The study concerning the Concreteness and Abstractness of Icon Design

Focused on the Mobile Application Icon

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Abstract

Icon, an element of GUI, became essential means of effective visual communication and its importance is gradually increasing with the wide spread and advancement of smart phone. Trend of such icon is changing from Skeuomorphism presenting concreteness to minimalism presenting abstractness and simplicity. However, its performance as effective visual communication has not been verified yet and there is a lack of study on this subject. Therefore, the purpose of this study lies in verifying the concreteness and abstractness of icon design. The research on visual component of icon was conducted through literature review, analysis on Skeuomorphism and minimalism was conducted to recognize current design trend, and consideration on concreteness and abstractness of icon was carried out. Afterwards, icon design was classified into each form of expressions that are 'realistic-concrete-iconic-abstract' expression and then user survey was conducted. The significance of this study lies in the fact that literatures review on the design of icon, a current hot issue, and verification on its influence with division of 5 aspects including information recognition, preference, curiosity, purchase intention, and memorability for each form of expression have been conducted.

Keywords: GUI, Skeuomorphism, Minimalism, Icon

1. Introduction

1-1. Background & Purpose of Research

There has been a sudden rise in digital media with the advancement in IT. As a result, there was a necessity for new means of communication in media and icon was utilized as one of those means. With the generalization in product function, user experience became more important than technology and users started to take interest in GUI (graphic user interface) as a result of conducting effective interaction through graphic. Under such circumstances, Apple took innovative approach in GUI design by presenting new minimalism design, a deviation from its previous design philosophy Skeuomorphism. It became a big issue in the field of design and trend in application of app store has changed into minimalism design afterwards. Particularly clear change is presented in icon design. However, there is a criticism that such change in GUI design is just a temporary trend. It is a common knowledge that Skeuomorphic icon presents concreteness and minimalistic icon presents abstractness. However, effect of concreteness and abstractness in icon design on user has not been verified yet and there is a lack of study on this subject.

Application is a core contents indispensable in smart phone and its importance increased with the growth of smart device market. Various applications are introduced and icon, in flood of applications, plays an important role in decision making of consumer by inducing the attention of consumer. In other words, icon plays a role of catalyst to assist the recognition of applications in decision making process of consumer as it is primary element of contact. Design can enhance competitiveness among applications with same function. The scope of this study was restricted to mobile application icon and its influence on user was verified by dividing it into concreteness and abstractness reflecting the trend of Skeuomorphism and minimalism which are hot issues.

First, is there a difference in preference based on concreteness and abstractness of icon design?

Second, is there a difference in information recognition based on concreteness and abstractness of icon design?

Third, does the abstractness of icon design induce the curiosity?

Fourth, is there a difference in memory based on concreteness and abstractness of icon design?

Fifth, do concreteness and abstractness of icon design have effect on purchase?

The subject of inquiry is based on hierarchy of advertisement effect. Hierarchy of effect describes the effect of accumulative short-term effect from exposure to advertisement and purchase by consumer in stages[1]. Icon is an image that represents the application and its purchase process is similar with that of hierarchy of effect. A stage where positive image toward

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[1] 이명천, 김요한(2012). 광고핵심이론. 커뮤니케이션북스

application turns into preference is very important as it leads to confidence in purchase.

1-1. Background & Purpose of Research

First of all, analysis on Skeuomorphism and minimalism was conducted by recognizing the current design trend through literature review. Also, theoretical consideration on visual components of icon and research on concreteness and abstractness of icon were conducted. The shape of icon design was classified into 4 stages for each form of expression and foundation for analysis on effective visual communication of icon as established based on it. Classification for forms of expression in stages refers to 4 stages of 'realistic-concrete-iconic-abstract' expression. The survey was conducted based on theoretical consideration. By selecting experiment group, user survey was conducted after manufacturing smart phone as a prototype. Evaluation on each question was conducted after presenting the prototype. After examining the recognition on icon design of application and preference for each form of expression, the factor of influence was looked into. Also, in order to conduct verification on subject of inquiry, independent evaluation was carried out for icon presenting each form of expression. Response on each item was made based on Likert 5 point scale. Upon completion of the evaluation, interview was conducted to ask opinions regarding each form of expression.

2. Consideration on GUI

2-1. Definition of GUI

GUI is abbreviation for graphic user interface and it enables more prompt and smooth interaction between people and computer using graphic[2]. It signifies user-centered design which provides convenience to user, an advancement from previous text-based user interface[3]. It enables easy learning and familiar approach with focus on visual aspect of work. User interface before introduction of GUI took form of CUI (character user interface) in which text command is delivered through keyboard to perform work and the result of work is indicated in text.. Afterwards, computer market presented rapid growth due to easier computer language computer followed by wide spread of GUI, computer market presented rapid growth with easy computer language and it adnvanced to be a strong media as it became a must for public from the domain of experts.

2-2. Change in Trend: Skeuomorphism & Minimalism

The design philosophy of iOS was 'Skeuomorphism' with focus on user experience before the introduction iOS7 of

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2 곽호완,박창호,이태연,김문수,진영선, 실험심리학용어사전,

시그마프레스, 2008.

3 추영지, 사용성 향상을 위한 그래픽 유저 인터페이스(GUI) 디자인에

관한 연구 : 종합병원 키오스크의 시각적 구성요소를 중심으로,

홍익대학교 대학원 석사논문, 2007.

