A PRELIMINARY STUDY ON AESTHETIC OF APPS ICON DESIGN

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Abstract: The total number of the world's major mobile platform apps at the end of 2011 already exceeded one million! Worldwide mobile app store downloads surpassed 45.6 billion in 2012 according to a global survey. With the prevalence of smartphones, more and more apps are being developed and integrated into people's lives. App demand increases and operation time of app is also getting longer and longer. Mobile app store competition is fierce, and an appropriate app icon design on the top will be important. A charming app icon will gain the advantage of a positive first impression when users browse available apps. The hypothesis of this study is that the constituent elements of an app icon will affect user psychology, and the aim of this study is to clarify the issues above with the development of the following research purposes: 1) to understand the types of aesthetic elements in app icons, 2) to clarify the relationships among the classifications of icon design styles, 3) to explore the relationship between icon style and users reactions, 4) to investigate the new issue related to the skeuomorphism of app icon design styles. The research methods include the evaluation grid method structure (EGM) from Miryoku engineering, quantification theory types I and III from the quantitative understanding of style classification, and the use of regression to identify the potential relationship between icon style and user emotions. The goal is build an interface design principle in order to provide another reference direction for app icon design. Finally, the study proposes a result with a kansei interface (KI) to depict the relationships among app icon constituent elements for users and designers as a follow-up to the icon design studies in the future.

Keywords: App icon, EGM, Kansei interface, Quantification theory type I, Quantification theory type III, Skeuomorphism.

1. Introduction

According to Mobilewalla web statistics, the total number of the major world's major mobile platform app at the end of 2011 already exceeded one million! Worldwide mobile app store downloads had surpassed 45.6 billion in 2012, according to Gartner , Inc. With the prevalence of smartphones, more and more apps have been developed and integrated into people's lives. In the case of users, app demand has increased, and the length of time individuals are engaged in use of apps is also getting longer and longer. According to app market analyses, the average number of app installations per user grew from 32 in 2011 to 41 in 2012. Smartphone users have deep roots in the solid demand for apps.

A charming app icon will generate the advantage of a great first impression when users browse these apps online, as shown in Figure 1. Attractive app icons will increase user curiosity and make them want to learn more details about the app they are investigating. Interface designers knowledge about to operate this “charm” factor will become an important issue in app design. The hypothesis is that this constituent element of an app icon can affect users, so the purpose of this study is to clarify the issues above, with the development of the following research purposes: 1) to understand types of the aesthetic elements existing in app icons, 2) to clarify the relationships among the classifications of icon design styles, 3) to explore the relationship between icon style and users emotions, 4) to investigate the new issue regarding the skeuomorphism design style for app icon. This study has the quality of a double analysis including an evaluation structure (EGM) of charm engineering (miryoku engineering) and a quantification theory type III understanding of style classification using a regression to identify the potential relationship between icons and user psychology with an app icon design as the reference index.

Figure 1 App Icon's first impression is necessary on store

It is difficult for users to find a suitable app in a sea of apps. If these app float top on apps store, then it’s the way we can see easily. However, even if we use a search engine, we still may not be able to find the app we want [1]. Therefore, the importance that icons play in app success can never be underestimated. The aesthetic of app icon constituents must be determined by an analysis of both quality and quantity. With the popularity of the iPhone, more and more users have come into contact with iOS. However, as iOS has developed, it has extended to another design style issue concerning skeuomorphism of UI [2]. This ongoing debate in regard to UI design represents its significance [3]. In recent decades, emotion design topics have flourished, so this study is an attempt to identify the traits of positive emotion toward the kansei interface concept in app icons in the UI field and the relation between emotion and skeuomorphism.

