

An Investigation of Attachment Factors to Digital Product

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Abstract: Modern innovation technology is shifting toward human-oriented technology structure combining technology and emotion. In this context to optimize user experience from user's perspective, it is necessary to understand consumer's usage experience and interaction between users and products in specific contexts. This study explores consumer's product usage experience and interaction with product to identify what kind of values consumers seek. By doing so, this study aims to identify how to structure a product and system to form emotional bond and attachment relations. Specifically, this study seeks to identify how users feel while interacting with products and which values they regard importantly in the experience of product. In doing so this research present an alternative to design new products and systems supportive of developing more emotionally cherished digital products. In the study, the researchers have conducted interactive elements analysis through FGD. Of the user-product interaction factors collected via the survey, interaction services common in diverse brand products were extracted and classified. Then qualitative survey was conducted in order to analyze the effect interaction elements on the attachment. To evaluate the predictive power of the independent variables (satisfaction for four interactive factors: function*person, function*system, emotion*person, emotion*system) on the dependent variable of attachments (attachment, possessive attachment and experiential attachment) a multiple regression analysis was performed. Finally, IPA (importance-performance analysis) was performed to find out which service experience needs to have an improved. Attachment is an essential factor for sustainable product. Designing and developing interaction experience enhance not only the practical value of a product but also its emotional value to form a relationship of attachment. Also, positive interaction is expected to improve product values, generate the sense of attachment to the product and expand product lifespan to improve the quality of user-product relationship. Therefore, it is essential to form products and design systems based on the understanding of the relationship between product and consumer which is formed based on the interaction with product and consumer usage experience during their possession of the product. Products should be designed to give positive and pleasant usage experiences to consumers and facilitate interaction with them in order to build consensus with user, let them attach special meaning to it and form a relationship of attachment.

Key words: Attachment, consumer value, emotional bond, human-oriented technology, user-product interaction

INTRODUCTION

People use diverse digital products in their daily lives and majority of digital products are gradually replacing physical goods. Now, digital products not only provide indispensable functions in people's everyday life but also play a key role, just as physical goods in helping them recall memories, represent their own identity and form social relationships (Kirk and Sellen, 2010).

Nevertheless, we normally find it hard to regard digital products as precious as physical goods (Golsteijn *et al.*, 2012). In many studies comparing physical goods and digital goods to find out which of them people valued more precious (Jung *et al.*, 2011;

Kirk and Sellen, 2010; Daniela and Whittaker, 2010) without exception most of the respondents found it hard to tell which digital products they valued more than physical products. Actual users however, have an attachment to digital products too and such an attachment equally works on digital product and physical product (Phil *et al.*, 2008, 2013). In other words, just like people form an attachment for their teddy bears or baseball cards, they value their smart phones or laptops precious and try to keep them carefully. As such, although multiple existing studies have proven that digital products too, invite an attachment in the relationship with consumers (William and Pierce, 2009; Daniel *et al.*, 2009; Binaebi and Bardzell, 2010; Alexander,

2009; Jung *et al.*, 2011), users tend not to perceive own attachment to digital products. It is mainly because digital products do not form an attachment in the same way as that by physical products.

Unlike analogue products to which people form an attachment by using all of their 5 senses via interaction to build emotional connections, digital products can hardly give people any emotional experience. Also, digital products easily become outdated with new technology development so relationships are easily disconnected, making it hard for users to give any special meaning thereupon. Such characteristics of digital products make users feel distanced. Consequentially, unlike analogue products, people do not regard digital products as something they should cherish and keep for a long time carefully, experiencing disturbance in emotional connection.

It is not that every product, we use is equally important to customers. Some are kept for a while and easily abandoned while some others are too important for us to be replaced by anything else even after their lifespan (Golsteijn *et al.*, 2012). The longer the pleasant and positive mutual relationships with users, the larger the product usability and significance become. And the relationship of attachment between user and product formed based on emotional bond makes a user actively try to find a way to maintain the relationships continuously. Also, such a product can have a symbolic value to represent the user's identity through the interaction and ties with the user. In this way, the product value rises more than the function in itself (Mugge *et al.*, 2006c). However, products without such a relationship of attachment with users soon lose their value because of user indifference and careless use. Even before they fulfill their actual effectiveness such products lose off their value and are easily abandoned (Jonathan, 2005).

