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A Study of iPhone's Attractiveness Factors By the Miryoku Engineering Approach

Chi-Hung Lo, Geng-You Liao, Zi-Xian Tang, Xin-Wei Chen, Hong-Fu Xu, Jing Hu, and Linda

Department of Industrial Design, Tunghai University

Abstract

Since the first iPhone was launched by Apple Inc., more than a decade ago, the iPhone products have remained the attractiveness for consumers in the worldwide market. Except for its unique brand image, excellent marketing strategy, and successful cost control, the superior design of iPhone has been the main contributing factor to its success. The objective of this study is to investigate the attractiveness factors of iPhone. The investigation starts from the product appearance and functions of iPhone. The target products include a range of iPhone products from iPhone 4 to the latest iPhone X, which are analyzed by the evaluation grid method of Miryoku engineering approach and the quantification theory type I. The results indicated that iPhone's abstract features can generally be classified by the evaluation grid method into (1) Adjectives for appearance: stylish, consistent, high-quality, comfortable, succinct, and proportionally adequate; (2) Adjectives for function: safe, convenient, efficient, and ergonomic. The analysis by the quantification theory type indicated that the male and female preferences are different as follows. For product profile, males pay attention to smooth surface but females prefer matte textures. For product features, males highlight fingerprint recognition but females emphasize more on voice assistant. Design differentiation for different target groups of users is recommended for future smartphones. Follow-up researchers are also advised to carry out investigations on potential users' gender and experiences of using smartphones of other brands.

Keywords: iPhone, smartphone, Miryoku engineering, evaluation grid method, Quantification Theory Type I

Corresponding Author:
Chi-Hung Lo
chlo@thu.edu.tw

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1. Introduction

Since the first iPhone was announced by Steve Jobs in 2007, the percentage of smartphones has been increasing to 63% according to the research by Zenith Marketing Group Inc. By the end of 2017, the total number of smartphones that have been sold reach 1.2B according to the investigation by Statista Research & Analysis. When iPhone X was launched in 2017Q4, the market share of iPhones accounts for 51%, which

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indicates iPhone's high level of attractiveness for consumers. In addition to brand image, marketing strategy, integration of hardware and software, and cost control, the appearance and features of iPhone products definitely have presented attractiveness to consumers so that a large number of people are willing to buy iPhones. Most of the earlier studies of iPhone concentrated around topics such as brand image, brand loyalty, and willingness to buy. On the contrary, few researchers carried out studies of iPhone's attractiveness factors. The objective of this study is to determine the attractiveness factors of iPhone by the evaluation grid method of Miryoku engineering approach. A questionnaire survey is carried out so that the attractiveness factors can be determined by the quantification theory type I. The results serve as a good reference for smartphone vendors and follow-up researchers on smartphone designs.

2. Literature Review

Apple Inc. has been building its brand image in order to guide consumers into buying Apple products (Weng, 2016). It utilizes the influence by media to compete with other smartphone vendors on the market (Tan, 2008). It also built various types of online platforms via the integration of hardware and software (Wu, 2014). It realizes the maximum profits by strict cost controls (Wu, 2014). However, the credit should also go to the excellent designs of iPhone products. The attractiveness of iPhone is effectively enhanced by the style design, color scheme, material selection, surface treatment or various types of functional innovations.

The Miryoku engineering approach is a branch of Kansei engineering. It was proposed by M. Ujigawa in 1991 and it deals with the techniques and knowledge for creating products or spaces that are attractive. Earlier studies clearly indicated that a product can be profoundly loved by consumers if a designer can master the consumers' desire for aesthetics on product appearance during the product design and development process (Huang, 2000). The study by Huang (2006) determined the attractiveness factors of consumer electronics on six attributes which include shape, color, material, imagery, functions, and decoration based on the evaluation grid method of Miryoku engineering. His study proposed a total of 8 attractiveness factors which are respectively (1) Convenient design, (2) Fashionable design, (3) Simple design, (4) Friendly design, (5) Imaginary design, (6) Quality texture, (7) Special design, and (8) Generating curiosity. The study of the attractiveness factors of professional LED flashlights by Ni (2012) indicated 5 top factors of attractiveness features including (1) Professional, (2) Safe, (3) Stylish, (4) Convenient, and (5) Convenient.

