</table>

$R^2 = 0.694$ $R^2 = 0.671$

**Note:** Standard error is in parentheses; *$p < 0.05$; **$p < 0.01$.

**Table 7** Conditional indirect effect of PA on PI across mean, low and high levels of PV

<table>
<thead>
<tr>
<th>Model</th>
<th>Level of PV</th>
<th>First stage</th>
<th>Second stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Indirect effect</td>
<td>Coeff. (SE)</td>
<td>95% CI</td>
</tr>
<tr>
<td>PA-BI-PI</td>
<td>$PV_{\text{mean}}$</td>
<td>0.528*</td>
<td>0.695**</td>
</tr>
<tr>
<td></td>
<td>$PV_{\text{Low}}$</td>
<td>0.484*</td>
<td>0.695**</td>
</tr>
<tr>
<td></td>
<td>$PV_{\text{High}}$</td>
<td>0.573*</td>
<td>0.695**</td>
</tr>
<tr>
<td>Index of moderated mediation</td>
<td>0.056 (0.021)</td>
<td>[0.029,0.108]</td>
<td></td>
</tr>
</tbody>
</table>

*$p < 0.05$; **$p < 0.01$.

**Note:** The first-stage and second-stage effects for mean, low and high levels of perceived value (PV) were calculated with coefficient estimates from Table 4. PVs were 3.613 (i.e. mean for PV), 3.066 (i.e. one SD below the mean) and 4.160 (i.e. one SD above the mean) for the mean, low and high levels of PV, respectively. The first-stage effects were calculated by ($a_1 + a_3$ the values of PV) and the indirect effects were calculated by multiplying the effects in the first and second stages. The index of moderated mediation is calculated by $a_3 b_2$ and the significance for indirect effect was based on bias-corrected confidence intervals derived from 1,000 bootstrapped samples.
For the testing of the moderated mediation model depicted in Table 6, the effect of PA on brand image depends on perceived value is significant \((a_3 = 0.081, p < 0.05)\). Moreover, customers with relatively higher satisfaction level of brand image expressed higher degrees of purchase intention \((b_2 = 0.695, p < 0.01)\). By the reasoning that evidence of moderation of one of the paths in the mediation model is sufficient to claim moderation of mediation (Hayes, 2013), these results supports the conclusion that the indirect effect of PA on PI through BI depends on PV. Furthermore, the indirect effect is the product of the conditional effect of PA on BI from Eq. (1) and the effect of BI on PI.

\[
\text{w} = (a_1 + a_2 PV) b_2 = a_1 b_2 + a_2 b_2 PV = 0.164 + 0.056 PV
\]  

which is a line of function of PV with intercept \(a_1 b_2 = 0.164\) and slope \(a_2 b_2 = 0.056\). The slope of this equation is the weight in the function linking the indirect effect to the moderator and is proposed as the index of moderated mediation proposed by Hayes (2013). In addition, the statistical significance of the moderated mediation model can be tested by the bootstrap confidence for the index of moderated mediation. As Table 7 shows that the index of moderated mediation is 0.056, which means that the indirect effect of PA on PI through BI is an increasing function of PV. Moreover, a 95% bootstrap confidence interval for the index based on 1,000 bootstrapped samples is 0.029 to 0.108. As this confidence interval does not include zero, the conclusion is the indirect effect of PA on PI through BI is positively moderated by PV. This result leads to support Hypothesis 3.