Literature review

Consumer-product attachment: Hendrik and Desmet (2008) defined the attachment between consumer and product as the emotional bond felt by consumer on a product and established by product usage experience. The definition implies the existence of emotional relation between user and object. Kagan *et al.* (1978) explained that attachment was an intensive emotional link between two subjects and became permanent with time and the isolation of such a relation accompanied stress and sadness.

A strong attachment is associated with intensive feelings such as connection, affection, love and passion (Mugg *et al.*, 2010b; Schultz and Baker, 2004). In fact, people most frequently feel love toward their possessions with attachment (Schultz *et al.*, 1989; Phil *et al.*, 2013). Therefore, attachment toward product is different from

satisfaction. Satisfaction is largely affected by product appearances and functions (Mano and Oliver, 1993) but attachment is formed by the emotion felt by users in the interaction process with a product and pleasure felt by users as a result of usage experience (Mugg *et al.*, 2010). In other words, users may be satisfied with excellent product function and performance itself or the effectiveness therefrom but they do not form an attachment. Attachment is built only through special or amusing usage experience in not temporary but continued relationship. This indicates that while satisfaction is formed based on the evaluation judgment on product performances (Mano and Oliver, 1993), product attachment is an emotional bond generated as a product becomes special for a customer (Wallendorf and Arnould, 1988). A user may feel satisfied with a product with average level of performances as expected. But the user does not develop any emotional bond since such a usage experience does not provide any special pleasure or amazing experience. Attachment can be formed only by meaningful usage experience and relationship with the product. Thus, attachment can be viewed as a result of user-product interaction and is formed with time (Kumar and Grisaffe, 2004).

Attachment toward a product is generally related to the desire to maintain a relationship or try to use a specific subject or product variants on the continued basis. Since, attachment brings users a desire to maintain a relationship and to avoid of negative feelings caused by relationship disconnection with a subject, it triggers relationship protective acts (John *et al.*, 1992; Mugge *et al.*, 2005a). In this sense, the intensity of attachment can be assessed based on the propensity not to sell own product even at a proper compensation (price) or propensity not to abandon a product even after its lifespan (Belk, 1991).

Moreover, customers tend to decide to replace such a product with a new product in the same brand based on their feeling about the existing product and experience of interaction with it (Dodds and Monroe, 1985). If a digital product has come to be related to a user's memories and own identity such a product forms an emotional attachment relation just like a physical product (Jung *et al.*, 2011). When it comes to the hardware, attachment works to make a user try not to throw it away and keep it constantly. When it comes to the software, attachment works as a key variable in product replacement to make a user choose a new product in the same brand.

Possession attachment and experiential attachment: Verbeek (2005) divided attachment into the attachment toward a product itself and attachment toward what the product provides. Attachment of possession is formed as a user owns a product with special significance. It means a status where a person tries to continue to keep a

product or object having a special meaning to himself or herself such as a generational family heritage, special object exchanged for friendship with a close friend, gift with a special meaning or own elaborate craft. Therefore, attachment is defined as the disposition to continue to hold the right or control of one's own possessions. In most cases the attachment of possession is related to common everyday goods or products but for their symbolic significance they have a matchless position. However, when the factor that formed the attachment disappears so does the relationship with the product (Wallendorf and Arnould, 1988). On the other hand, attachment of experience is developed when people pursue a specific act repeatedly such as stamp or coin collection or motor show participation. In this case attachment is formed by relevant product-oriented experience (Baldwin *et al.*, 1996). That is, the attachment of experience is formed as a result of a specific behavior represented by the object and specific interaction with the product (John *et al.*, 1992; Csikszentmihalyi and Halton, 1981; Kleine *et al.*, 1995). Therefore, the attachment of experience toward a product indicates that emotional connection is established when a person keeps interaction with a specific product to continue to do the specific personally important behaviors or when a person accumulates rich experiences of personal importance by using the specific product. Since unique experience becomes one's own personal story, owning and using a product representing his or her special experience is a key factor for one's identity and self-expression.