2. Related works

2.1 Smartphone Trend

The global mobile app market is poised to grow to $52 billion by 2016 [4]. Nowadays, it is beyond 1,000,000 apps in global app markets. It’s hard to imagine how in such a competitive environment the app designers can make their own work stand out. With the prevalence of smart phones, more and more apps are being developed and integrated into people's lives. The demand for apps is continuing to grow, and the amount of time spent using them is growing concurrently. According to the Nielsen study done in the U.S. market, the average number of app installations grew from 32 in 2011 to 41 in 2012, and in comparison to web browsing, it grew from 73% to 81%. The renowned Speckyboy [4] design magazine website suggested that the common characteristic is that users contact these apps using app icons. In this fiercely competitive environment, an attractive app icon will increase user curiosity and motivation to learn more about the details of the app.

Some app companies have suggested that a successful app can be summarized as being based on three aspects: innovativeness of the idea, solid engineering, and brilliant design [4,5,6]. UI of app design includes interface design and icon design; significantly, an appropriate UI offers splendid design to users. However, there are so many apps that it is impossible to investigate the details for every app, excluding first impression of app icon.

2.2 App icon design

Icons are used widely in the human-computer field [7]. The purpose of early icon design was functionality and the ease with which people could identify operating functions. In addition to functional uses, there were sometimes art and design attributes [8,9]. Early icon designs offered basic convenience, cognitive and guidance functions [10]; psychologically, icon design was intended to appeal to the inner feelings of people. The emoticon (emotion icon) for instant messaging, for example, make people accompanied feeling [11]. The design of the popular msn icons represented the expression of people's emotions. This kansei (a Japanese word that covers the meanings of sensitivity, sensibility, and intuition in English) interface is intended to improve people's emotions in a positive manner, and when people link the design of the app icon and the kansei interface, everyone views the app icon design according to the charm factor related to the kansei interface.

In an app store, app icons are the most important object on web pages at first glance [12,13]. Even the UI designers have suggested this on their blogs [4,14]. As a result of increasing user interest and touch intentions, app icons play a pivotal role [15]. What attractive factors must be included for an appropriate app icon and how it is operated are factored into icon design process and are important issues for the interface designer. It is important to app designers that the apps they create become the best sellers in stores. App icon design is one of the primary conditions for apps whether on the shelves after a short period of time to be concerned about. It can be said that if a well-designed app doesn’t have a beautiful and attractive icon, it may get buried in the sea. When we want to analyze app icons, the first consideration is the color, shape, and other visual performance related to which icon design elements draw user attention.

2.3 Skeuomorphism

A new style design concept on interface called “skeuomorphism”, means a physical ornament or design on an object made to resemble another material or technique on a UI. An example of a physical skeuomorph is where clay pottery has also been shown bearing rope-shaped protrusions. The most well-known implementation of skeuomorphism on a UI is Apple Inc.’s iOS use of the bookcases on the iBooks app (even though nobody puts magazines on a wooden bookcase at home) and the notes app with torn paper [2].

Figure 2 Skeuomorphs on a UI, iOS notes app with torn paper (Including this app icon)

Recently there have been arguments against skeuomorphism in the area of digital design, because some designers claim this style makes software more difficult to operate and is redundant and unnecessary [16,17]. Actually, it's necessary use skeuomorphism on some UIs to reduce the gap for new users with regard to interaction [18,19]. The initial good intentions of skeuomorphism was to allow users to become more familiar with the operation of the interface. However, there has been more and more opposition concerning its limitation on design style and usability. The pros and cons of skeuomorphism are listed on Table 1. We can imagine that the more visual ornaments appear on a fixed size screen, the less flexible is the design [20]. The arguments that have been suggested include a belief that skeuomorphism is too far away and unfamiliar to the Y-generation and that new style interfaces must follow with new digital information receiver way, especially in nowadays—the "Touch Era".