Apple in Jun. 2013. Skeuomorphism was often called as Skeuomorph. According to Gesseler (2012), it is compound word of 'Skeuous' which means 'tool' and 'Morphe' which means 'shape' in Greek referring to design that reflects the shape of tool as is. In other words, Skeuomorphism is to apply original shape and texture of real object to design as is and it is to express metaphor on screen. Hence, Skeuomorphism also referred to as 'real metaphor design' and it is realistic and concrete in expressing the image. Particularly, Apple has been leading the field of design referred to as sensible design and intuitive design because of Skeuomorphism. The competitiveness of Apple lied in providing GUI differentiated from other OS. Skeuomorphism was the core of Apple's design and its design philosophy. It stimulated analog sensibility by converting shape of analog into digital as is and thus reduced the difference between analog and digital. Function could be understood relatively easy and intuitive without manual and design full of details were enough to visually attract the interest of user. Due to such Skeuomorphism, previous iOS was evaluated to have maximized the user experience and received great reviews from users as well.


Figure 1 Skuomorphism icons of iOS6

On the other hand, there also exists criticism on Skeuomorphism. To be specific, it is a criticism about excessively realistic description for the object of metaphor. It suggests that focus on realistic visual expression produces unnecessary information and thus complicates it. Although increase in amount of information assists its understanding in aspect of visual perception and recognition, excessive amount of information may cause confusion in perception and recognition system of people[4]. Also, it would lower the understanding on function of application for users without experience of using digitally expressed objects in actual life. In addition, there is a limitation in producing creative outcome as it expressed the shape of actual object as is.

However, GUI design entered upon a new phase with the introduction of iOS7. Deviating from realistic and three-dimensional expression in the past, it has converted into minimalism. Minimalism refers to design which minimizes the expression disregarding unnecessary description. iOS7 is referred to as flat UI as it presents flat and neat image and it conforms to the essence of minimalism which promotes minimization and moderation in design element. Looking into new icon, it takes simple features of 2D presenting either iconic or abstract shape. Minimalism is in pursuit of extreme simplicity and implication of its significance.

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4 김성훈, 권동은, 스마트폰 시각커뮤니케이션 디자인을 위한 아이콘

조형 요소 연구, 한국디지털디자인학회 31, 291-300, 2011.
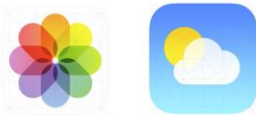
Figure 2 Minimalism icons of iOS7

Minimalism started to receive attention in aspect of methodology to enhance the focus on contents by concentration on design of elements with objective[5]. In the past when concept of smart phone was unfamiliar, it was necessary to reflect the concept of reality as is to inform its usage. However, with wide spread of smart phone, there is no need for figurative description of function as recognition of function has become a common knowledge. Although it may seem monotonous and dull, it became much easier to control and thus one can focus on original contents. Also, it is chic in aspect of aesthetics. On the other hand, some suggest that such dullness lower the understanding of user. When there almost no design element, it cannot fulfill its role of delivering the information sufficiently and cause confusion[6]. On the other hand, the biggest advantage of minimalism lies in its flexibility. With the introduction of device in various sizes including desktop, smart phone, pad, and others, design suitable for each display size was in demand and thus it is changing into responsive web[7]. More effective development in design was necessary with the introduction of such responsive web. As a result, minimalism was introduced as its countermeasure and settled as a design trend. Minimalism design is suitable for responsive web as it is more effective and convenient to expand with less resource compared to Skeuomorphism.

3. Icon

3-1. Visual Components of Icon

It is essential to consider visual design as icon is for effective information delivery. Particularly, it is essential for application icon of app store to have design which can draw attention of users. In this study, visual components of icon were defined as shape, color, and typography.

3-1-1. Shape

Shape refers to the appearance or form of object. Dictionary definition is "coherent form taken by part or whole structure" (National Institute of Korean Language) and Samara(2009) defined shape as the design element which includes all types of image and characters. Shape is important element that forms sensory experience as it is recognized by visual and tactile sensation. Shape is expressed in various forms. Samara(2009) largely divided the form of expression for shape

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[5] VINYL X, UX 전문가들의 관점에서 바라본 플랫디자인의

장점2013.12.18http://vinylx.blog.me/20201455054

[6] 김성훈, 권동은, above

[7] Responsive web design (RWD) is a web design approach aimed at crafting sites to provide an optimal viewing experience—easy reading and navigation with a minimum of resizing, panning, and scrolling—across a wide range of devices

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as 4 stages of 'realistic-concrete-iconic-abstract' to express spectrum from concrete representational description to abstract expression. Such spectrum is as illustrated in below Fig 3.

Figure 3 Spectrum about realistic-concrete-iconic-abstract

More realistic sensation is presented when the image is close to concreteness and more interpretation is required when it is closed to abstractness. The shape of icon has been changing corresponding to the change in era and it keeps developing. Although significance of difference in recognition corresponding to type of shape may change, there is no change in identity and visual effect of shape itself.