3. Methods

A series of iPhone products including iPhone 4 to the latest iPhone X are selected for investigation in this study. A total of 11 experts are interviewed by using the evaluation grid method in order to determine the attractiveness factors of iPhone. After that, a questionnaire survey was carried out by the quantification theory type I in order to determine which attractiveness factors are more influential than others. The research framework is shown in Figure 1.

Before interviewing with experts, photos of iPhone products are prepared and classified as follows. (1) Appearance: Phones of the styles and color-matching schemes of iPhones between iPhone 4 and iPhone X are collected. (2) Internal features: Photos including iOS system, Apple Store, fingerprint recognition system, and Face ID are collected. (3) Others: Photos of former Apple CEO Steve Jobs, after care service, and accessories are also collected. The total number of photos is 30 and they are shown in Figure 2.

These 11 experts for interview have to meet three requirements as follows. (1) More than 2 years of iPhone experience. (2) Experience with more than two iPhone models. (3) Own other Apple accessories. The interviews are carried out from Oct. 24th, 2017 to Nov. 7th, 2017. The abstract characteristics and concrete characteristics that are described by the experts are recorded in order to construct the evaluation grid diagram for iPhone. The factors with the mode values are classified into two groups which are respectively appearance and feature for the design of the questionnaire.

The questionnaire is designed with two portions of questions as follows. (1) Background information: Gender, age, years of iPhone experience, and experience with other smartphone brands. (2) Attractiveness evaluation: Two questions for evaluating the weights of abstract characteristics for appearance and feature. 10 questions of selecting the concrete characteristics that correspond to abstract characteristics. The questionnaire copies were dispatched during the period between Dec. 26th, 2017 and Jan. 2nd, 2018. The total number of questionnaire copies is 154. The number of valid questionnaire copies that are returned is 122.

After excluding those 32 copies of invalid questionnaire, the analysis by the quantification theory type I is carried out by all, gender, age, years of iPhone experience, and experience with other smartphone brands.

The evaluation grid diagram of iPhone's attractiveness factors is shown in Figure 3, in which orange items stand for abstract characteristics (top), red items original evaluation items (middle), and green concrete characteristics (bottom).