Table 1 Pros & cons of skeuomorphism

Pros	Cons
Family for new users	Not suitable for the new generation
Brilliant visual design	Usability reduced
Attractive aesthetic	Redundantcy ornamentation
	Design style limited
	Violation of the operation

2.4 Kansei interface

Every UI designer's expectancy is reaching the balance of usability and beauty in regard to interface design. The concept of the kansei interface (KI) is one of the ways to help designers find a middle ground [21]. In the digital age, sales of digital products is gradually becoming equal to (or higher than) physical goods, and there needs to be a model to show the relationship between digital products and user emotions, so the concept of KI was proposed. There have been more emotional elements applied to kansei interface designs [22]. We advocate that KI can increase positive emotions in users with motivation toward a specific interaction behavior on the UI. The KI not only contains basic usability conditions, but also has positive emotion design factors [23]. KI mentioned three points: 1) positive emotion, 2) interactive motivation, and 3) balance between usability and beauty; KI stressed the link relations above, and it also emphasizes the connection between user and product as shown in Figure 3. This research is an attempt to discover some clues from KI on app icons and to determine the relationship between app icons and user emotions.

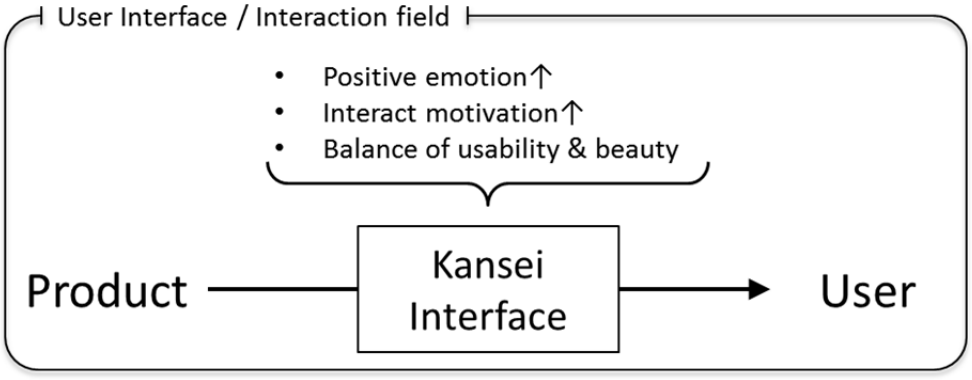


Figure 2 Kansei Interface (KI) concept model

3. Methods

3.1 Research Scope

In this study, we collect app icons using the Apple Inc.'s App Store (iOS) platform for the experimental sample, focusing particularly on the aesthetic of results. There is consistency in the design style of these app icons under strict restrictions by the App Store.

3.2 Measures and Analyses

To understand the relation between app icons and users' feelings, this research analyzed them using quantification theory type III (QT-III) and quantification theory type I (QT-I) as shown in Figure 4. At the beginning stage, the icon related to aesthetic trend analysis was carried out. We deconstructed the constituent elements of the app icon using EGM (evaluation grid method), and 8 designers were invited (including 2 app programmers, and 6 art designers for the Web). After the EGM was carried out, 3 UI designers were invited into a focus group to discuss the final aesthetic structure of the icon as shown in Figure 5. We can see the types of constituent elements (physical traits) of the app icon through Figure 5. The original evaluation items (OEI) are the factors of evaluation and preference structures determined through an interview process [24]. There are 42 participants (aged between 18 and 50) from QT-I, and all users had least 3 months of app purchasing experience. Purchasing experience is important for app icon evaluation in regard to aesthetic, and they all had purchased at least 10 apps. The end of the research process was intended to mutually verify the relationship between the icon trend son the market and user's feelings.