3-1-2. Color

Color presents the biggest effect after shape in aspect of efficiency among cognitive design elements (Geunyeong Yang, 2004). Dictionary definition of color is the trait of visual sensation which can be identified by spectrum wave of light and it has three attributes of color, brightness, and chroma[8]. Jinho Lee and Namsik Lee(2003) suggested that the use of color gives focus on important information, increase the understanding, and increase reliability and attractiveness. Also, it was revealed that color enables more realistic description of object and increases the memory of user compared to black & white. It is essential that color shall be used for easy distinction of icon. It is important to use as small number of colors as possible although there is difference in number of available colors for expression based on system specification. Even when there is limited number of colors available, richness of color can be sensed when taking advantage of difference in brightness and chroma. Color combination gives various color sensation that cannot be presented with just one color thus it assists effective message delivery.

3-1-3. Typography

With the expansion of media, typography come to have much more significance in modern design without dominance of letterpress printing or metal type and it refers to overall design activities relevant to characters that include design of font, readability, etc. In other words, it refers to all design using characters for aesthetic value[9]. Character also is one of visual element and it can induce various message delivery effect with vision.

Looking into the study by Seunggeun Yim(2009) and Yunhee Jung(2013), typography applied to icon is largely divided into two types that are 'application of itself as symbolic image' and 'text information that supplements the image'. CI and BI is the example of such symbolic image. Typography that

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[8] 월간미술, 세계미술용어사전, 월간미술, 1999.

[9] 김일태, 윤기헌, 김병수, 설종훈, 양세혁, 만화애니메이션사전, 한국만화영상진흥원, 2008.

supplements the image enables easy understanding on significance of sentence. In regards to symbol in typographic shape, however, influence of visual aspects including size, height, width, and others of character on message and structure of icon shall be considered. Since size of icon is small, it becomes complicated and may cause confusion in delivering the message when too much typography used thus great skill is necessary for its use.

3-2. Concreteness & Abstractness of Icon

3-2-1. Concreteness

Concreteness refers to specific trait possessed by object or subject. Icon with concreteness describes the feature of object as is and its contour shall be described clearly. Concreteness is presented when describing actually existing object detectable by sensory organs of human being and significance of concreteness lies in existential reproduction of object[10]. Realistic expression based images are self-explanatory. Since icon with concrete shape directly expressed actual object, described subject can be recognized at a glance and easy understanding on function of application is available. However, high degree of concreteness does not lead to effective delivery of information all the time. In regards to same subject, a drawing that depicts the subject may be more effective than realistic photo. Since the increase in concreteness brings about visual complexity, it is very important to pursue balance with simplicity[11]. Excessive visual information gives user unnecessary information and thus lowers the understanding and clouds the judgment. Therefore, user may have difficulty sorting out necessary information. There is necessity for proper information delivery technique which grasps the trait of information to deliver.

3-2-2. Abstractness

Dictionary definition of abstractness is 'a trait that cannot be experienced in reality or concrete'. Abstract object is opposite of concrete object referring to non-concrete and ambiguous object[12]. In general, it is understood as a concept which describes the state deviating from concrete object. It stems from object shape of natural world not conceptualization of object in real world[13]. Shapes of circle, triangle, quadrangle, and others are also a type of abtraction. In art history, it is suggested that abstract art was introduced in the prehistoric age and dolmen shape in the neolithic age, geometric pattern of Egyptian pyramid, and anti-natural stylization are also a type of abstract[14]. When triangle and quadrangle that appear in

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[10] 신석규, 시각기호의 구체성과 추상성에 관한 진화론적 형태변이 논의, 한국디자인문화학회, 15(4), 272-289, 2009.

[11] 이진호, 이남식, graphic user interface, 안그라픽스, 2003.

[12] 김양순, 날염디자인에 있어서 추상적 표현에 관한 연구 : 패턴 디자인을 중심으로, 이화여자대학교 산업미술대학원 석사학위논문, 1991.

[13] 신석규, 위의 글. Above

[14] 김해성, 현대 미술을 보는 눈, 열화당, 1988.

Egyptian pyramid is abstract in its absolute pure shape created from geometrical shape, shell-and-bone characters of China can be referred to as natural abstract considering the fact that it characterized the shape of object.

3-3. Trait of icon design presenting each form of expression

There is a variety of classification standards applied by each researcher and it is also interpreted differently. In this study, classification of icon design was conducted based on stages from concrete shape to abstract shape classified by Samara(2009). The image was primarily classified as 'realistic-concrete-iconic-abstract' for each form of expression and the transformation in each form of expression was classified the second.

Table 1 Examples about expression, Samara(2009)

Realistic	Semi Realistic	Concrete	Semi Concrete	Iconic	Semi Iconic	Abstract

3-3-1. Realistic Icon

Most realistic icon refers to an image of photo itself. Pure photo image is considered as outstanding form of illustration as it presents fast information delivery speed. Due to realism and directness of photo, viewer can understand the contents of image very quickly. Photo image can be considered as manufactured goods as it is always applied of techniques such as decision making on composition of photo, focus, trimming, etc[15]. When using photo image, it is most like to be accepted as 'truth' even though it is manufactured or forged. Realistic icon refers to icon of all images with realistic depiction using photo. Although retouching has conducted to photo image, it can be considered as realistic icon depending on the extent of expression.