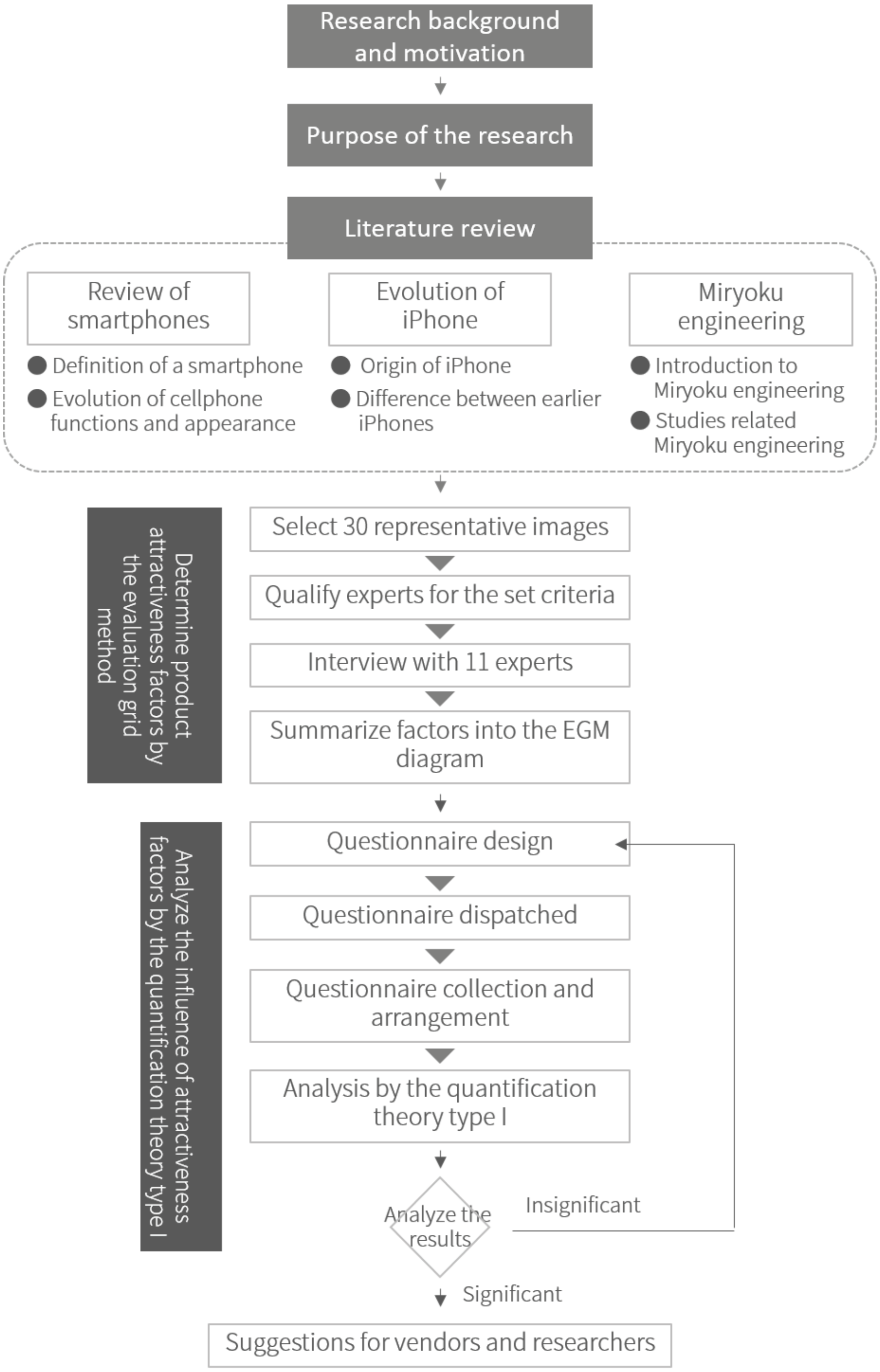
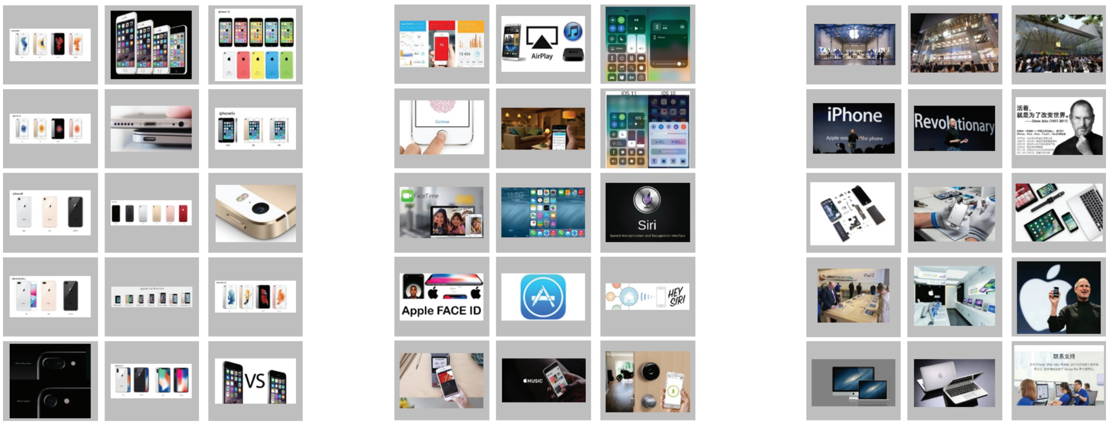

Research background and motivation
Purpose of the research
Literature review
Review of smartphones
Definition of a smartphone
Evolution of cellphone functions and appearance
Evolution of iPhone
Origin of iPhone
Difference between earlier iPhones
Miryoku engineering
Introduction to Miryoku engineering
Studies related Miryoku engineering
Determine product attractiveness factors by the evaluation grid method
Select 30 representative images
Qualify experts for the set criteria
Interview with 11 experts
Summarize factors into the EGM diagram
Analyze the influence of attractiveness factors by the quantification theory type I
Questionnaire design
Questionnaire dispatched
Questionnaire collection and arrangement
Analysis by the quantification theory type I
Analyze the results
Insignificant
Significant
Suggestions for vendors and researchers

Figure 1: Research framework of this study.