The product symbolizing family tradition, long-accumulated social honor and position expresses the sense of belonging and social status. Collections, travel souvenirs or goods bought in a flea market during travel represent one's past experiences and owning them means to own symbolic evidence. Such a symbolic value and proof of past experience in owning such goods induces personal and mental association to make people feel it important to own such a product itself. Usually, people form an attachment toward their personally special products. And the attached products are generally viewed as very special and important. Thus, the symbolic meaning of these products is connected to attachment and the more the memories associated with the product, the more positive the effect on attachment. So, the attachment of possession increases with time (Mugge *et al.*, 2006).

Moreover, attachment has a social value as an attachment to a product associated with one's precious experience helps the person share the experience with others and pursue exchanges (Arnould and Price, 1993; Celsi *et al.*, 1993; Dwayne and Tasaki, 1992; Schouten and McAlexander, 1995). For instance, sky divers would take extra care of goods such as color coordinated parachute gear used for a specific set of experiences. And if sky

Table 1: The differences of possession attachment and experiential attachment

Classification	Possession attachment	Experiential attachment
Description	Attachment toward a product itself	Attachment toward what the product provides
Cause	Importance of ownership	OSL (Optimal Stimulus level)
Affect	Positive emotion	Hedonic consumption (fantasies, feelings, fun)
Strengthening factor	Represent past experience	Flow experience
Role	Self-extension	Self-expression
Consequence	Engagement	Know-how

divers identify others by the jumpsuits they wear, the jumpsuits have a social meaning of self-representation (Celsi *et al.*, 1993). But most of all the attachment of experience is formed based on the hedonic value. Multisensory, fantasies and fun experiences encourage people to seek hedonic values repeatedly and this continued interaction adds more significance to the corresponding product (Mugge *et al.*, 2010). However, when people seek such an experience less they use the relevant products less often as well possibly disconnecting the attachment relation with the products. Therefore, for constant interaction with product, it is necessary to maintain OSL continuously to reinforce product-related good memories (Table 1).

Consumer value: Consumers make a purchase decision after reviewing whether a product is worth buying, whether they can enjoy a specific value by buying the product or service and whether the price is reasonable for the value. Therefore, consumer value creation is not only a key factor for business success (Porter, 1985; Slater, 1997) but also a prerequisite to create and maintain a competitive advantage (Wang *et al.*, 2004; Gale and Wood, 1994) explained that business can succeed by providing excellent consumer value and therefore companies try to deliver the best customer value to gain a competitive edge (Woodruff, 1997). Especially in innovative technology development and its accompanied new product designing (Mizik and Jacobson, 2003; Spiteri and Dion, 2004), consumer value creation is regarded as a key product development strategy while being utilized as a factor to develop customer loyalty and long-term relationships.

In traditional study on value, consumer value was defined from the benefit-cost perspective (Kumar and Grisafe, 2004; Roig *et al.*, 2006; Gounaris *et al.*, 2007). The benefit-cost model defines value based on the gap between benefit that consumer expected and sacrifice taken to get it. Value includes a product's tangible/intangible attributes, evaluation on such attributes and the process of gain the benefit. In this perspective, Woodruff (1997) defines consumer value as

consumer's perceived preference and evaluation on product attributes, performance of attributes, fulfillment of purpose of product use and ease of product use. More generation from the benefit-cost perspective, consumer value is defined as the evaluation of what the customers gain (benefits, quality, worth, utility) from a product against what they pay (price, costs, sacrifices) to buy and use the product (Gale and Wood, 1994; Zeithaml, 1988).

However, the consumer value of digital product is not created by any product attribute itself or benefit at the purchasing point. Although, a new camera with new technology is released to the market, it is not that these cameras include any value. Only consumers can realize its values by installing corresponding programs, setting the device according to their needs and using it for their own satisfaction. From this perspective, product quality and consumer value are mutually different ideas (Bolton and Drew, 1991; Day and Crask, 2000; Dodds and Monroe, 1985; Monroe and Krishnan, 1985). Consumer value is not realized as a consumer buys a product but as the consumer utilizes it while feeling about its value and multiple emotions. Therefore, product value is defined as what a customer perceives while using the product (Woodruff, 1997) and interaction experience relatively preferred (Holbrook, 1999, 2005).

