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Prioritising and gender differences on aesthetics of mobile phone usage through users' perspectives

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Abstract: Aesthetics is an important trend in management research in recent years. Mobile phones are also necessary for everyday life. Mobile phones combined with the concept of aesthetics to emphasise whether users and their genders will have preference differences, is a good topic that is worth studying. The purpose of this research is to measure, prioritise and compare gender differences on aesthetics of mobile phone usage by users' perspectives. Analytical hierarchy process (AHP) methodology is adopted to analyse the data. According to the study, aesthetics of mobile phone usage is categorised into three types: visual sense, auditory sense and tactile sense. Gender differences on aesthetics of mobile phones are significant. The results show that visual sense is the most important one in mobile phone use. The findings suggested that mobile phone service companies to adopt the understanding of designing aesthetics of mobile phone users.

Keywords: communication; mobile phone; mobile phone usage; aesthetics; analytic hierarchy process; AHP.

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1 Introduction

1.1 Background

Mobile phones have become an indispensable tool in modern people's daily life. The selection of mobile phone is also an issue that mobile phone users must face. For mobile phone manufacturers, in addition to emphasising featured functions and prices, they also need to find new competitive features. The concept of 'aesthetics' has been of popularity in the management literature recently. However, it is still unknown how the aesthetic elements of related products are produced, and how the appreciation of product aesthetics arouses the purchase intention of individual consumers. There are some studies show the factors of product aesthetics. Crolie et al. (2019) indicated that product aesthetics can enhance consumer welfare in various ways. Product aesthetics can also influence the inferences that consumers make about functional attributes instead of simply making products more pleasurable. Moreover, Sundar et al. (2020) indicated that aesthetics of package design is an important consideration when consumers make purchase decisions. By signalling product efficacy, the beauty-in-a-bottle heuristic appears to inform purchase decisions. Although some studies have studied the factors that affect product aesthetics (Hoyer and Stokburger-Sauer, 2012), there are few studies of how the aesthetics affect purchasing decisions (Turel et al., 2010). Mobile communication technologies have infiltrated consumer markets all over the world. Initially, mobile services primarily facilitated voice and visual communication. It is very essential to recognise how mobile service companies should handle with their users and deliver services in electronic situations (Parasuraman and Zinkhan, 2002). Swilley (2012) provides an important foundation for this research. She put forward suggestions on colours, design and overall appearance, texture/touch, beauty and shape, etc. And the overall appearance dimension were individually tested and four different factors were determined: such as design, colour, touch and shape. Moreover, Lee and Kim (2018) surveyed colour, material and design of the mobile phone case and the design satisfaction of the mobile phone case. The emotional vocabulary required in mobile phone cases appeared 'modest', 'clear', 'smooth', 'sophisticated', 'clean' and 'neat'. On the other hand, there are types preferred not only for colour but also for material and appearance. Besides, aesthetics plays an important part for mobile phone users to purchase

smartphones. For example, Liu et al. (2019) designed an instant photo aesthetics evaluation method which utilises several simple and effective ways to predict photo scores for mobile phone users. Therefore, the combination of functions and aesthetics of the mobile phone is worthy of researching.

1.2 Motivation and purposes

A study of the significance of aesthetics on customers' intentions to purchase smartphones shows that aesthetics has an important direct relationship with purchase intention (Toufani et al., 2017). Hence, it is very important to understand how aesthetics of mobile phone users influence the use of mobile services and the behavioural adoption for service providers. To know their thoughts of aesthetics of mobile phone are particularly important. Consequently, how to measure and prioritise the aesthetics of mobile phone is an significant topic. On the other hand, Huang et al. (2020) showed gender difference in visual product aesthetics. Therefore, the purpose of this study is to explore aesthetics of mobile phones and gender differences via users' perspectives. This paper is structured as follows. The next section provides a comprehensive literature review of aesthetics of mobile phone, and the nature and application of analytic hierarchy process (AHP). After explaining the AHP procedure in Section 3, the application of AHP to analyse the collected data is illustrated and the findings of the survey is discussed in Section 4. The conclusion and suggestions are presented in Section 5.