Based on the results in Figure 3, the mode values are shown in Figure 4, in which the items to the right are abstract characteristics and those to the left are the corresponding concrete characteristics. It was found in Figure 4 that these abstract characteristics can be classified into two group which are adjectives for appearance or feature respectively.



appearance feature others

Figure 2: Photos that are selected for the evaluation grid method.

4. Results and Discussion

The background information of the participants is as shown in Table 1.

Table 1: Background information of participants.

Gender	Males:41%(50) Females:59%(72)	Smartphone brands	Android:83% (101) WindowPhone:0% (0) Other:5%(6) No experience with other brands:12% (15)
Age	18 yrs old or below: 0%(0)	Years of experience	1 yr or below: 24%(33)
	18 25yrs old: 71%(86)		2yrs: 20%(24)
	26 30yrs old: 23%(28)		3yrs: 20%(26)
	31 40yrs old: 2%(3)		4yrs: 11%(13)
	41 50yrs old: 2%(2)		5yrs: 7%(11)
	51 60yrs old: 2%(3)		6yrs: 9%(11)
	60 yrs old or above: 0%(0)		7yrs: 4%(5)
			8yrs: 3%(4)
			9yrs: 0%(0)
			10yrs: 2%(2)
A total of 122 questionnaire copies are returned with a return rate of 100%			(): Number of participants

The results of the general analysis by the quantification theory type I is shown in Table 2 as follows.

The results of the analysis by the quantification theory type I by gender is shown in Table 3 as follows.