Figure 4 Realistic icon

3-3-2 Concrete Icon

It refers to illustration which expresses actual object close to representational depiction. More detailed and concrete depiction presents more realistic sensation thus significance of object itself becomes important. More creative expression is available compared to photo image and means of information transmission and its application also become diverse. Samara(2009) mentioned that strength of illustration lies in delivering visual sensation of emotional, poetic, organic, and

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[15] Samara,T., Design Elements : A Graphic Style Manual : Understanding the Rule and Knowing When to Break Them; 경노훈, 박경숙 역(2009). 디자인언어 그 시각적 원리를 언제 깨뜨릴까, 아트나우, 1999.

primary human nature compared to photo. Also, in regards to concrete icon, non-existing details in reality can be added and focus on movement, texture, arrangement, space, and light is available.

Figure 5 Concrete icon

3-3-3. Iconic Icon

Icon refers to a symbol that is related to the subject and simply presents the trait of certain subject[16]. Iconic expression enables easy recognition and memory of icon with maximum moderation and simple form of depiction. Lidwell, Holden, and Butler(2003) defines iconic icon as similar, illustrative, and symbolic icon. Similar icon is a type of icon that uses visually similar image. There are icons of falling rocks, speed bumps, and others as examples. It depicts same shape as actual object. In regards to illustrative icon, image, behavior, object, and others than can be associated with the subject is used rather than expression of subject as is. In case of airport or restaurant, it is more effective to use image of air plane or tablewares instead of directly expressing the shape of building itself. It is representative case of illustrative icon. Symbolic icon sometimes present abstract concept and it is icon useful in delivering the information related to easily recognizable subject. In regards to the brake of vehicle or lock function of smart phone, lock image which represents the control function is used although it looks different from actual brake. It can be considered as an example of using symbolic icon.

Table 2 Similar, Illustrative, Symbolic icon

Similar icon	Illustrative icon	Symbolic icon

In order to express subject as iconic icon, the most widely recognizable element shall be found. It is to create a new language with unique identity through diverse and distinctive expression rather than imitating lookalike subject.

Figure 6 Iconic icon

3-3-4. Abstract Icon

Abstract icon refers to icon which gives a form to concept that does not exist in reality or image of which its expression deviates from previous form. It corresponds to abovementioned concept of abstractness. The former can be referred to as arbitrary icon in which agreement is made in

abstract form for delivery and acceptance of its meaning[17]. It symbolizes the significance of object by implication. As its source is basic figure for minimalistic expression, its design element takes simple and coherent form and it is often referred to as single color expression in minimalism.

Figure 7 Abstract Icon

4. User survey on application icon design presenting each form of expression
4-1. Subject & Method of Survey

User survey on icon design presenting each form of expression was conducted. User survey was conducted for a month from 2014.04.14 to 05.14 and users with experience of purchasing application from app store among a group of people in their 20's and 30's who use smart phone the most were selected as its subject. Total 44 subjects have participated in the survey. For experiment group, same condition as actual app store was created to present manufactured smart phone prototype and subjects were asked to answer each question. 7 types of icon classified into each form of expression within same category were presented in experiment group and it is icon in each stage associated with spectrum of [Table 1]. To disregard the influence of sequential change in concreteness and abstractness, icons were presented in random order. Education on icon presenting each form of expression was conducted before user survey and direct control of prototype was allowed for the subject. In regards to the item, the evaluation was conducted immediately after viewing the icon. Survey was conducted with division into three parts. First part is composed of 6 questions on preference for icon presenting each form of expression and pattern of significant sequential change and icons of three categories were presented. Second parts is composed of total 80 questions including 20 questions each for independent evaluation of icons presenting 4 forms of expression that are 'realistic icon', 'concrete icon', 'iconic icon', and 'abstract icon'. Each question is about information recognition, preference, curiosity, purchase intention, and memory and response was to be evaluated with Likert 5 point scale. Last, icon of 1 category was presented to extract in depth the element of information recognition, aesthetic satisfaction, effect on selection, and easy memory and each part was composed of 8 questions. Then, the survey was completed upon conducting a brief interview to ask opinion on icons presenting each form of expression.

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[16] 김정희, 모바일기기 앱-아이콘 조형의 커뮤니케이션과 색채와의 상관관계 연구, 한양대학교 박사학위논문, 2012.

[17] 박은애, 아이콘의 유형별 메시지 전달 효과에 관한 연구 -웹 브라우저 아이콘을 중심으로-, 홍익대학교 산업미술대학원 석사학위논문. 2010.
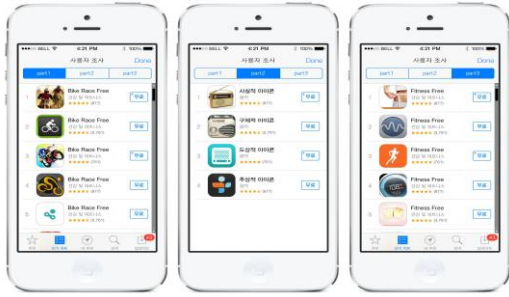
Figure 8 Prototype

4-2. Survey result on preference for icon presenting each form of expression

4-2-1. Experiment Group 1: Bike Icon

In regards to all parts of experiment group, icon that belongs to category with balanced distribution of icon presenting each form of expression was selected. As a result of preference survey on icon presenting first form of expression, bike, dictionary, and sketch icon were selected as the subject of experiment. 7 icons in each stage of expression form were randomly arranged to examine its preference. Multiple numbers of selection were available for preferred icon.