2 Literature review

2.1 Mobile phone usage

Before we know why mobile phone users adopted their phones, it is exceptional to understand the aesthetics of mobile phone through users' perspectives. Grewal et al. (2018) examined consumers' general in-store mobile phone usage and shopping behaviour. Anecdotal evidence has proposed that mobile phone use (MPU) may decrease point-of-purchase sales, but the results of the current study indicate that it could improve purchases overall instead. Although the significant of aesthetics of mobile phone is widely recognised, the growing body of research about aesthetics is quite fragmented and the definition of aesthetics is divergent. In an attempt to understand the mobile phone user's adoption, a number of multidisciplinary studies including task-contingent decision-making and theory of reasoned action have devoted to Davis' technology acceptance model (TAM) (Hart and Porter, 2004). In addition, based on the subjective theory of value (STV) (Coombs and Frawley, 2019), the product has value only because of personal needs. Moreover, these values are based on how much the buyer is willing to pay for because the individual's perception varies, and it will cause different subjective situations. The increasing use of electronic forms of mobile apps provides new opportunities in the study of mental health; Bakker and Rickard (2018) examined the effectiveness of a self-monitoring mobile phone App by exploring the relationships between app engagement and mental health outcomes. In addition, Volkmer and Lerner (2019) surveyed the relationship between MPU and some concepts of positive psychology which including life satisfaction, mindfulness, and well-being. Overall, results proposed that the more often participants who use their mobile phones, the lower

scores it gets on life satisfaction, mindfulness and well-being in the report. Furthermore, results revealed that the relationships between positive psychology concepts and MPU differ from male and female. Furthermore, aesthetics of mobile phone obtained more and more attraction lately. Indeed, it is the motivation for us to find out the aesthetics perception of mobile phone users.

2.2 Aesthetics of mobile phone

As stated previously that aesthetics has become a popular topic with applications of aesthetics integrated into life. According to the resource-based view, which contains the benefits of both tangible and intangible assets, is gaining acceptance in the strategic management, accounting, and economic literature, following positive results from connecting company resources and performance measures (Riahi-Belkaoui, 2003). On the other hand, the study of intangible assets is 'smart capital', also called intellectual capital, many researchers hold different perspective on its definition. Human capital, relational capital and structural capital are three main aspects which are, the main connotations of constructing the intangible assets of companies (Ordóñez de Pablos, 2002). As well as the aesthetics may become a new dimension. This is the reason why a more systematic method of reporting on and measuring these tangible and intangible factors about aesthetics of mobile phone is needed. Tan and Sie (2015) revealed that personal innovations in information technology (PIIT) is an important predictor in explaining centrality of visual product aesthetics (CVPA) in their study of emulating smartphone and functional phone users. Zhang and Juhlin (2016) surveyed the fashion value of mobile phone. Such as beautification, desirability through symbolic interaction, and high variation, are more and more visible in mobile phone design. A laboratory experiment provides empirical evidence for the relationships between emotions, visual aesthetics, and higher order evaluations such as users' perceived quality and the intentions to download. Important relationships were found between aesthetic sub-dimensions and valence. Selective emotional sub-dimensions also significantly affected quality perceptions, attractiveness, and intention to download (Bhandari et al., 2019). Popular apps evaluated have entire moderate quality and include behavioural tracking features and a range of change techniques related with behaviour change. These apps may affect behaviour, although more attention to information quality and evidence-based content are guaranteed to enhance their quality (Bardus et al., 2016). By understanding the role and impact of aesthetics, from an aesthetic perspective, Xiao et al. (2020) designed a new interface layout design quantification method, a user aesthetic favour similarity measurement model, and a recommendation result ranking method. Merikivi et al. (2017) emphasised ease of use, novelty, aesthetic design, and challenge. They conclude that continual mobile game use is strongly driven by enjoyment, which in turn is mainly driven by the system's capacity of rebirth and visually attractive and easy-to-use interface. In addition, Peng et al. (2017) showed how colourful appearance affects consumers' decision-making and informs their overall perceptions of an e-commerce website by demonstrating that product aesthetics can effect customers' cognition before they make purchasing decisions and establish a connection between the product and the website. Given the dual nature of online shoppers as both IT users and consumers, they proposed that product aesthetic information can improve their online shopping experiences by consolidating visual identity and brand appealing. Toufani et al. (2017) provided the results of research. In order to strictly consider how to use aesthetics

in product development, promotion and positioning strategies, and to directly or indirectly link up consumers' appreciation of smartphone aesthetics to their purchase intentions, we recommend that the design, colour, touch and shape are all for smartphones. Aesthetic appreciation has an impact. In addition, the aesthetics also has a positive impact on the different dimensions of perceived value and purchase intention. Hence, this research has explored the aesthetics of mobile phone through users' perspectives.