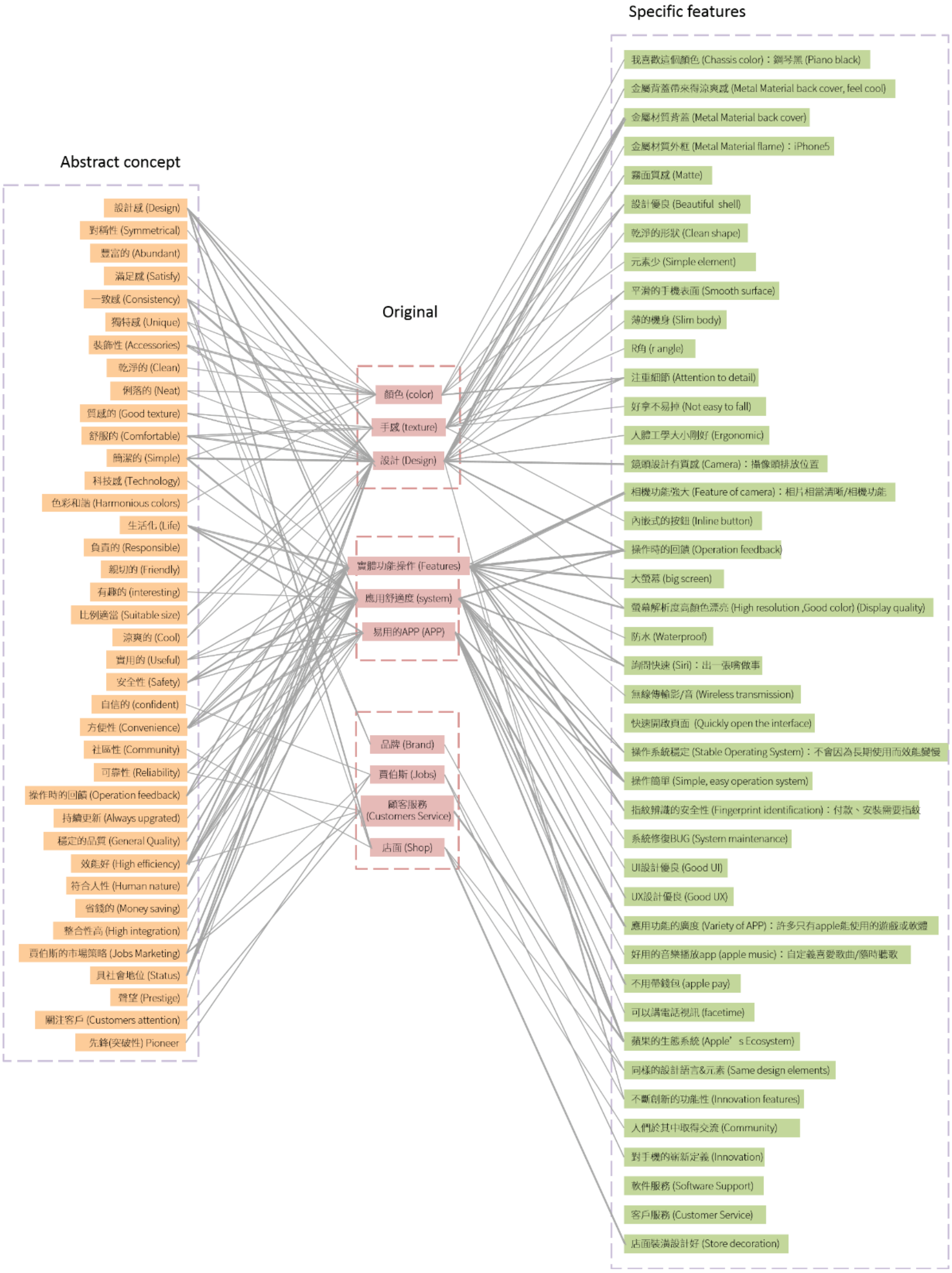

Specific features
Abstract concept
設計感 (Design)
對稱性 (Symmetrical)
豐富的 (Abundant)
滿足感 (Satisfy)
一致感 (Consistency)
獨特感 (Unique)
裝飾性 (Accessories)
乾淨的 (Clean)
俐落的 (Neat)
質感的 (Good texture)
舒服的 (Comfortable)
簡潔的 (Simple)
科技感 (Technology)
色彩和諧 (Harmonious colors)
生活化 (Life)
負責的 (Responsible)
親切的 (Friendly)
有趣的 (interesting)
比例適當 (Suitable size)
涼爽的 (Cool)
實用的 (Useful)
安全性 (Safety)
自信的 (confident)
方便性 (Convenience)
社區性 (Community)
可靠性 (Reliability)
操作時的回饋 (Operation feedback)
持續更新 (Always upgrated)
穩定的品質 (General Quality)
效能好 (High efficiency)
符合人性 (Human nature)
省錢的 (Money saving)
整合性高 (High integration)
賈伯斯的市場策略 (Jobs Marketing)
具社會地位 (Status)
聲望 (Prestige)
關注客戶 (Customers attention)
先鋒(突破性) Pioneer
Original
顏色 (color)
手感 (texture)
設計 (Design)
實體功能操作 (Features)
應用舒適度 (system)
易用的APP (APP)
品牌 (Brand)
賈伯斯 (Jobs)
顧客服務 (Customers Service)
店面 (Shop)
我喜歡這個顏色 (Chassis color)：鋼琴黑 (Piano black)
金屬背蓋帶來得涼爽感 (Metal Material back cover, feel cool)
金屬材質背蓋 (Metal Material back cover)
金屬材質外框 (Metal Material flame)：iPhone5