Table 3 Experimental case 1 : Motorcycle icon

1	2	3	4	5	6	7

Table 4 Result of experiment 1

Variable	Expression	Frequency	Percent(%)
5	Abstract	18	37.50%
7	Semi Realistic	12	25.00%
2	Iconic	6	12.50%
4	Semi Iconic	5	10.42%
6	Semi Concrete	4	8.33%
1	Realistic	2	4.17%
3	Concrete	1	2.08%

It was revealed that abstract icon (37.505) presented highest preference among bike icon experiment group followed by semi-realistic icon (25%). 1st and 2nd ranked icons occupied more than half. On the other hand, preference of icon with expression from presenting concreteness was the lowest.

4-2-2. Experiment Group 2: Dictionary Icon

Table 5 Experimental case 1 : Dictionary icon

1	2	3	4	5	6	7

Table 6 Result of experiment 2

Variable	Expression	Frequency	Percent(%)
4	Iconic	21	45.65%
2	Semi Concrete	15	32.61%
6	Concrete	3	6.52%
7	Abstract	3	6.52%
5	Realistic	2	4.35%
1	Semi Realistic	1	2.17%
3	Semi Iconic	1	2.17%

It was revealed that iconic icon (45.65%) presented the highest preference in dictionary icon experiment group followed by semi-concrete icon (32.61%). 1st and 2nd ranked icon in experiment group 2 also occupied more than half. Form of expression presenting the lowest preference was revealed to be semi-realistic (2.17%) and semi-iconic (2.17%).

4-2-3. Experiment Group 3: Sketch Icon

Table 7 Experiment 3 : Sketch icon

1	2	3	4	5	6	7

Table 8 Result of experiment 3

Variable	Expression	Frequency	Percent(%)
1	Abstract	15	28.30%
2	Iconic	11	20.75%
4	Concrete	11	20.75%
5	Semi Iconic	5	9.43%
3	Realistic	4	7.55%
6	Semi Realistic	4	7.55%
7	Semi Concrete	3	5.66%

It was revealed that abstract icon (28.30%) presented the highest preference in sketch icon experiment group followed by iconic and concrete icon. The preference of icon presenting concreteness was revealed to be low in experiment group 3 as well.

4-3. Result on pattern recognition of sequential change

Table 9 Frequency of pattern recognition of sequential change

	Experiment1	Experiment2	Experiment3
Respondents	34	32	33
Percent(%)	77.27%	72.73%	75.00%

Table 10 Total result

Experiment		Realistic-Concrete	Concrete-Iconic	Iconic-Abstract
1	Frequency	13	15	19
	Percent(%)	38.24%	44.12%	55.88%
2	Frequency	9	15	9
	Percent(%)	28.13%	46.88%	28.13%

3	Frequency	10	13	12
	Percent(%)	30.30%	39.39%	36.36%
Average(%)		32.22%	43.46%	40.12%

Experiment on pattern recognition of sequential change was conducted to examine whether or not the subject recognizes classification stage for each form of expression. This study is about concreteness and abstractness thus the degree of recognition on pattern change was verified. Average of 75% of subject responded that they recognized the pattern of sequential change in each experiment group. In order reexamine how accurately subject recognized the pattern, the percentage of correct answers was measured by classifying the section for each form of expression and frequency of subject who accurately recognized sequential pattern of each section was measured. As a result, it was revealed that the recognition rate on change in sequential pattern from concrete icon to iconic icon was the highest presenting the average of 43.46% and it was lowest for change in sequential pattern from realistic icon to concrete icon as subject had difficulty recognizing the boundary between representational depiction and photo.

4-4. Result of independent evaluation on each form of expression

Table 11 Icons for independent evaluation experiment

Realistic icon	Concrete icon	Iconic icon	Abstract icon

Second, as a survey to verify problem of icon presenting each form of expression, experiment group of radio icon was selected as its subject. In case of realistic icon, it has problem of difficulty in understanding the problem as there is no way to figure out its usage when image of very old analog product is used or in case of user without experience in use. In order to examine this aspect, old analog radio icon was selected as experiment group. Concrete icon has problem in that excessive or complicated depiction may lower the understanding. Therefore, icon which depicts more refined and representational image was selected. Iconic icon has problem in that function cannot be recognized with excessive simplicity and it is monotonous in most cases due to influence of iOS7. Therefore, in order to verify the influence exerted by the number of colors, icon of single color with most simple shape of radio was selected and opinion and users was received. In regards to abstract icon, understanding on icon may differ accordingly with previous knowledge on the icon when it is random icon. Therefore, abstract icon of less known brand was selected to conduct experiment.

4-4-1. Information Recognition

Table 12 Result about Information recognition

	Realistic	Concrete	Iconic	Abstract	Avg.
Function recognition	4.43	3.70	2.00	1.11	2.81
Icon distinguish	4.14	3.55	2.25	1.59	2.88
Quick recognition	4.20	3.52	1.98	1.27	2.74
Disorder interpretation	4.07	3.55	2.09	1.27	2.75
Form information	4.39	3.73	2.64	1.50	3.07
Expression	3.98	3.57	2.30	1.18	2.76

As a result of survey, realistic icon presented the highest average value for all 5 items related to information recognition followed by concrete icon. Iconic icon and abstract icon presented value lower than average in 5 items.