2.3 Gender differences on aesthetics of mobile phone usage

There is related literature to be discussed as follows. Huang et al. (2020) revealed gender difference in the association between the CVPA and grey matter volume (GMV). As well as Oyibo and Vassileva (2017) indicated that gender moderates the effect of perceived aesthetics on perceived usability, with this effect being stronger for males rather than females. Azam and Gavrilova (2017) provided statistical feature analysis with graph visualisation to demonstrate biometric pattern recognition discriminating behaviour between males and females for each feature. Hence, the purpose of this study is to explore and prioritise aesthetics measures on gender differences in mobile phone users to help mobile service companies to develop their products.

3 Methodology

Some research shows that it is fantastic to understand the aesthetics of mobile phone through users' perspectives which influences mobile phone users' intention to adopted their phones. Grewal et al. (2018) examined consumers' general in-store mobile phone usage and shopping behaviour. To identify the components of value, this study data is gathered from people who have experiences of purchasing and using the phone. The analytical hierarchy process (AHP) methodology is applied for this study.

3.1 Sampling and data collection

The data for this study was collected by adopting convenient and purposive sampling. Fifty-eight users who had already adopted in various mobile phones for more than two years and had also spent much time in this study from March to May at National Taipei University in Taiwan. 50% of the respondents are males, the rest of respondents are females. All of them are experienced mobile phone users.

3.2 Measures and reference sources

Some concepts from the literature including the theory of sensory aesthetics and resource-based viewpoints are adopted. Three main factors are developed using the above conceptual framework.

Moreover, the study of intangible assets may have an impact on the aesthetics and it is adopted as the basis of the research.

Table 1 Demographic variables of the study

<i>Demographic variables</i>	<i>Frequency (percent)</i>
Gender	Male: 29 (50.0%) Female: 29 (50.0%)
Age	18–22 years: 24 (41.4%) 23–27 years: 18 (31.0%) 28–32 years: 3 (5.2%) 33–37 years: 6 (10.3%) 38–42 years: 4 (6.9%) Above 43 years: 3 (5.2%)
Education	Senior college: 1 (1.7%) University: 51 (87.9%) Master: 6 (10.4%)
Occupation	Government officials: 4 (6.9%) Students: 38 (65.5%) Office employees: 12 (20.7%) Others: 4 (6.9%)

Table 2 Aesthetics of mobile phone

<i>Item</i>	<i>Sub-item</i>	<i>Sources</i>
Visual sense	Big screen size	Hou et al. (2012), Hsiao (2013), Schmidt and Maier (2019), Zhang and Juhlin (2016), Guo et al. (2016)
	Streamline design	
	Varnished phone case	
	Multiple colours	
	High screen resolution	
Auditory sense	Plain and neat appearance	Park and Park (2014), Suhag et al. (2016), Shieh and Lai (2017), Chakraborty (2019), Trappey et al. (2018)
	Great sound quality	
	Variety of built-in ringtones	
	Earphones included	
	Noise-cancelling function	
Tactile sense	Sufficient sound volume of the speaker	Prattichizzo et al. (2013), Shieh and Lai (2017), Hadi and Valenzuela (2016), Hattula et al. (2017)
	Sufficient sound volume for the handset	
	Light weight	
	Ergonomic design	
	Metal phone case	
	High sensitive touch-screen	
	High sensitive side-button	
	Multi-touch function	

3.3 Reliability

The reliability of this study is discussed through the item analysis. The acceptable reliability of this study is 0.761.