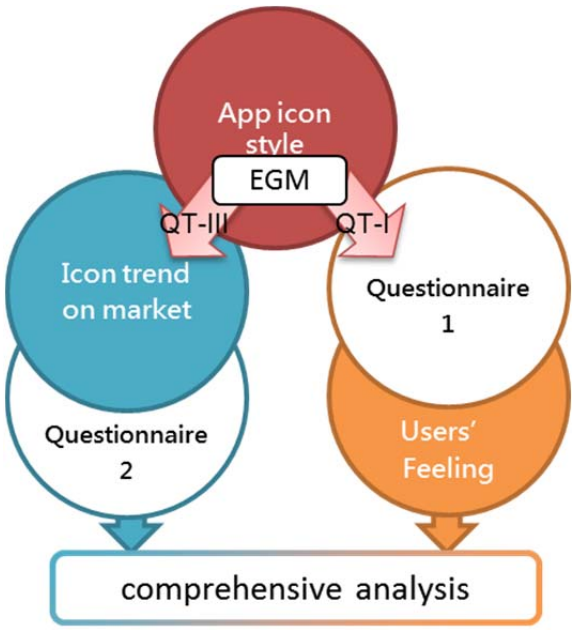


Figure 3 Research method of understanding the app icon

The main 8 factors for attractiveness (Original Evaluation Items, OEI) included artifact imitation, humorous cartoon elements, three-dimensional effect, color, brilliant logo, dynamic elements, appropriate function, and novelty. In further analysis of attractiveness factors, we used abstract phrases (user's psychological feelings) as shown in Table 2.

