

# Approaching Product Subjective Sustainability: Comparative Study on Evolution of Users' *Kansei* during Lifetime of their Mobile Phones between Iran and Japan

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## Abstract

Most of the scholar works about Sustainable Design treat of the objective side of product sustainability, whereas its subjective side has not been observed adequately. A sustainable product should be able to last in its expected lifetime not only objectively but subjectively. The main focus of design researches concerning the subjective issues of sustainability is on 'lifetime optimization of products'. Focusing on the subjective side of product sustainability, here the concept of 'Product Subjective Sustainability' is proposed to specifically indicate 'the emotional, affective and/or aesthetical capability of a product for satisfyingly and pleasantly lasting during its expected long/short lifetime'. However, such a concept may generally encompass all possible subjective effects of the product on sustainability values. This research basically aims to clarify 'Product Subjective Sustainability' experientially. As *Kansei* embraces much wider subjective issues of product than emotion, this study is based on *Kansei* Engineering approach. Here, a comparative and analytical study is done on the evolution of users' *Kansei* toward their personal product during its entire lifecycle in two different contexts, Iran and Japan. The product lifecycle from user perspective is divided into three stages including purchasing or choosing, keeping or using and replacing or throwing away the product. The assigned personal product for this comparative analysis is mobile phone which is an approximately short-lived product. Thus, two groups of Iranian and Japanese subjects are investigated about their senses, feelings and/or emotions (ie *Kansei*) regarding their mobile phone during each of its lifecycle stages. After extracting the patterns of evolution of their *Kansei* and thence drawing the trends of subjective sustainability of mobile phone in Iran and Japan, the resulted patterns and trends would be compared.

## Keywords

Product Subjective Sustainability; Psychological Lifetime; *Kansei* Evolution; Attachment; Mobile Phone; Context.

The importance of subjective aspects of sustainability has been reinforced within some scientific debates almost from the first stages of emerge of the concept of sustainable development (Douven, Nijkamp, & Scholten, 1995; Ierland, Straaten, & Vollebergh, 2001). Some researchers argue that sustainable development is an inherently subjective concept (Kemp, & Martens, 2007). However, most studies about sustainability, especially in the last decade, have focused on its objective side, whereas its subjective aspects have not been observed adequately (Hart, 1994; Paddison, Money, Lever, & Lever, 1995). The key challenge of "subjective environmental aspects of products and processes" has been discussed in design research since the last decade (Hoffman, 1997). As design touches human multilaterally, the given importance to the subjective issues of sustainability within the design researches – for instance about sustainable lifestyle and socio-ethical values – is increasing theoretically and empirically (Childs, Agouridas, Barnes, & Henson, 2006). Practically, the main focus of design researches concerning the subjective issues of sustainability is on 'lifetime optimization of products' (Nes, & Cramer, 2003). Emphasizing "the main challenge in design for longevity lies in achieving an enduring satisfaction with the product, rather than only

meeting the momentary desires of today”, Nes and Cramer (2005), on the basis of the results of analysis of the factors influencing the users’ decision for product replacement, propose five design strategies for product longevity including: design for reliability and robustness; design for repair and maintenance; design for upgradeability; design for product attachment and design for variability. Among these five strategies ‘product attachment’ seems to be the most directly-related one to product psychological or subjective lifetime. ‘Product attachment’ simply is defined as “the emotional bond experienced with a product” (Schifferstein, Mugge, & Hekkert, 2004). Many design researchers argue that extending the psychological life span of durables as well as increasing the degree of consumer-product attachment could be instrumental to reduce the demand for scarce resources and the rate of solid waste disposal and may contribute to a more sustainable society (Mugge, Schifferstein, & Schoormans, 2004; Hinte, 1997; Govers, & Mugge, 2004). The strategy to enhance product attachment is however the most uncertain in actually enhancing longevity. As this strategy is based on the fact that the disposal of products is made harder when one feels attached to the product, it brings so many questionable points and challenges implying that it should be well considered and applied delicately (Nes, & Cramer, 2005). A product, even a very personal one like mobile phone, could be emotionally pleasurable, aesthetically appealing and/or functionally comfortable during its expected short/long lifespan while there might not be any strong user-product-attachment. Moreover, durability of users’ satisfaction and emotional pleasure regarding a product and its appeal may not necessarily eventuate to attachment. In fact, user-product-attachment is one of the product subjective issues including the user’s total attitude, feeling, affection, emotion and/or appreciation, which could be called *Kansei*, about a product (Childs, Agouridas, Barnes, & Henson, 2006; Schütte, Eklund, Ishihara, & Nagamachi, 2007). Keeping the above mentions as the background and aiming to analytically expand ‘product subjective sustainability’, this paper presents the process and results of a comparative study done on the evolution of users’ *Kansei* toward their mobile phone during its entire lifecycle between two different contexts, Iran and Japan.

## Approach

### **Conceptualization**

Considering the above mentioned points and challenges concerning product attachment and also according to the authors’ findings within the last researches (Zafarmand, Tauchi, Terauchi, Kubo, & Aoki, 2009a,b), it seems that product attachment is just one of the effective means that can be used for extending or optimizing the psychological lifespan or subjective lifetime of products, while there are some other effective means in this regard. Thus, there is a room for an open concept or wide expression to comprehensively encompass product subjective issues contributing to the products pleasurable longevity when considering product sustainability.