The value perceived by a consumer while using a product includes the values felt by the consumer throughout the whole consumption period. So, consumer value changes dynamically according to not only the product or service itself but also the time, place and purpose of use (Parasuraman and Grewal, 2000; Roig *et al.*, 2009; Roland and Oliver, 1993; Zeithaml, 1988). While using a product, its value felt by a customer may disappear during a specific period. Or on the other hand, a new value may be created as well. New products with advanced technology may deliver value instantly at the moment of its purchase and use by a consumer whereas products with memory and nostalgia can have a special symbolic meaning with the time of possession.

As such consumer value is formed by consumer product (user-object) interaction. Depending upon user and purpose of use and situation of use, different values can be preferred and these preferred values can be mutually compared.

MATERIALS AND METHODS

Stimulus product: Other products, product category or the individual use shows different type of attachment (Mugge *et al.*, 2006). It is possible that each other affections are working in the form of developments. In that reason we chose a smartphone for the study in order

to minimize the experience variation. Attachment is closely related to the availability and physical proximity (Phil and Sobolewska, 2009). In other words, frequent interactions product such as an electronic clock or laptops is physically or psychologically rather than TV and games consoles and the former is more likely than the latter to make attachment. Moreover, Smartphones are usually located near at hand or in hand with the switch on and are more frequently used than any other devices. Besides, they are also used as camera and MP3 player and for access to the internet and e-mail; they involve diverse interactions. Therefore, smartphones are among the most suitable products for researching patina as they are the devices with the most abundant accumulated trace from use.

Research design: First of all to explore the smart phone-related interaction behavior, frequency of use and importance/satisfaction of them, the FGD was implemented in this study. According to smart phone brands, different services are provided thus, the ratio of users of each brand was arranged mutually similar (Samsung: 3 persons, Apple: 2 persons, LG: 3 persons, Pantech: 1 person). Subjects were selected among the members with loyalty to each brand. The respondents were requested to list personally significant and important interaction services (instead of the services provided by applications) by focusing on the service of the product itself. And they explained the interaction, experience and their behavior.

Of all interaction services collected and identified through FGD we selected common interaction services provided by every kind of smart phones. A survey was implemented on the selected services to investigate their importance-satisfaction, attachment, emotion on service experience and value provided by such services. Survey data from 285 respondents were collected for qualitative research. As in the FGD, the number of survey respondent was arranged similarly among each brand and the male and female ratio was adjusted equally.

All items of each variable were operationally defined for the empirical analysis and then self-report questionnaire were developed based on that. The survey was conducted in order to analyze the effect interaction elements on the attachment. To evaluate the predictive power of the independent variables (satisfaction for four interactive factors: function*person, function*system, emotion*person, emotion*system) on the dependent variable of attachments (attachment, possessive attachment and experiential attachment) a multiple regression analysis was performed. All survey items were adjusted for the purpose of study on the basis of the

Table 2: Interactive factors classification

Factor 1: function*person	Factor 2: function*system
I can adjust the arrangement of background icons or group them	The product automatically arranges last-used applications in order
I can set frequently-used apps as quick button for faster access	The product analyzes my texting patterns and show frequently used words
If I enter my schedule, the product alerts me through a message	If I plug in the earphones, the product automatically adjusts the volume to the previous decibel
Factor 3: emotion*person	Factor 4: emotion*system
I can change the smartphone wallpapers to the pictures or photos I want	The product has several application icons looking like the shapes of actually used goods such as note or radio
I can change application icons or folder designs	The product provides services through which I can log my daily activities such as daily schedule or exercise duration
The product has a photo editing function or story insertion function and photo sharing function	The product provides a conversation function such as Siri or S voice

scales that were used in previous researches. This research was conducted through online pay survey site with professional research company and we used statistical package program SPSS 18.0 for analysis.