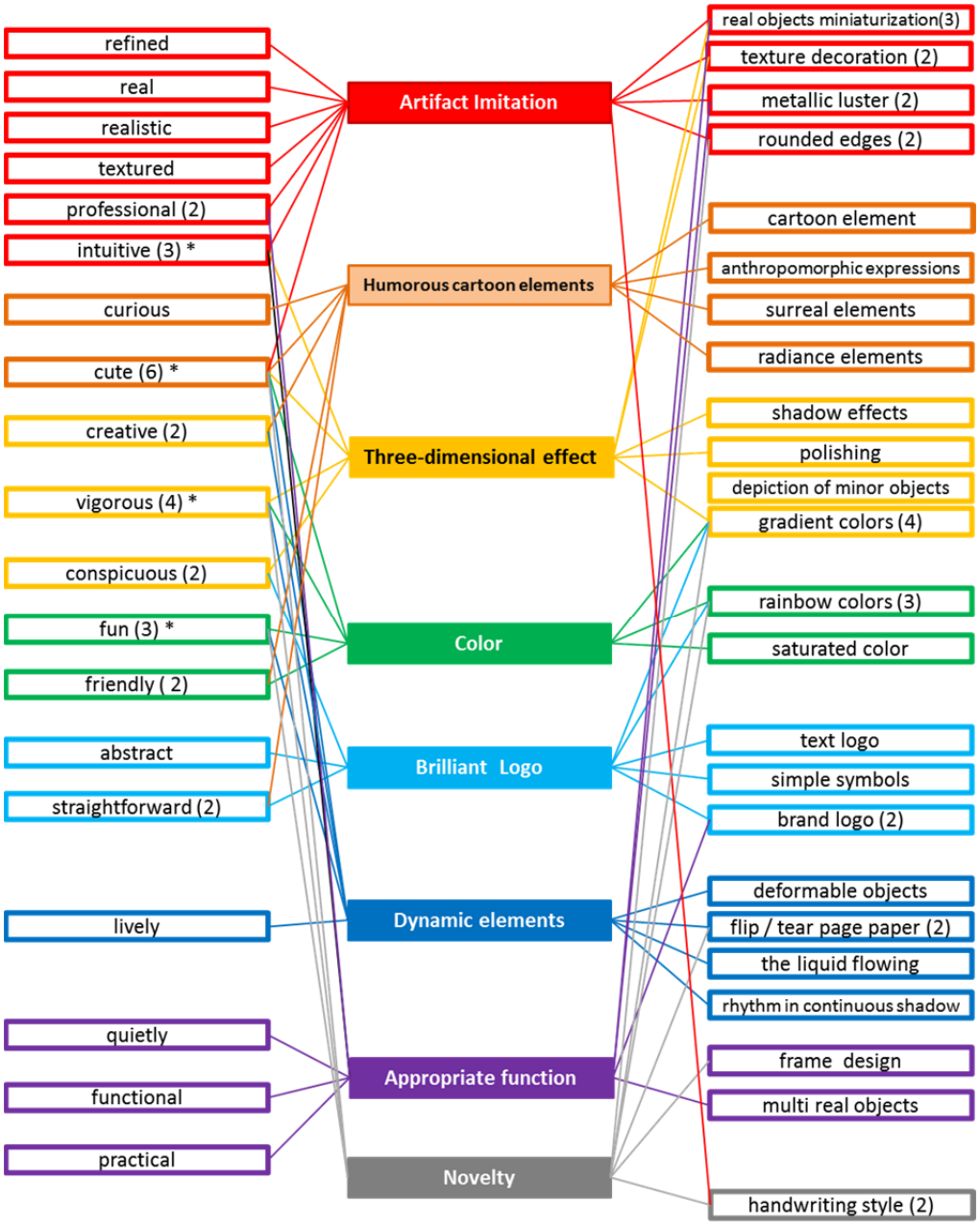


Figure 5 EGM structure for attraction of the app icon design

(number) is the numbers of links

Table 2 The abstract phrases

refined	real	realistic	textured	professional (2)
intuitive (3)*	curious	cute (6)*	creative (2)	vigorous (4)*
conspicuous (2)	fun (3)*	friendly (2)	abstract	straightforward (2)
lively	quietly	functional	practical	

* Connect more than three words with the OEI (original evaluation items).

QT-I: in order to further determine the inner feelings of participants, we took the group of abstract phrases including intuitive, cute, vigorous, and fun for the authentication-based design questionnaire. The questionnaires were returned from 65 copies, 45 copies of valid questionnaires (including 19 male, 23 female; 23 design backgrounds, 19 non-design backgrounds).

4. Results

4.1 About app icon

In order to determine whether or not app icons really attract users, in this research, a pre-test questionnaire was used, with the results shown as Figure 6. There were 82 participates involved with smartphones. 74 (90%) agreed that they found the app icon to be attractive, and most users preferred rich visual design or concrete objects on the icon design.