霧面質感 (Matte)
設計優良 (Beautiful shell)
乾淨的形狀 (Clean shape)
元素少 (Simple element)
平滑的手機表面 (Smooth surface)
薄的機身 (Slim body)
R角 (r angle)
注重細節 (Attention to detail)
好拿不易掉 (Not easy to fall)
人體工學大小剛好 (Ergonomic)
鏡頭設計有質感 (Camera)：攝像頭排放位置
相機功能強大 (Feature of camera)：相片相當清晰/相機功能
內嵌式的按鈕 (Inline button)
操作時的回饋 (Operation feedback)
大螢幕 (big screen)
螢幕解析度高顏色漂亮 (High resolution ,Good color) (Display quality)
防水 (Waterproof)
詢問快速 (Siri)：出一張嘴做事
無線傳輸影/音 (Wireless transmission)
快速開啟頁面 (Quickly open the interface)
操作系統穩定 (Stable Operating System)：不會因為長期使用而效能變慢
操作簡單 (Simple, easy operation system)
指紋辨識的安全性 (Fingerprint identification)：付款、安裝需要指紋
系統修復BUG (System maintenance)
UI設計優良 (Good UI)
UX設計優良 (Good UX)
應用功能的廣度 (Variety of APP)：許多只有apple能使用的遊戲或軟體
好用的音樂播放app (apple music)：自定義喜愛歌曲/隨時聽歌
不用帶錢包 (apple pay)
可以講電話視訊 (facetime)
蘋果的生態系統 (Apple’ s Ecosystem)
同樣的設計語言&元素 (Same design elements)
不斷創新的功能性 (Innovation features)
人們於其中取得交流 (Community)
對手機的嶄新定義 (Innovation)
軟件服務 (Software Support)
客戶服務 (Customer Service)
店面裝潢設計好 (Store decoration)