4-4-2. Preference

Table 13 Result about preference

	Realistic	Concrete	Iconic	Abstract	Avg.
Preference	2.57	2.89	2.80	2.50	2.69
Likability rise	2.30	2.28	2.70	2.32	2.40
Effect of Form	2.59	2.98	2.98	2.55	2.78
Effect of Color	2.98	2.93	3.07	2.52	2.88

In regards to preference for each form of expression, concrete (2.89) and iconic (2.80) icon presented 1st and 2nd highest average value displaying slight difference. Iconic icon (2.70) also presented the highest average value for increase in favorability due to form of expression and other forms of expression presented similar average value. In regards to preference and increase in favorability, it was suggested that realistic and iconic icon receive more influence by color rather than shape.

4-4-3. Curiosity

Table 14 Result about curiosity

	Realistic	Concrete	Iconic	Abstract	Avg.
Causing Curiosity	2.25	2.77	3.11	3.18	2.83
Needs for detailed info.	2.41	2.59	2.93	2.84	2.69
Effect of form	2.41	2.89	3.25	3.18	2.93
Effect of color	2.18	2.36	2.82	2.66	2.51

In curiosity item, abstract icon (3.18) presented the highest average value followed by iconoic icon (3.11). In regards to desire to examine detailed function, however, it presented the highest average in order of iconic icon (2.93) followed by abstract icon (2.84). As the element that induces the curiosity, shape exerted more influence compared to color in all forms of expression. Particularly, the difference between average value for influence by shape and color was the highest in abstract icon suggesting that it was more influenced by shape compared to other forms of expression.

4-4-4. Purchase Intention

Table 15 Result about purchase intention

	Realistic	Concrete	Iconic	Abstract	Avg.
Intention of	2.34	2.52	2.50	2.25	2.40

purchasing					
Effect of form	2.84	2.84	2.84	2.68	2.80
Effect of color	2.50	2.27	2.61	2.41	2.45

Form of expression with the highest average value of purchase intention was concrete icon (2.52). Realistic (2.34) and abstract (2.25) icon presented value lower than average. In regards to a factor that has influence on purchase, it was more influenced by shape in all forms of expression.

4-4-5. Easy Memory

Table 16 Result about easy memory

	Realistic	Concrete	Iconic	Abstract	Avg.
Ease of memory	3.66	3.18	1.11	2.43	2.6
Effect of form	3.43	3.20	1.50	2.70	2.71
Effect of color	2.52	2.52	1.59	2.59	2.31

In regards to easy memory of icon presenting each form of expression, realistic icon (3.66) presented the highest average value. Iconic icon (1.11) presented the value lower than total average. In regards to easy memory, realistic and concrete icon was more influenced by shape and abstract icon was more influenced by the color.

4-5. Result of in-depth survey on icon presenting each form of expression

Next, fitness icon was selected for experiment group and 7 icons in each stage of expression form were presented with random arrangement. Then, survey to extract in-depth element was conducted. Subject was allowed to select only one icon for each item and multiple numbers of selections were allowed for selection on factors.

Table 17 Experiment : Fitness icon

1	2	3	4	5	6	7

4-5-1. Information Recognition

Form of expression with the most ease in recognizing information of icon was revealed to be realistic (31.82%) and iconic (29.55%) icon. On the other hand, no one selected the abstract icons. Most of subject answered that realistic image (25.45%) and understanding on meaning (23.64%) are factors for easy recognition of information followed by detailed description (16.36%), simple shape (9.095), and simple expression (9.09%).

Table 18 Result about information recognition

Rank	Variable	Expression	Frequency	Percent(%)
1	1	Abstract	14	31.82%
2	2	Iconic	13	29.55%
4	7	Semi Realistic	11	25.00%
5	3	Concrete	4	9.09%
3	4	Semi Concrete	1	2.27%
6	5	Semi Iconic	1	2.27%
7	6	Abstract	0	0.00%

Table 19 Factors of information recognition

Rank	Factors	Frequency	Percent(%)
1	Realistic image	28	25.45%
2	Understanding Implicated meaning	26	23.64%
3	Sophisticated description	18	16.36%
4	Simple shape	10	9.09%
5	Abstract expression	10	9.09%
6	Simple color	9	8.18%
7	Harmony of colors	4	3.64%
8	3 dimensional expression	3	2.73%
9	Simple expression	1	0.91%
9	Etc	1	0.91%

4-5-2. Aesthetic Satisfaction

Table 20 Result of Aesthetic satisfaction

Rank	Variable	Expression	Frequency	Percent(%)
1	2	Iconic	12	27.27%
2	6	Abstract	11	25.00%
4	1	Realistic	9	20.45%
5	4	Semi Concrete	5	11.36%
3	5	Semi Iconic	4	9.09%
6	3	Concrete	2	4.55%
7	7	Semi Realistic	1	2.27%

Table 21 Factors of Aesthetic Satisfaction

Rank	Factors	Frequency	Percent(%)
1	Simple shape	26	23.01%
2	Simple expression	20	17.70%
3	Understanding Implicated meaning	19	16.81%
4	Simple color	17	15.04%
5	Harmony of colors	8	7.08%
6	Realistic image	7	6.19%
7	Abstract expression	6	5.31%
8	Sophisticated description	4	3.54%
9	3 dimensional expression	2	1.77%
9	Simple expression	2	1.77%
9	Various colors	2	1.77%

Form of expression with the highest aesthetic satisfaction was presented to be iconic (27.27%) and abstract (25.00%) icon. On the other hand, preference of semi-realistic (2.27%) and concrete (4.55%) icon was low. This displays same result as the abovementioned preference survey of first part. Simple

shape (23.01%), simple expression (17.70%), understanding on meaning (16.81%), and simple color (15.04%) were extracted as the factor of aesthetic satisfaction.