4.4 Measurement comparison

4.4.1 Product attributes level

For the overall satisfaction of product attributes (PA 1–PA 8 in Appendix 1), the satisfaction level of Apple ranked the highest among the four smartphone brands. Especially for the item of ‘exterior design’ (PA 3) of tangible attributes, Apple performed with a score of 4.138 to display the highest satisfaction. This also provides evidence when there is a new iPhone handset introduced into the market to draw global attention. Nevertheless, the ‘warranty periods’ (PA 7) of intangible attributes are the lowest satisfaction level among the eight product attributes for the four smartphone brands. Additionally, the satisfaction level of ‘thickness and weight’ (PA 4) of tangible attributes for Samsung is obviously higher than HTC, but the satisfaction levels of ‘durability’ (PA 5) and ‘easy of operation’ (PA 6) of intangible attributes for HTC are higher than Samsung. Moreover, Sony ranked the lowest for the satisfaction levels of eight product attributes among the four smartphone brands. For more detail, please refer to Figure 4 and Appendix 1.
4.4.2 Brand image level

Besides the item of ‘adopting the smartphone brand due to celebrity endorsements’ (BI 4), Apple ranked with the highest levels for the other seven attributes of brand image for the four smartphone brands. Especially for the brand image of ‘the smartphone brand continues to improve product quality’ (BI 3), Apple performed with the highest score of 4.080. As the item of ‘adopting the smartphone brand due to celebrity endorsements’ (BI 4) was the lowest among the eight brand image attributes for the four brands, HTC performed with the highest rating of 2.788. It has displayed that the ‘celebrity endorsement’ for the consideration of adopting a smartphone is not so important from Taiwan’s respondents’ viewpoint. Samsung rated the lowest level of 2.794 for the item of ‘the smartphone brand represents high social status’ (BI 5). Sony ranked with the lowest level of the six items for a total of eight items of brand image. For more detail, please refer to Figure 5 and Appendix 1.
4.4.3 Perceived value level

HTC ranked with the highest level of 3.924 for the item of ‘the paid cost is in consistent with my use benefit’ (PV 3) of perceived value. Other than the above referred item, Apple ranked the highest level of the other seven items among the four smartphone brands. Samsung ranked in the second position for both items of ‘the smartphone brand enriches my convenient daily life’ (PV 1) and ‘social media sharing information could enrich my emotions’ (PV 4). Sony ranked with the lowest level irrespective of perceived quality value, emotional value and social value among the four brands. For more detail, please refer to Figure 6 and Appendix 1.

Figure 6 Agreement level of perceived value for the four smartphone brands (see online version for colours)

4.4.4 Purchase intention level

Apple ranked with the highest level of purchase inclination (PI 2), repurchase intention (PI 3 and PI 4) and recommendation (PI 5) among the four smartphone brands. Especially worthy of being mentioned is that Apple ranked with the highest score of 4.046 for the repurchase intention of ‘when in repurchase status will adopt the current smartphone brand’ (PI 3). It displayed that iPhones have the highest repurchase intention which signifies high loyalty. For the five measured items of purchase intention, HTC scored higher than Samsung which might be due to the local advantage of Taiwan’s market. The lowest level of ‘decide to buy due to manufacturers’ advertisements or promotions’ (PI 1) to mean that the smartphone users are scarcely influenced by the advertisements or promotions. Sony ranked with the lowest level of five items on purchase intention among the four smartphone brands. For more detail, please refer to Figure 7 and Appendix 1.
5 Discussion

5.1 Moderated mediation model

The important issues for smartphone manufacturers are how to enhance customer purchase intention and improve their profits in an intensely competitive global environment. Taylor and Baker (1994) indicated that customer satisfaction is a critical influence on the formation of customer’s purchase intentions in service fields. However, customer satisfaction usually played a mediator between the customer’s purchase intention and its antecedent variables (Kuo et al., 2009). Hence, this study refines the satisfaction level in the context of product attributes, and then further explores the moderated mediation effects among the related variables to display the academic implication in line with the works of extant literature (Taylor and Baker, 1994; Kuo et al., 2009).

This study confirmed that the direct effect for the customer satisfaction of product attributes on purchase intention, showing that the satisfaction level of product attributes is a critical factor to influence the purchase intention. Because the smartphone is a kind of experienced product, the well-designed features and attributes of the handsets could be further transformed as advantageous information in customer’s memories after the products were experienced. Mason and Bequette (1998) indicated that product information affects consumer product evaluations and beliefs about product performances. Therefore, the higher degree of customer satisfaction on product attributes is helpful to construct the stronger relationship between product and customer’s belief, and then become the positively influence on customer purchase intention.