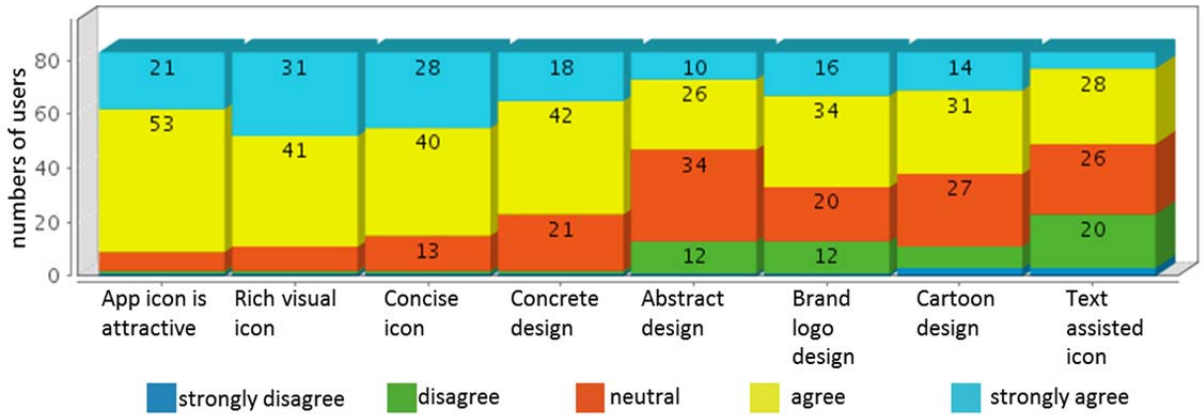


Figure 6 Statistics for app icon general cognitive results

4.2 Users ’Feeling with QT-I

After the QT-I questionnaire, the 4 main abstract phrases resulting from the following linear regression with QT-1 are presented in Table 3. In the first row of each table, the multiple correlation coefficient (MCC) and the MCC2 are presented. The 4 MCC values are in the acceptable range (MCC > 0.3), the cute and vigorous phrases in particular. There is another vital value, which is the partial correlations coefficient (PCC). PCC can be used as a third method by which to express the relationship between criterion and a predictor; the category score (CS) shows in which direction and to which extent the factor is affected by a certain property [25]. According to the PCC, the “artifact imitation” and “novelty” of the OEI with “cute” phrases is strongly significant; the “humorous cartoon elements”, “three-dimensional effect” and “dynamic elements” of the OEI with “cute” phrases is weakly significant. There are important design elements that icon designers can emphasize. We found the positive responses for the physical trait related to “artifact imitation” to be texture decoration and the physical trait of “novelty” to be gradient colors. These two physical traits related to image can increase users’ feeling that an icon is cute to a high degree. If we want design a vigorous icon image, we can emphasize the “three-dimensional” effect with depiction of minor object designs or punctuate the “novelty” design with a detailed flip/tear page paper. In this context, the designer can’t ignore the “dynamic elements” with “rhythm in continuous shadow” physicals traits, as shown in Table 3(a). The special value is that the flip/tear page existed in both the “dynamic elements” and “novelty” OEI at the same time. However, the value of the flip/tear page in “novelty” was higher than that of “dynamic elements”, which means that the flip/tear page design element provided more novelty for users. The components and constructs of visual aesthetics related to intuition and fun are presented in Table 3(b). These results of abstract phrases were shown to evoke positive emotions, which is in line with the kansei interface principle. All abstract phrases cause connection attraction for users.

Table 3 QT-1 regression results

Cute*	MCC = 0.58; MCC^2 = 0.33		
OEI	physics trait	CS	PCC
Artefact imitated	real objects miniaturization	0.09128	0.40052
	texture decoration	1.34192	
	metallic luster	-0.32499	
	rounded edges	0.00099	
	handwriting style	-0.31449	
Humorous cartoon elements	cartoon element	-0.01279	0.32388
	anthropomorphic expressions	0.10181	
	surreal elements	-0.65458	
	radiance elements	-0.14204	
Three-dimensional effect	shadow effects	0.01992	0.34238
	polishing	0.06964	
	depiction of minor objects	0.19947	
	gradient colors	-0.30569	
Color	gradient colors	-0.15968	0.19126
	rainbow colors	-0.10873	
	saturated color	0.06607	
Dynamic elements	deformable objects	0.10093	0.87354
	flip / tear page paper	-0.16876	
	the liquid flowing	-0.58395	
	rhythm in continuous shadow	0.1646	
Novelty	rounded edges	-0.05043	0.50543
	gradient colors	1.50128	
	rainbow colors	-0.26111	
	flip / tear page paper	0.04286	
	frame design	-0.12047	
	handwriting style	-0.13276	

Vigorous*	MCC = 0.65; MCC^2 = 0.42		
OEI	physics trait	CS	PCC
Three-dimensional effect	shadow effects	-0.0702	0.3733
	polishing	-0.01669	
	depiction of minor objects	0.53722	
	gradient colors	-0.05848	
Color	gradient colors	0.06924	0.1462
	rainbow colors	0.02476	
	saturated color	-0.11021	
Dynamic elements	deformable objects	-0.05882	0.4031
	flip / tear page paper	-0.38462	
	the liquid flowing	0.11227	
	rhythm in continuous shadow	0.17661	
Novelty	rounded edges	-0.02969	0.4462
	gradient colors	0.05835	
	rainbow colors	-0.22237	
	flip / tear page paper	0.42288	
	frame design	-0.17761	
	handwriting style	0.13121	

(a)

Intuitive	MCC = 0.39; MCC^2 = 0.16		
OEI	physics trait	CS	PCC
Artefact imitated	real objects miniaturization	0.09319	0.3101
	texture decoration	0.27742	
	metallic luster	-0.37512	
	rounded edges	-0.43379	
	handwriting style	-0.06781	
Three-dimensional effect	shadow effects	-0.09104	0.281
	polishing	0.11394	
	depiction of minor objects	0.05807	
	gradient colors	0.99277	
Appropriate function	real objects miniaturization	0.39151	0.2537
	metallic luster	-0.16882	
	brand logo	-0.05898	
	multi real objects	-0.04047	