Table 3 The validity of this study for item analysis

Item	CR	Item-total statistics		
		Item-total correlation	Corrected item-total correlation	Cronbach's α if item deleted
a1	1.561	0.299*	0.133	0.774
a2	3.68**	0.429**	0.302	0.754
a3	3.108**	0.386**	0.267	0.756
a4	4.808***	0.531***	0.427	0.743
a5	4.245***	0.440**	0.383	0.751
a6	1.966	0.301*	0.195	0.760
a7	2.46*	0.282*	0.183	0.761
a8	3.306*	0.447***	0.326	0.752
a9	2.871*	0.471***	0.356	0.749
a10	3.596**	0.552***	0.465	0.741
a11	5.989***	0.638***	0.539	0.732
a12	5.336***	0.644***	0.550	0.731
a13	2.431*	0.400**	0.288	0.754
a14	3.842**	0.462***	0.391	0.749
a15	5.672***	0.466***	0.346	0.750
a16	2.733*	0.351**	0.284	0.755
a17	3.427*	0.362**	0.263	0.756
a18	4.764***	0.609***	0.509	0.735

Notes: Reliability: 0.761. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 4 The degree of mutual agreement of three coders

No.	Statements	A		B		C	
		Agree	Disagree	Agree	Disagree	Agree	Disagree
1	Big screen size	V		V			V
2	Streamline design	V		V		V	
3	Varnished phone case	V		V			V
4	Multiple colours	V		V		V	

Notes: Average mutual agreement = $(16/18+14/18+14/18)/3 = 0.81$.

Reliability = $3 \times 0.81 / [1 + (2 \times 0.81)] = 0.87$.

The reliability of this study is above 0.8, which is considered to be satisfactory.

Table 4 The degree of mutual agreement of three coders (continued)

No.	Statements	A		B		C	
		Agree	Disagree	Agree	Disagree	Agree	Disagree
5	Screen resolution	V		V		V	
6	Plain and neat appearance	V		V		V	
7	Great sound quality	V		V		V	
8	Variety of built-in ring tones	V			V		V
9	Earphones included	V		V		V	
10	Noise-cancelling function	V		V		V	
11	Sufficient sound volume for the speaker	V		V		V	
12	Sufficient sound volume for the handset	V		V		V	
13	Light weight	V		V		V	
14	Ergonomic design	V		V		V	
15	Metal phone case	V		V			V
16	High sensitive touch-screen	V		V		V	
17	High sensitive side-button	V		V		V	
18	Multi-touch function	V			V	V	

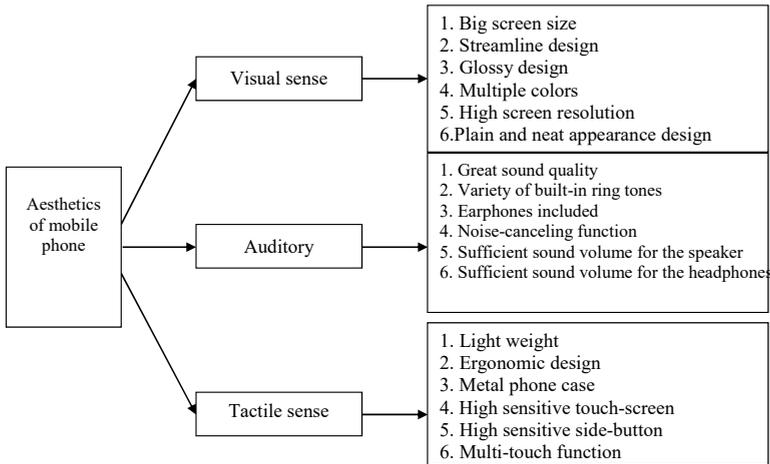
Notes: Average mutual agreement = $(16/18+14/18+14/18)/3 = 0.81$.
 Reliability = $3 \times 0.81 / [1 + (2 \times 0.81)] = 0.87$.
 The reliability of this study is above 0.8, which is considered to be satisfactory.

3.4 Analytical hierarchy process

The data in this study is analysed by using a multi-criteria decision making approach which is called the analytical hierarchy process (AHP). The analytical hierarchy process

was developed by Saaty (1977). Saaty (1994) claimed that AHP takes advantage of our ability to rank choices. Figure 1 illustrates the two levels of the model.