Figure 3: Evaluation grid diagram of iPhone’s attractiveness factors.

The next step is to analyze by the years of experience with iPhone. Since the number of participants with more than 5 years of iPhone experience is insufficient as samples for investigation, only the results of participants with less than 5 years of iPhone experience are shown in Table 4 as follows.

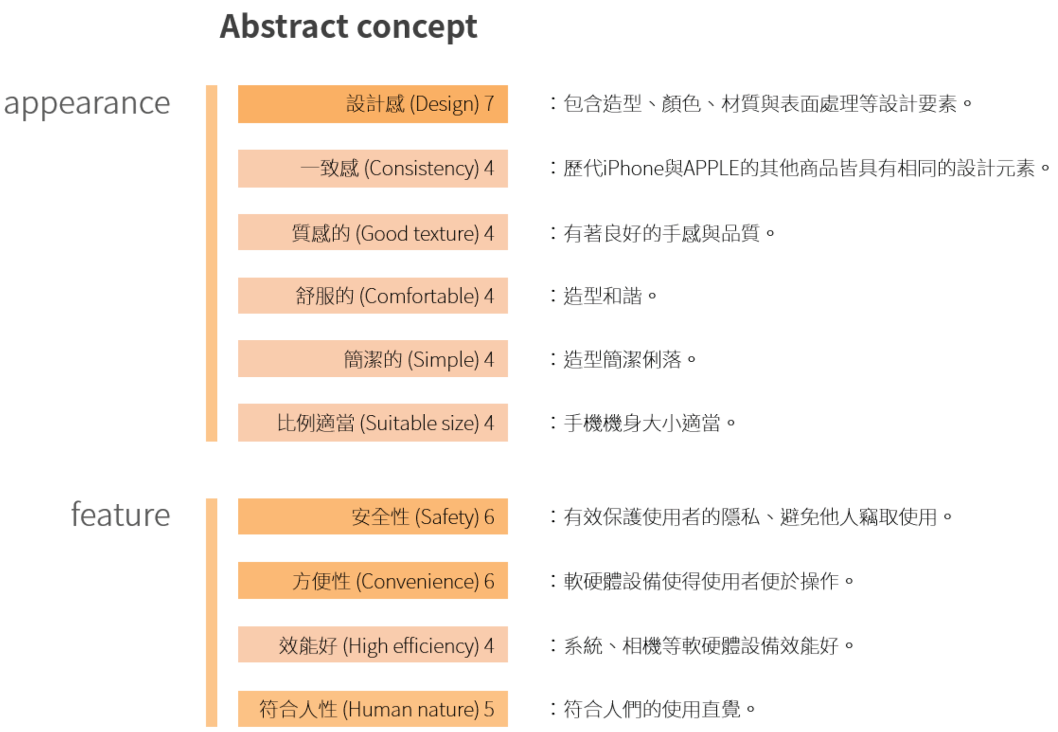

Abstract concept
appearance
設計感 (Design) 7
：包含造型、顏色、材質與表面處理等設計要素。
一致感 (Consistency) 4
：歷代iPhone與APPLE的其他商品皆具有相同的設計元素。
質感的 (Good texture) 4
：有著良好的手感與品質。
舒服的 (Comfortable) 4
：造型和諧。
簡潔的 (Simple) 4
：造型簡潔俐落。
比例適當 (Suitable size) 4
：手機機身大小適當。
feature
安全性 (Safety) 6
：有效保護使用者的隱私、避免他人竊取使用。
方便性 (Convenience) 6
：軟硬體設備使得使用者便於操作。
效能好 (High efficiency) 4
：系統、相機等軟硬體設備效能好。
符合人性 (Human nature) 5
：符合人們的使用直覺。

Figure 4: Evaluation grid diagram of iPhone’s attractiveness factors after classification.

Table 2: General analysis by the quantification theory type I.

		Ranking #1	Ranking #2	Ranking #3	Partial coefficient of correlation
Adjectives for appearance	Stylish	Stylish lens design	Aesthetic style design	-	0.343
	Consistent	Matte texture	Attention to details	Simple and brief shape	0.421
	High-quality	Stylish lens design	Matte texture	Simple and brief shape	0.411
	Comfortable	Matte texture	Color	Smooth phone surface	0.278
	Succinct	Smooth phone surface	Color	Matte texture	0.425
	Proportionally adequate	Ergonomically fit	-	-	0.183
Adjectives for feature	Sate	Automatic bug-fixing	Fingerprint recognition	-	0.181
	Convenient	Fingerprint recognition	Voice assistant	No more wallet	0.289
	Efficient	Stable operating system	-	-	0.182
	Ergonomic	Feedback during operations	Exchanging opinions	Voice assistant	0.269

For the analysis of participants with experience of using other brands, since the number of samples is insufficient for participants with Windows Phone, other brands or no experience, only the result of participants with Android smartphone experience is shown in Table 5 as follows.

5. Conclusion

Results of this study indicated that the abstract features can generally be classified by the evaluation grid method into (1) Adjectives for appearance: stylish, consistent, high-quality, comfortable, succinct, and proportionally adequate; (2) Adjectives for function: safe, convenient, efficient, and ergonomic.

The results of the questionnaire survey on the participants by the quantification theory type I indicated that the correlation is insignificant. Moreover, no control group for the factors including the number of years using iPhones or smartphones of other brands is available is this study. On the other hand, the differences between genders on the abstract adjectives of product profile are described as follows. (1) Stylish: Both male and female participants highlight the factor of stylish lens design. They indicated that iPhone's lens' style design is more attractive than other brands. (2) Consistent: Male participants prefer smooth phone surface but female ones prefer matte texture. (3) High-quality: Both male and female participants prefer matte texture on a smartphone's back cover since they feel the quality is enhanced by the matte surface. (4) Comfortable: The result is similar to that for the Consistent factor as males prefer smooth phone surface and females prefer mattes surface. (5) Succinct: Male participants highlight slim phone designs but female participants present no significant factors for consideration. (6) Proportionally adequate: Males prefer simple and brief shapes while females prefer aesthetic style designs. The differences between males and females on the abstract adjectives of product feature are as follows. (1) Safe: No significant factor for both male and female participants. (2) Convenient: Males highlight fingerprint recognition while females pay more attention to voice assistant. (3) Efficient: Both male and female participants highlight the importance of a stable operating system. The participants agree that the iPhone's operating system is satisfying. (4) Ergonomic: Male participants highlight fingerprint recognition while female participants present no significant factor.

Smartphone vendors are advised to carry out design differentiation for different target groups. Follow-up researchers could conduct further experiments on other factors

Table 3: Analysis by the quantification theory type I by gender.