Fun	MCC = 0.44; MCC^2 = 0.2		
OEI	physics trait	CS	PCC
Color	gradient colors	0.36803	0.3241
	rainbow colors	0.12768	
	saturated color	-0.19635	
Dynamic elements	deformable objects	-0.00892	0.2635
	flip / tear page paper	0.25338	
	the liquid flowing	-0.13931	
	rhythm in continuous shadow	-0.14163	
Novelty	rounded edges	-0.0652	0.2923
	gradient colors	0.07301	
	rainbow colors	0.53963	
	flip / tear page paper	-0.02895	
	frame design	-0.07899	
	handwriting style	-0.10059	

(b)

4.3 Aesthetic Design Trend for App Icons with the QT III results

As shown in Table 2, quantification theory type III was employed to evaluate the comprehensive specificity among multivariables and the gravity of each attribution in both groups. Quantification theory type III was

employed to investigate the similarities among the items and the gravity of each attribution in the four groups. The first axis shows that the highest eigenvalue and the highest correlation coefficient were 0.66943 and 0.81819, respectively. The map result is shown as Figure 7.

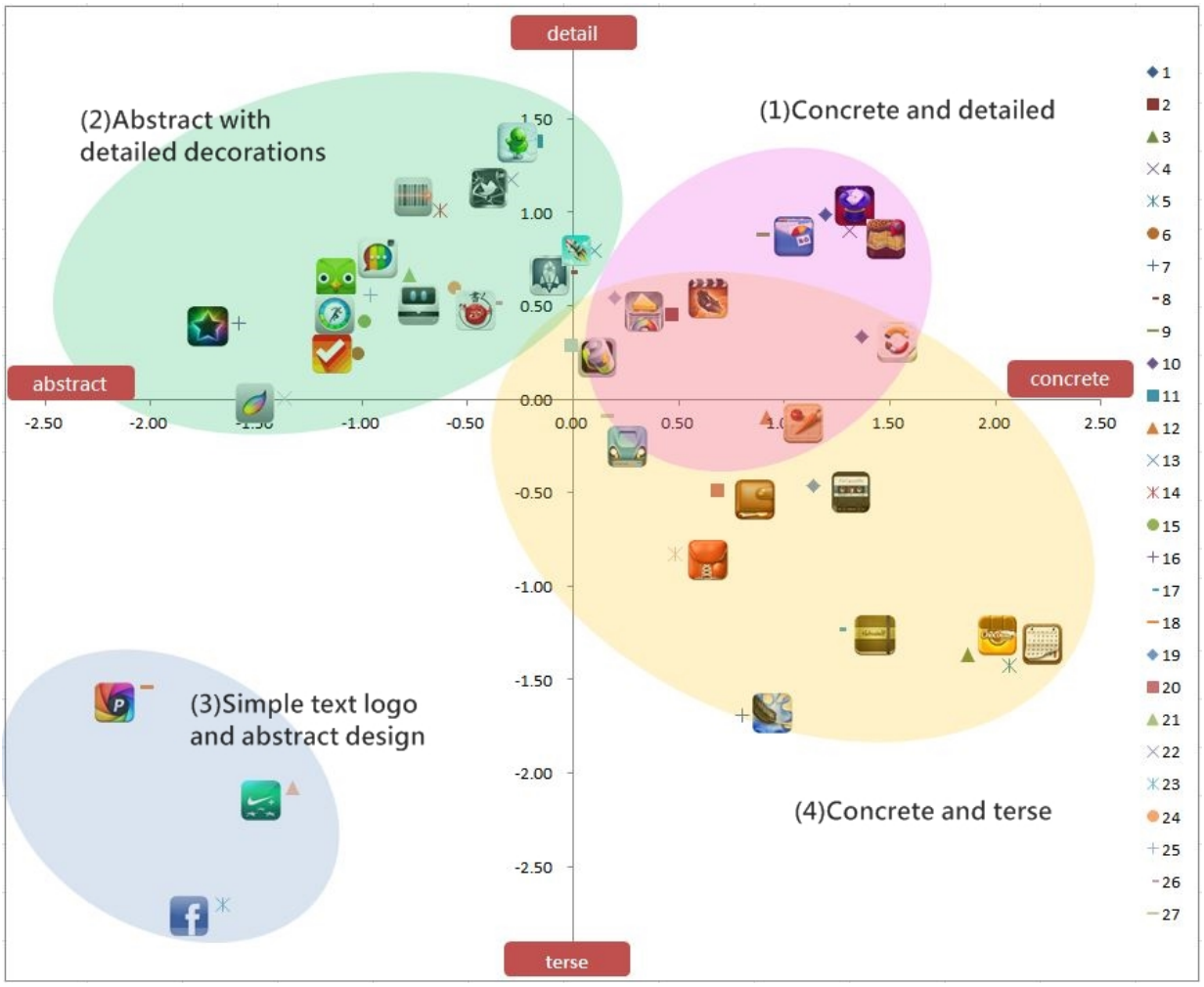
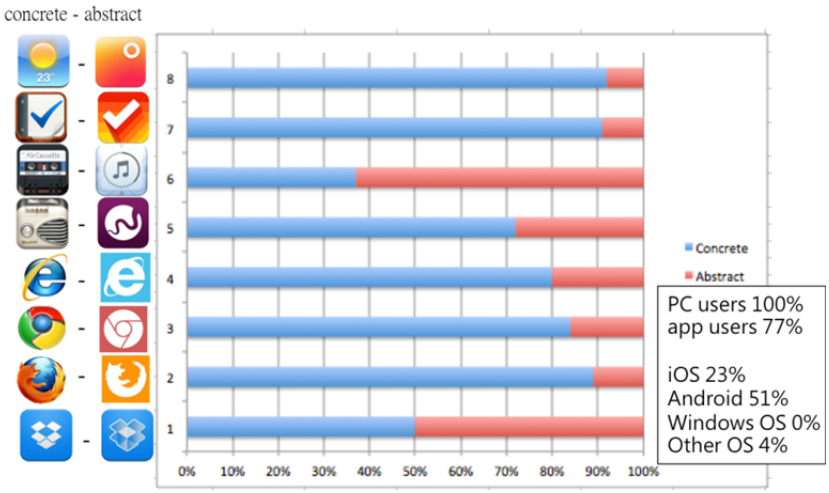