Figure 1 Intellectual capital structure of commercial wireless television companies



The AHP methodology composes of four steps: first, develop the aesthetics of mobile phone hierarchical structure; second, assign different levels of relative importance to each of the selection criteria for the different elements of aesthetics of mobile phone; third, rank the alternatives under each criterion of aesthetics of mobile phone; fourth, rank the contribution of each alternative to aesthetics of mobile phone. Expert choice (Forman and Selly, 2001) is the software for AHP implementation, providing various comparison methods. The judgement inconsistency coefficient is below 0.1.

4 Results

This study attempts to identify the aesthetics mobile phone usage of users. The results of this study are shown as Table 5. The results state that the weight and sequence of value measurement follows the order.

Regarding the indicators, sensory aesthetics of mobile phone has the following orders: visual sense, auditory sense and tactile sense. Tactile aesthetics has become the most important factor, especially for the high sensitive touch-screen of sub-dimension. Visual sense is the second factor which emphasises on high screen resolution. Auditory sense is the third factor which concerns great sound quality.

The results (Table 5) show that the determinants at the first level could be ranked as follows: tactile sense, visual sense and auditory sense. There was no significant difference on both genders with auditory sense of the main facet. On the other hand, there was a difference with visual sense and tactile sense of the main facet that males mostly prioritised tactile sense more than females. For the visual sense, with high screen resolution and plain and neat appearance in the secondary facet are the same on both genders. For the auditory sense, variety of built-in ring tones and sufficient sound volume for the speaker in the secondary facet show the same preference on both genders. Lastly, in the secondary facet, light weight of the mobile phone, metal phone case, high sensitive

side-button, and multi-touch function also show the same preference by both males and females.

Table 5 Weight and rankings for level 1 and level 2 of aesthetics sensory

	<i>Criteria</i>	<i>Items</i>	<i>Weight</i>	<i>Sequence</i>	<i>Total weight</i>	<i>Total sequence</i>
Aesthetics of mobile phone	Visual sense 0.352(2)	Big screen size	0.102	6	0.036	17
		Streamline design	0.128	4	0.045	12
		Varnished phone case	0.110	5	0.039	14
		Multiple colours	0.148	3	0.052	9
		High Screen resolution	0.294	1	0.104	1
		Plain and neat appearance	0.218	2	0.077	4
	Auditory sense 0.288(3)	Great sound quality	0.267	1	0.077	3
		Variety of built-in ring tones	0.080	6	0.023	18
		Earphones included	0.173	3	0.050	10
		Noise-cancelling function	0.204	2	0.059	7
		Sufficient sound volume for the speaker	0.143	4	0.041	13
		Sufficient sound volume for the handset	0.134	5	0.039	15
	Tactile sense 0.359(1)	Light weight	0.166	3	0.060	6
		Ergonomic design	0.203	2	0.073	5
		Metal phone case	0.105	6	0.038	16
		High sensitive touch-screen	0.233	1	0.084	2
High sensitive side-button		0.156	4	0.056	8	
		Multi-touch function	0.136	5	0.049	11

At second level of sub-dimensions have revealed a number of important differences. At second level, with high screen resolution, variety of built-in ring tones, and sufficient sound volume for the speaker in the secondary facet show the same preference by both genders. In contrast, there were differences by genders in the determinants of visual sense, auditory sense, and tactile sense. Males generally prioritised the sequence of main facet as tactile sense, visual sense and auditory sense on mobile phone usage; relatively, females prioritised them as the sequence as visual sense, tactile sense, and auditory sense.

Table 6 Gender differences in the weights and rankings of aesthetic sense levels 1 and 2