4-5-3. Influence on Selection (curiosity)

Table 22 Result of influence of selection

Rank	Variable	Expression	Frequency	Percent(%)
1	6	Abstract	25	56.82%
2	3	Concrete	6	13.64%
4	5	Semi Iconic	5	11.36%
5	2	Iconic	4	9.09%
3	1	Realistic	2	4.55%
6	4	Semi Concrete	1	2.27%
7	7	Semi Realistic	1	2.27%

Table 23 Factors of influence on selection

Rank	Factors	Frequency	Percent(%)
1	Abstract expression	24	26.09%
2	Simple expression	16	17.39%
3	Simple shape	14	15.22%
4	Understanding Implicated meaning	12	13.04%
5	Simple color	10	10.87%
6	Sophisticated description	6	6.52%
7	Realistic image	5	5.43%
8	Etc	2	2.17%
9	3 dimensional expression	1	1.09%

As a form of expression which have influence on selection by inducing curiosity, abstract icon (56.82%) presented overwhelming occupancy of over 50%. Abstractness (26.09%), simple expression (17.39%), and simple shape (15.22%) were revealed to be the factor that induces the curiosity followed by understanding on meaning (13.14%) and simple color (10.87%) presenting slight margin.

4-5-4. Easy Memory

Table 24 Result of easy memory

Rank	Variable	Expression	Frequency	Percent(%)
1	2	Iconic	16	36.36%
2	1	Realistic	10	22.73%
4	7	Semi Realistic	7	15.91%
5	6	Abstract	5	11.36%
3	4	Semi Concrete	3	6.82%
6	3	Concrete	2	4.55%
7	5	Semi Iconic	1	2.27%

Table 25 Factors of easy memory

Rank	Factors	Frequency	Percent(%)
1	Realistic image	21	19.63%
2	Understanding Implicated meaning	17	15.89%
3	Simple shape	16	14.95%
4	Simple color	15	14.02%
5	Simple expression	14	13.08%
6	Sophisticated description	13	12.15%
7	3 dimensional expression	4	3.74%
8	Abstract expression	2	1.87%
8	Harmony of colors	2	1.87%
8	etc	2	1.87%

Iconic icon (36.36%) was revealed to be the easiest form of expression to remember followed by realistic (22.73%) and semi-realistic (15.91%) icon. Realistic image (19.63%), understanding on meaning (15.89%), simple shape (14.95%), and simple color (15.89%) were presented to be factor that enables easy memory. It is estimated that the subject chose realistic image as the factor since iconic image is also a form based on reality.

4-6. Rank for General Preference of Experiment Group

Table 26 Total rank from all experiments

Rank	Expression	Avg.rank
1	Abstract	1.7
2	Iconic	2.0
3	Concrete	4.0
4	Semi Realistic	4.3
5	Semi Concrete	4.7
6	Semi Iconic	4.7
7	Realistic	5.3

Rank value acquired through preference survey of all experiment groups was summed up to extract average rank. Icon with the highest preference was revealed to be abstract icon followed by iconic icon. Form of expression for 1st and 2nd rank icon presented relatively high average compared to other forms of expression presenting huge difference. On the other hand, icon with the lowest preference was revealed to be realistic icon.

4-7. Result of Interview

In regards to realistic icon, it was evaluated to be convenient in information delivery as it enables quick understanding on function of application. However, it was evaluated to lack aesthetics. It was suggested that expectation toward application is lowered due to dull design. There were multiple responses that it would be suitable for application with professional function with sole purpose of information delivery without pursuit of fun.

In regards to concrete icon, the response that it enables easy understanding on function of application also occupied more than half and it was evaluated to be more aesthetic compared to realistic icon. Although detailed description increased the expectation toward function of application, it was suggested

that excessive description and shape brings about confusion in identifying the icon hence makes it unfavorable. In addition, 9.09% of subject responded that trend had influence on the preference.

In regards to iconic icon, it was considered as most appropriate form of expression to express icon which enable easy recognition. However, it was suggested that unclear expression of shape may lower the understanding. It was revealed to be most aesthetic and receive influence of color the most. Its preference differed accordingly with the color and it seemed to indicate the trait of application as well.

In regards to abstract icon, many suggested that it is difficult to understand as it presents high degree of implication. The necessity for hint to recognize information was pointed out since there is no factor to recognize information of application. However, it was evaluated to be aesthetically pleasing and induce curiosity.

4-8. Analysis on Result

Consideration on subject of inquiry was conducted by integrating the result of user survey and the result is as illustrated below.