Research analysis

FGD analysis: We conducted interactive elements analysis through FGD. Of the user-product interaction factors collected via the survey, interaction services common in diverse brand products were extracted and classified. When requested to explain their interaction with the products, users classified interactions by focusing on what kind of benefits they could gain from the services provided by the products. That is they explained interaction factors by classifying them based on the empirical criteria of cognitive aspects such as usefulness and usability and emotional aspects such as aesthetic value and enjoyment. They also explained what kinds of behaviors they pursued in order to acquire and maintain such benefits. It is deemed that user's interaction activities are divided into active participating behaviors and passive receptive behaviors. In other words in some cases users actively participate such as changing the smartphone wallpaper designs in line with their taste or downloading and installing applications for their own purposes of use. On the other hand, in some other cases, users did not intend active interaction but the product itself provided interactive services such as the auto phrase completion function or auto arrangement of last used applications.

In this sense, the smartphone-user interaction behavioral types can be classified according to interaction purpose and participation degree as in Table 2. One of them is the cases where users engage in active participation in product adjustment and alteration to meet their own taste while granting the product playful/symbolic significance. And the other is the cases where the products provide optimal customized system

Table 3: Breakdown of respondents

Categories/Range	Frequency	Percentage
Gender		
Male	145	50.9
Female	140	49.1
Age		
10	12	4.2
20's	139	48.8
30's	68	23.9
40's+	66	23.2
Smartphone brand currently in use		
Samsung	122	42.8
Apple	98	34.4
LG	52	18.2
Pantech	11	3.9
Etc	2	0.7
Reason of selection smartphones currently in use		
Ease of use	90	31.6
Excellence in quality	54	18.9
Brand image	47	16.5
Originality of design	34	11.9
Discriminatory performance	25	8.8
Many people use	15	5.3
Smartphone brandusing the longest period		
Samsung	145	50.9
Apple	65	22.8
LG	50	17.6
Pantech	18	6.3
Motorola	2	0.7
Blackberry	1	0.4
Etc	2	0.7

functions by patternizing user experiences or provide sensible fun and pleasure in interaction with users to reinforce the experience of amusement.

Survey analysis: Overall, 285 responses returned to us completed and usable questionnaires. Demographic configuration of the respondent used in this study are as shown in Table 3. The demographic characteristics of the respondents are: 50.9% males and 49.1% females; mean age is 31 years. Smartphone brands in the most widely used are Samsung, Apple, LG, Pantech in order and smartphone brands using the longest had similar order, Samsung, Apple, LG, Pantech, Motorola and Blackberry. The main reasons of selection smartphones currently in use were ease of use, excellence in quality and brand image in sequence.

The results from the correlation analysis show that attachment and interaction elements are positively correlated. All four dimensions of Interactions are positively correlated with attachment, possessive attachment and experiential attachment. All types of interactions are as expected, highly intercorrelated (Table 4).

The reliability analyses of all variables entered into the calculations show that the Cronbach's a coefficient are satisfactory for all variables and constructs (Table 5).

Table 4: Correlation analysis

Dimensions	Attachment	Satis. in factor 1	Satis. in factor 2	Satis. in factor 3	Satis. in factor 4
Attachment	1.000				
Satisfaction in factor 1: function*person	0.300	1.000			
Satisfaction in factor 2: function*system	0.345	0.509	1.000		
Satisfaction in factor 3: emotion*person	0.363	0.474	0.536	1.000	
Satisfaction in factor 4: emotion*system	0.314	0.344	0.484	0.444	1.000
Possessive attachment	1.000				
Satisfaction in factor1: function*person	0.254	1.000			
Satisfaction in factor 2: function*system	0.301	0.509	1.000		
Satisfaction in factor 3: emotion*person	0.301	0.474	0.536	1.000	
Satisfaction in factor 4: emotion*system	0.234	0.344	0.484	0.444	1.000
Experiential attachment	1.000				
Satisfaction in factor 1: function*person	0.298	1.000			
Satisfaction in factor 2: function*system	0.322	0.509	1.000		
Satisfaction in factor 3: emotion*person	0.374	0.474	0.536	1.000	
Satisfaction in factor 4: emotion*system	0.347	0.344	0.484	0.444	1.000