Second, this study found support for our hypotheses that brand image mediates the satisfaction of product attributes and purchase intention. This finding indicated that satisfying customer expectations and needs for better deploying the tangible and intangible product attributes, contributes to form the positive attitudes and perceptions for corresponding brands in the consumers’ mind (Elgin and Nedunchezhian, 2012). In
addition, satisfied customers often engage in information transmission of word-of-mouth (WOM) for their satisfied products or experiences and these activities further strengthen the familiarity of brand image and then affect consumers’ attitude towards a specific brand (Laroche, Kim and Zhou, 1996). Moreover, WOM among consumers also influence brand image and purchase intention of brands in consumer markets (Reza and Samiei, 2012). By enhancing a higher satisfaction level of product attributes, the firm has great opportunities to strengthen customer beliefs and attitudes for its brand image; to help it to increase customer preferences and trust; and then to transform into the purchase intentions and activities. Therefore, the customer satisfaction of product attributes and brand image have a positive impact on purchase intention, and brand image mediates the relationship between the satisfaction level of product attributes and purchase intention.

Finally, the result concerning the customer satisfaction and purchase intention is that its strength varied significantly (Homburg and Giering, 2001). Yi and La (2004) indicated that the link between customer satisfaction and purchase intention is complex. Expanding upon these studies, this study demonstrated that the customer’s perceived value moderates the path of satisfaction of product attributes, brand image and purchase intention relationship. This moderated mediation model suggested that product attributes of smartphones must be close to the perceived value of consumption in order to create a synergy effect on the brand image and purchase intention. This model also confirms that the relationship between customer satisfaction of product attributes and purchase intention is more complicated than direct, mediated, moderated models presented before, thus offering a practical contribution for the adoption of a favourite smartphone in the mobile industry.

5.2 Managerial implication

For the ‘exterior design’ of product attributes, Apple performed the highest satisfaction to provide the reference improved space for other smartphone manufacturers. The smartphone users were most concerned about ‘warranty periods’ of product attributes but in general they were not satisfied for the four smartphone brands. For the agreement level of ‘adopting the smartphone brand due to celebrity endorsements’ was the lowest among the eight items of brand image. It had displayed that the ‘celebrity endorsement’ for the consideration of adopting a smartphone is not as important from Taiwan’s respondents’ viewpoint. HTC performed the highest level of perceived value for the item of ‘the paid cost is consistent with my use benefit’, to reconcile consumer cognitive benefit and paid cost is an important issue for the smartphone brands to be concerned.

Furthermore, Apple performed the highest level for repurchase intention of ‘when in repurchase status I will adopt the current smartphone brand’ to deploy high loyalty. With comparison to other items of purchase intention, the lowest level of ‘decide to buy due to manufacturers’ advertisements or promotions’ to mean that smartphone users are less influenced by the advertisements or promotions from Taiwan’s users viewpoint. In addition, Sony ranked the lowest for the satisfaction of product attributes, perceived value and purchase intention among the four smartphone brands.
6 Concluding remarks

This paper presented the first study to prove the mediation and moderated mediation effects on the adoption of a favourite smartphone. The contribution for this paper has verified that the moderator of perceived value positively moderates the relationship between the satisfaction of product attributes and purchase intention through the mediator of brand image. If there exists a satisfied product attributes, it will promote the brand image of an enterprise and products, to improve customer perceive value, and further to improve the purchase intention. It is also proved that when the perceived value was lower, then a positive association between product attributes and brand image was weakened. But when the perceived value was higher, a positive association with product attributes and brand image was strengthened.