			Ranking #1	Ranking #2	Ranking #3	Partial coefficient of correlation
Adjectives for appearance	Stylish	Male	Stylish lens design	Simple and brief shape	Aesthetic style design	0.804
		Female	Stylish lens design	Matte texture	Smooth phone surface	0.469
	Consistent	Male	Smooth phone surface	Simple and brief shape	Slim design	0.737
		Female	Matte texture	Slim design	Simple and brief shape	0.566
	High-quality	Male	Matte texture	Aesthetic style design	-	0.750
		Female	Matte texture	Color	Simple and brief shape	0.556
	Comfortable	Male	Smooth phone surface	Color	Matte texture	0.741
		Female	Matte texture	Smooth phone surface	Color	0.332
	Succinct	Male	Slim design	Color	Smooth phone surface	0.726
		Female	Matte texture	Smooth phone surface	Color	0.599
	Proportionally adequate	Male	Simple and brief shape	Slim design	-	0.360
		Female	Aesthetic style design	Ergonomically fit	Simple and brief shape	0.186

such as gender, years of smartphone experience, or the experience with smartphones of other brands.

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[3] Wu, H.T. (2014). A new way of investigating smartphone business models by the thinking of integrating hardware and software. National Central University.

Adjectives for feature	Sate	Male	Fingerprint recognition	Automatic bug-fixing	-	0.268
		Female	Automatic bug-fixing	Fingerprint recognition	-	0.294
	Convenient	Male	Fingerprint recognition	Big screen	Powerful camera functions	0.462
		Female	Voice assistant	Fingerprint recognition	Stable operating system	0.365
	Efficient	Male	Stable operating system	-	-	0.602
		Female	Stable operating system	-	-	0.042
	Ergonomic	Male	Fingerprint recognition	Shortcuts to pages	Feedback during operations	0.693
		Female	Exchanging opinions	Voice assistant	Feedback during operations	0.448

Table 4: Analysis by the quantification theory type I by years of iPhone experience.

		Ranking #1	Ranking #2	Ranking #3	Partial coefficient of correlation
Adjectives for appearance	Stylish	Stylish lens design	Aesthetic style design	Simple and brief shape	0.625
	Consistent	Matte texture	Metal back cover	Smooth phone surface	0.508
	High-quality	Simple and brief shape	Matte texture	-	0.647
	Comfortable	Color	Smooth phone surface	Slim design	0.328
	Succinct	Matte texture	Smooth phone surface	Color	0.457
	Proportionally adequate	Ergonomically fit	-	-	0.363
Adjectives for feature	Sate	Automatic bug-fixing	-	-	0.190
	Convenient	Fingerprint recognition	Voice assistant	No more wallet	0.329
	Efficient	Stable operating system	-	-	0.146
	Ergonomic	Exchanging opinions	Big screen	Fingerprint recognition	0.292

[4] Wu, C.Y. (2014). An Analysis for Firms Profiting Ability in Business Ecosystem: A Case Study of iPhone Suppliers. National Sun Yat-sen University.

Table 5: Analysis by the quantification theory type I by the experience of Android smartphones.

		Ranking #1	Ranking #2	Ranking #3	Partial coefficient of correlation
Adjectives for appearance	Stylish	Stylish lens design	Aesthetic style design	Simple and brief shape	0.499
	Consistent	Matte texture	Simple and brief shape	Metal back cover	0.463
	High-quality	Stylish lens design	Simple and brief shape	Matte texture	0.545
	Comfortable	Color	Matte texture	Smooth phone surface	0.392
	Succinct	Color	Matte texture	Simple and brief shape	0.487
	Proportionally adequate	Ergonomically fit	Slim design	-	0.332
Adjectives for feature	Sate	Automatic bug-fixing	-	-	0.175
	Convenient	Fingerprint recognition	Voice assistant	No more wallet	0.334
	Efficient	Stable operating system	Shortcuts to pages	-	0.209
	Ergonomic	Voice assistant	Feedback during operations	Fingerprint recognition	0.271

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