Table 5: Descriptive and reliability analysis

Satisfactory	Cronbach's		
	alpha	Mean	SD
Attachment	0.82	4.62	1.02
Possessive attachment	0.72	4.42	1.19
Experiential attachment	0.72	4.71	1.11
Satisfaction in Factor 1: function*person	0.71	5.31	1.33
Satisfaction in Factor 2: function*system	0.74	5.05	1.36
Satisfaction in Factor 3: emotion*person	0.87	5.24	1.39
Satisfaction in Factor 4: emotion*system	0.88	4.81	1.55

RESULTS AND DISCUSSION

Satisfaction and attachment: The survey investigated how the satisfaction with each interaction factor affected attachment and how much positive interaction contributed to form user's tie with product. As a result, differences were found in the influence of satisfaction with each interaction experience on attachment formation. Differences were also found in its effect on the formation of attachment in different dimensions (Table 5).

Regarding the general attachment, influence related to P3 (emotion*person) was found the strongest in attachment formation followed by P2 (function*system) and P4 (emotion*system). That is active interaction showed the largest effect on attachment formation such as user's adjustment of partial smartphone settings or saving their memos, diaries, photos, etc., in their smartphones. Users change the default main images provided generally by the manufacturers or ordinary photos to those satisfying their personality and usage purpose by adding own rich stories in the process, they transform the product in line with their own taste and usage purpose. And while using the product (or in such a manner), it is estimated that they increase their psychological attachment to the product re-created by themselves.

On the other hand, P1 (function*person) showed no significant effect on attachment formation. Users adjust

application arrangement or set quick buttons to improve their convenience of product use and participate in interaction with product to utilize the 'push' function that alerts their schedule. As a result, users come to realize an optimized service functional configuration for themselves. Such intended and active usage behaviors of users induce user-centered service provision by the products, contributing to enhanced product performance and convenience. However, user's satisfaction with usability, convenience and functional performance may work favorably to positive product evaluation but it seems not to promote specific emotion, thus failing to form attachment.

Specifically, regarding the attachment of possession and attachment of experience, the former was found to have been affected the most by P2 (function*system) followed by P3 (emotion*person) and the latter by P3 (emotion*person) and P4 (emotion*system) in order. It is deemed that users regard customized services as individual expansions which are provided by the products after analyzing the repeated patterns of user's product use. And since such a product represent a user's unique pattern of device use a symbolic value is added to the product and the product becomes the user's another self to form attachment. In other words as for the service for example, that analyzes a user's texting patterns and shows frequently-used phrases, users are deemed to feel similarity and familiarity to the profound customer-tailored service that remembers their own way of speaking while increasing the sense of ownership. The case of P3 (emotion*person) showed strong influence in both the attachment of possession and attachment of experience and especially stronger influence in the formation of the latter. They change the default main image to their own photos or images with good memory or personal importance. Or they edit and save memos, photos,

Table 6: Regression analysis on attachment

Attachment	B	β	t-values
Satisfaction in factor 3: emotion*person	0.156	0.213	3.221*
Satisfaction in factor 2: function*system	0.121	0.163	2.400*
Satisfaction in factor 4: emotion*system	0.092	0.140	2.197**
R ²		0.177	
Adjusted R ²		0.169	
Possessive			
Satisfaction in factor 2: function*system	0.172	0.196	2.962*
Satisfaction in factor 3: emotion*person	0.169	0.196	2.956*
R ²		0.212	
Adjusted R ²		0.181	
Experiential			
Satisfaction in factor 3: emotion*person	0.160	0.213	3.274*
Satisfaction in factor 4: emotion*system	0.140	0.208	3.413*
Satisfaction in factor 1: function*person	0.096	0.123	1.977**
R ²		0.185	
Adjusted R ²		0.177	

etc. Such behaviors not only have a symbolic value representing a specific event or memory but also deliver their own story and prove their past experience. In this manner such behaviors deliver the kind of intimacy that has been maintained for a long time in the most humane and emotional manner (attachment of possession).

Moreover, to store one's memories is to record the person's individual record of transformation during the long period of growth from the past to present. Doing so enables users to leave their traces of life beyond the structural limitation of physical space. In this mechanism, the products become the rich source of user's personal stories. These behaviors seem to work the same way as the acts of collecting all of the photos and arranging them in a photo album; pulling up an album to recall the past or collecting precious childhood goods in the box of memories; contributing to attachment formation.