This study provides a detailed evaluation by combining the satisfaction levels of product attributes with the mediator of brand image, the moderator of perceived value and its synergy on purchase intention. Although prior literature studies have addressed the direct effect of customer satisfaction on purchase intention, few studies have examined the indirect effect through the effect of brand image. Nevertheless, this study demonstrates that the satisfaction of product attributes has a direct impact on the dependent variable of purchase intention and exerts an indirect effect through brand image. Thus, for the purpose of enhancing customer purchase intention, the synergistic effect could be further shaped through both variables of brand image and perceived value. Moreover, Apple was superior to the other three manufacturers for the satisfaction level of eight product attributes and purchase intention, which deserves notice by the other manufacturers.

The smartphone has not only been a tool for phone calls. Instead, it has become a communication channel for connecting the social communities and the outside world. Although the good fit of the theoretical model and the actual data are appropriate, the survey data were mainly collected from Taiwan’s top four mobile firms, which might inadequately reveal the generalisability for the research issue. Due to fierce market competition, the top ranking smartphone market share changes quickly with time, which is not easy to consistently trace (this is a research limitation). In addition, the Asus Zenfone and Xiaomi have increased their mobile market share in Taiwan. To add these two brands into the observed samples is a suggestion for future research. Moreover, there are newly related variables for the smartphone adopting process which could focus more on the multi-dimensions of psychological, personal, fashionable and social relationships and not only examine this from functional or cost considerations. Furthermore, the effects of other moderators and mediators could be compared in order to more deeply understand the precise mechanisms as well as to provide suggestions for further research directions.

References


MIC (Market Information Center) in Taiwan ‘H1 2015 manufacturers’ smartphone market shares in Taiwan,’ issued July 2015. Available at: http://www.mic.iii.org.tw (access March 2016).


**Appendix 1 (The questionnaire)**

A.1. **Product Attributes (PA)**

A.1.1. **Tangible attributes**

   PA 1 Screen size.
   PA 2 Photography pixels.
   PA 3 Exterior design.
   PA 4 Thickness and weight.

A.1.2. **Intangible attributes**

   PA 5 Durability.
   PA 6 Ease of operation.
   PA 7 Warranty period.
   PA 8 After-sales repair service.

A.2. **Brand Image (BI)**

A.2.1. **Quality level**

   BI 1 The smartphone quality level can satisfy my demands.
   BI 2 The smartphone software quality service is superior.
   BI 3 The smartphone brand continues to improve product quality.
Product attributes and purchase intention for smartphones

A.2.2. Symbolic
   BI 4 Adopting the smartphone brand due to celebrity endorsements.
   BI 5 The smartphone brand represents higher social status.
   BI 6 The smartphone product design reflects my personal taste.

A.2.3. Experiential
   BI 7 The smartphone brand brings me pleasure and fun.
   BI 8 The smartphone brand is used with low faults.

A.3. Perceived Value (PV)

A.3.1. Perceived quality
   PV 1 The smartphone brand enriches my convenient daily life.
   PV 2 The smartphone brand provides diversified service functions.
   PV 3 The paid cost is consistent with my use benefit.

A.3.2. Emotional value
   PV 4 Social media sharing information could enrich my emotions.
   PV 5 Smartphone brand is trustworthy for users.
   PV 6 Owning this smartphone brand helps me catch up with time trends.

A.3.3. Social value
   PV 7 Owning this brand lets others have good impressions on me.
   PV 8 Owning this brand lets me gain others recognition.

A.4. Purchase Intention (PI)

A.4.1. Purchase inclination
   PI 1 Decide to buy due to manufacturers’ advertisements or promotions.
   PI 2 Decide to buy due to manufacturers’ introduction of new handsets.

A.4.2. Repurchase intention
   PI 3 When in repurchase status will adopt the current smartphone brand.
   PI 4 In case other competitive brands offer a lower price, I will still adopt the currently used brand.

A.4.3. Recommendation
   PI 5 Will recommend relatives and friends to purchase my used brand.