Figure 7 Distribution map of the resulting QT-III

According to the QT-III distribution, this study was an attempt to define the axis of the map as ***concrete-abstract*** and ***detailed-terse***. The app icons are also arranged into four groups including 1) concrete & detailed, 2) abstract with detailed decorations, 3) sample text logo and abstract design, 4) concrete and terse. Based on the above map of app aesthetic trends, questionnaire 2 was built using a concrete-abstract style to examine the preference for 16 icons (including some PC software types of icon). There were 74 participants including 77% smartphone users and 23% featurephone users. The results showed most participants (75%) to prefer the concrete style icon, as Table 4. An opposing perspective is that item 6—the music icon indicated a different result.

Table 4 The result of questionnaire



5. Discussion and Conclusions

According to the two phases of the experimental results, we show that the extreme app icon design trend has two directions, which are concrete-abstract. Concrete on one end presented the skeuomorphism design style; and on the abstract end, it meant digital impression. Interestingly, however, users appear to currently prefer miniaturized designs of real goods, perhaps as a result of their relationship to life experiences. It is possible that these items used in the digital devices conveys a feeling to users that the icons are novel and cute. Nevertheless, our findings still provide doubt that the success of the skeuomorphism style will continue in the future. The result of questionnaire 2 indicated that the new generation of users are unfamiliar with items as old as compact audio cassettes. With regard to the music app icon, the users indicated more preference for the abstract audio design—music symbol style. The UI designers must consider the users and functions of the app at the same time in order to make the best decisions in regard to style. From the above results, all of the results of this study can be a reference for designers.

This study indicates that varying the aesthetic design of app icons has an impact on the emotional reactions of users. As discussed previously, the current trend for app icons is concrete-abstract and detailed-terse. UI designers should carefully choose their design strategies for the app market. Future works on this topic will find a more detailed effect/relation/connection between app interface design and users' emotions.

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