Lastly, P4 (emotion*system) is an interaction factor connecting user's offline lifestyle with online lifestyle or analogue elements with digital forms. It provides a more improved way of interaction than the original product functions as the more the users use smartphones, the more the smartphones accumulate their usage patterns, remember their own individual usage patterns and individualize functions to provide enhanced ways of interaction. In this relationship improved based on such accumulation, the attachment of experience is formed to become more willing to continue the interaction and strengthen personal significance of the product (Table 6).

IPA analysis: In order to develop services encouraging a stronger attachment, it is necessary to find out which service experience needs to have an improved performance first. To this end, IPA was performed in this study. IPA is an evaluation technique that assesses the

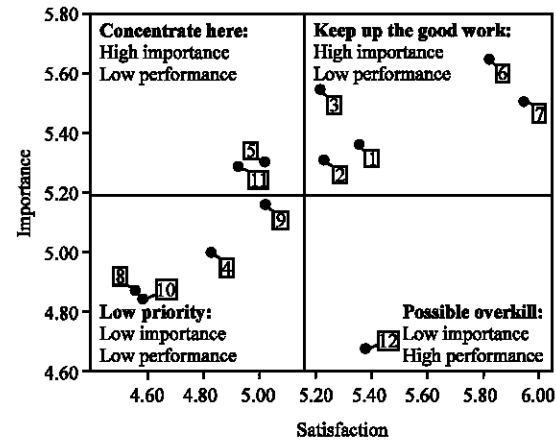


Fig. 1: IPA analysis: 1: Adjusting the arrangement of background icons or group them; 2: Setting frequently-used apps as quick button for faster access; 3: The product alerts me through a message about my schedule 4: Automatically arranges last-used applications in order; 5: Analyzes my texting patterns and show frequently used words; 6: The product automatically adjusts the volume to the previous decibel; 7: Changing the smartphone wallpapers to the pictures or photos I want; 8: Changing application icons or folder designs; 9: A photo editing function or story insertion function and photo sharing function; 10: Several application icons looking like the shapes of actually used goods such as note or radio; 11: Providing services logging daily activities such as daily schedule or exercise duration 12: Providing a conversation function such as Siri or S voice

pre-use importance and post-use satisfaction of each attribute in order to assess user satisfaction with a product or service then, simultaneously compares and analyzes the relative importance and achievement of each attribute. IPA method performs both expectation and satisfaction assessment at the same time to present the elements that muse be improved, clearly showing the problems in its results. Quadrant 1 represents high importance but low satisfaction thus, intensive management is required. Quadrant 2 represents high importance and high satisfaction, requiring well-maintenance strategies. Quadrant 3 represents low importance and low satisfaction. Its management priority may be lowered. Quadrant 5 represents low importance but high satisfaction. In this quadrant, it is necessary to remove unnecessary extra management or make the necessary improvements.

Table 7: Consumer value of each interaction

Function*person	Function*system
Efficiency in life	Personalized service
Personalized service	Efficiency in life
Better looking appearance	Improved quality and new function
Emotion*person	Emotion*system
Emotional pleasure	Efficiency in life
Better looking appearance	Personalized service
Personalized service	Emotional pleasure

As you can see in Fig. 1, the services requiring the most intensive management are those that store and analyze consumer behavioral information and provide customer-specific tailored interaction such as frequently-used phrase recommendation and sentence completion or daily log of exercise hours or step count. Both services require customizing according to contexts. Their functions need to be diversified in line with usage purposes and intention. Otherwise, such a service would rather become the source of inconvenience on the contrary. Such inconvenience is caused frequently when a user does not want to store his or her device use patterns or has no intention to continue own previous usage patterns.