First, there was difference in preference based on concreteness and abstractness of icon design. Iconic and abstract icon presented the highest preference among icons presenting each form of expression and it was revealed that icon presenting abstractness is more preferred in comparison with icon presenting concreteness. Factor of aesthetic satisfaction was revealed to be simple shape and simple expression. However, not all icons with simple shape were preferred but just those which deliver the information presented by the icon. Preference of abstract icon was lower in case of unclear information delivery. Even though it takes abstract shape, it shall be recognizable to certain degree. Therefore, metaphor selection of shape is considered to be important. Metaphor shall have close relation with function of application or information for delivery. In other words, external features of object shall be utilized as a metaphor and it shall be general object that anyone can understand with ease. Average number of colors for icon with high preference was presented to 2.9. It is determined that small number of colors enables clearer and more concise understanding and such understanding leads to preference. It is recommended to use less than 3 colors. Concrete icon presented lower preference compared to abstract icon. Representational image was more preferred compared to photo image and excessively precise depiction of shape was less preferred compared to depiction in level of semi-concrete icon. Reason for low preference of concrete icon lied in the fact that it could not be distinguished from photo due to detailed depiction. It was determined that trend has small influence on preference as only 9.09% of subject responded that the trend had influence on the preference.

Second, there was difference in information recognition based on concreteness and abstractness of icon design. Form of expression with the easiest and fastest recognition of function was presented to be realistic icon and concrete icon also present high rate of information recognition. Recognition of function was easy regardless of fact that it is analog or old object and excessive details and expression did not hinder the information recognition. However, it was revealed that there is huge difference in information recognition of iconic icon based on its shape. Although it presented the highest rate of information recognition, it also hindered easy recognition of information regardless of the fact that exterior of shape was expressed with simplicity. As it was aforementioned in survey result, information recognition of iconic icon is closely related to preference thus selection of metaphor is important. It is important to find metaphor with proper shape that clearly and concisely expresses the trait of object or information to deliver rather than just simplify the shape as is. Also, iconic icon was revealed to receive great influence by color due to simplicity of its shape. Association by color occurs based on symbolized perception and it has considerable amount of influence on recognition of application. On the other hand, abstract icon presented the lowest rate of information recognition and considered to be unsuitable for information delivery. Delivery of meaning is most important for easy and fast information recognition and original shape of object shall be maintained for delivery of clear meaning. In other words, external feature of object shall be utilized as metaphor as abovementioned in preference and it shall take very realistic shape or present simple expression of function trait.

Third, abstractness of icon design was determined to induce curiosity. Also, simple shape and expression were also determined to induce curiosity other than abstract expression. It was more influenced by shape compared to color.

Fourth, there was difference in memory based on concreteness and abstractness of icon design. Icon with detailed or realistic depiction enabled easy memory. Also, clear recognition on application information enabled easy memory. In case of iconic icon presenting simple shape, the result presented clear difference based on information recognition. Therefore, it is determined that representational depiction similar with actual object is necessary for easy memory.

Fifth, the concreteness and abstractness of icon design did not have influence on purchase. Purchase of icon was conducted with clear recognition on function of application regardless of concreteness and abstractness of icon design. In case of abstract and iconic icon with high preference, purchase intention was the lowest for icons with difficulty to recognize the meaning of its shape. It was determined that concreteness and abstractness do not have direct influence on purchase although it may induce people to examine detailed information.

5. Conclusion

More attention is being paid to GUI with the wide spread of smart phone and its function. Also, term called interface became common. As a component of GUI, icon is a means to assist effective visual communication in digital media and express the identity of application thus it has become more important. Under such circumstances, there has been a change in feature of GUI. Design innovation was conducted with change from Skeuomorphism with concrete shape to minimalism with abstract shape. However, verification on which is more effective visual communication between

Skeuomorphism and minimalism has not been conducted yet and there also is a lack of study on it. Therefore, the purpose of this study lied in verifying the influence of concreteness and abstractness of icon on user by dividing the degree of icon's concreteness and abstractness and classifying it into 'realistic-concrete-iconic-abstract' for each form of expression and conducting the user survey on 5 criteria of information recognition, preference, curiosity, purchase intention, and easy memory based on hierarchy model of advertisement as empirical study.

As a result of analysis, the preference of iconic icon was presented to be the highest and the preference was high for icon which clearly delivers its meaning. It illustrates the important of metaphor selection and external shape of object as is shall be utilized as metaphor. There was almost no influence by trend. Simple shape and expression were extracted as the factor of aesthetic satisfaction. It was determined that concrete shape enables the fastest recognition of function and maintenance of original shape of object enables easy information recognition. Also, it was verified that abstractness induces the curiosity. It suggested that concrete shape of icon bring about easy memory. Last, the concreteness and abstractness of shape did not have effect on purchase.

The significance of this study lies in the fact that literature review on icon design, a current issue, was conducted and influence of concreteness and abstractness on user was verified with 5 items. However, there lies limitation in generalization of result as subject of restricted to people in their 20's and 30's and evaluation on image was conducted with application of certain category only. Also, user survey was conducted disregarding the function of icon or other external factors. It is regrettable that specific visual factor could not be extracted based on survey result as the study was conducted to the extent of comparing and examining the concreteness and abstractness. Follow-up study shall be conducted to extract clear visual factors. Continuous research is necessary as classification standard may become ambiguous or new type of icon may be introduced in the future. Follow-up study that supplements abovementioned limitations shall be conducted and I expect that this study will be utilized as basic data at initial stage of research on icon design.

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