Main facet	Items	Male (n=29)			Female (n = 29)		
		Weight	Sequence	Total weight	Weight	Sequence	Total weight
Visual sense	Big screen size	0.369(2)	0.098(6)	0.036(16)	0.356(1)	0.106(5)	0.038(15)
	Streamline design		0.144(3)	0.053(9)		0.114(4)	0.041(12)
	Varnished phone case		0.126(5)	0.046(12)		0.103(6)	0.037(16)
	Multiple colours		0.132(4)	0.049(11)		0.170(3)	0.061(7)
	High Screen resolution		0.290(1)	0.107(1)		0.294(1)	0.105(1)
Auditory sense	Plain and neat appearance		0.211(2)	0.078(4)		0.212(2)	0.076(7)
	Great sound quality	0.259(3)	0.274(1)	0.071(5)	0.295(3)	0.249(1)	0.074(4)
	Variety of built-in ring tones		0.079(6)	0.020(18)		0.077(6)	0.023(18)
	Earphones included		0.141(4)	0.036(15)		0.215(2)	0.063(6)
	Noise-cancelling function		0.206(2)	0.053(8)		0.193(3)	0.057(9)
Tactile sense	Sufficient sound volume for the speaker		0.162(3)	0.042(14)		0.133(5)	0.039(14)
	Sufficient sound volume for the handset		0.139(5)	0.036(17)		0.133(4)	0.039(13)
	Light weight	0.373(1)	0.162(3)	0.060(6)	0.349(2)	0.164(3)	0.057(8)
	Ergonomic design		0.217(1)	0.081(2)		0.191(2)	0.067(5)
	Metal phone case		0.117(6)	0.044(13)		0.094(6)	0.033(17)
High sensitive touch-screen	High sensitive touch-screen		0.213(2)	0.079(3)		0.249(1)	0.087(2)
	High sensitive side-button		0.152(4)	0.057(7)		0.152(4)	0.053(10)
Multi-touch function		0.139(5)	0.052(10)		0.150(5)	0.052(11)	

In terms of mobile phone aesthetic sense, males in tactile sense were found to prioritise the sequence of secondary facet as ergonomic design, high sensitive touch-screen, and light weight whereas females prioritised the sequence of secondary facet as high screen resolution, plain and neat appearance and multiple colours. In terms of mobile phone aesthetic sense, males prioritised tactile sense in the main facet, whereas visual sense was prioritised by females. When it came to aesthetic characteristics, males prioritised tactile information, and females prioritised visual information. Auditory senses are the least important sub-dimensions for both genders. On the other hand, there are differences in the order of visual and tactile sensory. Males prioritised tactile senses over females. So males emphasise a preference on overall operating and tactile sense on mobile phone usage, while females emphasise a preference on visual perception.

5 Conclusions and suggestions

5.1 Conclusions and suggestions

This study examines the aesthetics of mobile phone through users' perspectives. It also build-up the approach for measuring the aesthetics of mobile phone users. The data used for this study which was collected from mobile phone users for setting up useful measuring indicators. The analytical hierarchy process is chosen for ranking the factors. The results have revealed that aesthetics of mobile phone is categorised into three dimensions: visual sense, auditory sense, and tactile sense. Furthermore, 18 indicators have been developed for aesthetics assessment and comparing gender differences. This research provides an exploratory viewpoint of aesthetics of mobile phone users' perspective, and suggests mobile phone service companies that how they are able to employ their resources for creating competitive strengths in the future.

5.2 Managerial implications and future research

Measuring aesthetics of mobile phone also can be used to help formulate strategies and strengthen competitive advantages in mobile companies. These indicators offer an evaluation basis for companies to construct the aesthetics in the mobile phone manufacturing. Up to now, the mobile phone has become an essential device in our contemporary life and even has affects users' emotion. Therefore, understanding mobile phone users' aesthetics preferences are particularly important. When males emphasise a preference on overall operating and tactile sense on mobile phone usage, mobile phone manufacturers could provide more functional features of the mobile phone to attract male consumers' attention. When females emphasise a preference on visual perception, mobile phone manufacturers could emphasis on featuring the colourful phone case, and the plain and neat appearance.

This research has several potential constraints. However, aesthetics is an intangible subject which depends on the subjectivity of researchers that has led mobile phone users to ambiguity in this reach. This study is merely exploratory and simply represents an initial attempt to survey the aesthetics of mobile phone users. There are some suggestions provided as follows. First, for conveniences, 58 subjects are chosen for this study seems insufficient. Future study should adopt a larger sampling or compare with different demographic samples in the analytical hierarchy process model. Finally, figuring out the

relationship between the aesthetics of mobile phone and customers' satisfaction or brand loyalty would be an interesting topic.

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