For instance, users use different forms of language when they text with friends about daily events by using online terms casually from when they text to a teacher or older people by using polite words. In this situation, the auto phrasing function could be a very convenient or very inconvenient function for different contexts and different users depending upon what kinds of vocabularies are stored. Therefore, it is necessary to analyze user environment of device use and contexts. By doing so the general situation of interaction should be considered and further specified in customization process. In this manner, greater user convenience and satisfaction would be achieved (Sasan, 2015; Dash *et al.*, 2016; Vijayabanu *et al.*, 2016):

Consumer value: The most important values in each interactive experience are shown in Table 7. As the user environment of IT device use has shifted from PCs to mobile, smartphones have become the main part of individual devices. Furthermore, smartphones are even regarded as another self of users. Users, after buying a smartphone, install applications in line with their lifestyle or usage purpose. And for the convenience of use, they arrange the positions of frequently-used applications, categorize them according to similar types and change application icons, etc., to adjust smartphone main pages. In this process, users develop product engagement and adjust product functions for their own purpose of use.

For better usability and convenience, they input their lifestyle information and pursue other activities as well to

make participation and enhance product functionality. Thanks to such first-hand participation experience and its resulting service provision, users interact frequently with their products. And consequentially, smartphones become something valuable to users which hold personal significance and attachment. Therefore, enterprises need to give autonomy to users so they can change the default settings according to their own taste and purpose of use with a view to reinforce product-user interaction and product individualization for users to develop attachment to their smartphones as the product for their own while using them. This product individualization and personalization reinforces user-product relationship and make the product more significant as their other self.

Moreover, user's active interaction and engagement strengthen the joyful/symbolic meaning of smartphones. Smartphones accumulate user's device use patterns and provide customized user-centered services in line with their specific way of phone use. In this manner, smartphones provide elevated usability and convenience to users than that given by their initial default functions. In addition as users voluntarily store their log record, smartphones store abundant stories about their users.

Thus, smartphones become a medium of emotional communication that stores and bring back user experiences and memories, providing emotionally expanded functions. Also, the use behavior of sharing with others smartphone-saved user experiences and memories facilitates interaction with others and solidifies bond through digital product in real world. By doing so, such a behavior grants digital product a huge humane emotion.

Goods that personalized function as an identity symbol to indicate one's social position and prove its justification are important factors for self-expression. And in this mechanism such goods are regarded as very special and important. Possessing goods associated one's past memories helps the person not to forget the experience and remember the memories to hold a special symbolic meaning. That is specific objects or products representing one's experience come to have a symbolic significance to signify the time, place or situation of the certain specific piece of experience.

CONCLUSION

This study explored product attachment elements by analyzing the interaction between digital products and users and looked at what kinds of emotional factors had affected attachment. Also, based on interaction factors, this study identified the value types sought for by customers and presented value improvement factors for a stronger attachment and its specific methods.

First of all by categorizing the types of user-product interaction, this study looked at the characteristics and nature of user-product relationship. Also, regarding digital products that can hardly be formed a close relationship of attachment with users, this study explained attachment formation factors in digital product by focusing on smartphones and explored the possibility of consumer relationship formation and further development. Lastly, product designing methods were studied to form a close tie with users by reinforcing the user-product interaction. It will be an essential factor for sustainable product designing to develop the kind of interaction enhancing not only the practical value of a product but also its emotional value to form a relationship of attachment. Also, positive interaction is expected to improve product values, generate the sense of attachment to the product and expand product lifespan to improve the quality of user-product relationship.

Attachment is formed as a user owns a product with special significance. It is viewed that attachment bases on repeated exposure or familiarity. And familiarity brings about deep knowledge on the corresponding product. Attachment is formed as a user owns a product with special significance. It is viewed that attachment bases on repeated exposure or familiarity. And familiarity brings about deep knowledge on the corresponding product. Moreover, attachment is the result of user-product interaction and established with time. Attachment makes a certain product dear to a user so if product experience can be continued until a user accumulates plenty of product-related memories thus gives it a symbolic meaning that much of memories are attached to the product to sustain the attachment of experience. Attachment formation through enhanced product-user interaction experience is a process of making digital product to cherishable thing. Attachment makes a certain product dear to a user so if product experience can be continued until a user accumulates plenty of product-related memories thus gives it a symbolic meaning that much of memories are attached to the product to sustain the attachment of experience and digital product would be an irreplaceable and indispensable thing as a result.

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