The term ‘subjective sustainability’, as a versatile and wide concept, has been used in the literatures of various fields, such as Social Sciences (Becker, & Jahn, 1999), Public Policy (Tierney, 2003), Forest Management (Raison, Brown, & Flinn, 2001), Urban Planning (Hart, 1994; Paddison, Money, & Lever 1995; Castello, 2006) and Package Design (Salazar, 2008). ‘Subjective sustainability’ in terms of Social Sciences generally is the matter of the social and cultural issues of sustainable development (Becker, & Jahn, 1999) and in Urban Studies specifically is about “rising real incomes, adjusted market frameworks and changing consumer preferences interact to moderate resource inputs while raising GNP” (Hart, 1994; Paddison, Money, & Lever, 1995). According to Haie (2006), subjective sustainability criteria should be approached through subjective judgments, subjective classifications and subjective conclusions. Nevertheless, the definite territory of ‘subjective sustainability’ has not been identified clearly and expanded well within the literatures.

In this research “a product’s capability of being pleasing, appealing and satisfyingly lasting during its expected long/short lifetime” is called ‘Product Subjective Sustainability’ (PSjS). The word ‘sustainability’ in this concept is to imply not only a fair durability but the imperative application of such durability in terms of product sustainability. However, such a concept could be expanded to generally embrace all subjective issues of product reflecting/effecting/affecting sustainability values.

## Experimental Framework and Purpose

To experientially expand PSjS, we have carried out a comparative analysis on the evolution of Japanese and Iranian users' *Kansei* toward a product in its entire lifecycle. For covering all subjective issues, this analysis is on the basis of *Kansei* Engineering approach (Schütte, Eklund, Ishihara, & Nagamachi, 2007). Here, the entire lifecycle of product from user perspective is divided into three main stages including: Purchase (P); Keep/Use (KU); and end or Replace (R). The specified product type for this analytical study is Mobile Phone, since its subjective issues are more considerable than the other kinds of product due to the users' very close/personal relation with it despite being a short-lived product (Zafarmand, Sugiyama, Watanabe, & Ono, 2006a,b). User's emotional attachment to mobile phone – rather than the other kinds of product – is also reflected in numerous scholarly works (Vincent, 2006; Vincent, 2005; Wehmeyer, 2007; Wehmeyer, 2008).

Furthermore, there is the highly effects of context on the form-structural patterns of aesthetic boredom and consequently aesthetic durability of mobile phone (Zafarmand, Sugiyama, Watanabe, & Ono, 2007). In fact these two phenomena affect product psychological lifetime while being included in the subjective issues of product. Within the authors' last researches with the same theme and approach just a limited number of Japanese students were investigated. To find out the effects of contextual differences on PSjS, here a considerable number of mobile phone users living in two quite different contexts are investigated. The major processed output of investigation would be the *Kansei* descriptive items regarding each lifecycle stage of the subjects' mobile phones, the items and subjects groupings and thereupon the various patterns of the evolution of the subjects' *Kansei* regarding their mobile phone during its lifecycle. Finally, as the main outcome of this study, the major trends of PSjS would be drawn on the basis of the results.

## Outline and Method

This comparative study has been performed within three main steps. In the first step, two groups of Iranian and Japanese subjects are investigated through the definite and extensive-descriptive questionnaire. The second step is the process and analysis of the data derived from the questionnaire by using KJ Method, Descriptive Statistics, Quantification Theory Type III (QT3) and Cluster Analysis. Last, as the third step, the results of analysis are interpreted and put in discussion.

All of the subjects are selected randomly. The Japanese subjects ranging from 15 to 24 years, 31% female and 69% male in total, consist of 32 students of Chiba University and 17 high school students living in Chiba. The Iranian subjects ranging from 16 to 28 years, 77% female and 23% male in total, consist of 50 university students – of University of Tehran, Iran University of Science and Technology and Shiraz University – and 21 high school students living in Shiraz. They are investigated about: a brief history of their used/replaced mobile phones; their reasons for replacing mobile phone; the level of dis/satisfaction of their current mobile phones; and their feeling, emotion, image and/or attitude – namely *Kansei* – regarding their mobile phones in each of the three lifecycle stages of P, KU and R separately into three different questions.

The *Kansei* descriptive words responded by the subjects are summarized through KJ Method. Then the subjects' responded items in all three lifecycle stages are processed altogether by using QT3. To identify the *Kansei* items' grouping and also the subjects' grouping on the basis of their *Kansei* regarding their mobile phones in the three lifecycle stages, the method of Cluster analysis is used. On the basis of the axis dimensions as the output of QT3, all of the subjects' *Kansei* statuses in the three lifecycle stages of their mobile phones are put in the 3-dimensional spaces. As the following formulation shows, if the distance of a subject's *Kansei* status ( $S_i$ ) in two different lifecycle stages, for example P and R, was higher than the addition of Average distance and Standard Deviation ( $Av.+SD$ ), that is considered important case regarding the shift between those two stages.

$Dist S_{iPR} = \text{Distance of } S_i \text{ in P and R lifecycle stages}$

$$Dist S_{iPR} = \sqrt{(X S_{iP} - X S_{iR})^2 + (Y S_{iP} - Y S_{iR})^2 + (Z S_{iP} - Z S_{iR})^2}$$

If  $Dist S_{iPR} > Av.+SD$ ,  $S_{iPR} \text{ Importance} = 1$

If  $Dist S_{iPR} < Av.+SD$ ,  $S_{iPR} \text{ Importance} = 0$

The various patterns of the subjects' *Kansei* evolution are then extracted from the positions of the highlighted important cases in terms of the resulted groupings in each lifecycle stage. Then, according to the positions of extracted patterns in the areas of the resulted 3-dimensional spaces, the major trends of PSjS are drawn. Finally, the major trends and patterns of PSjS extracted from Iranian and Japanese subjects' responses are compared.

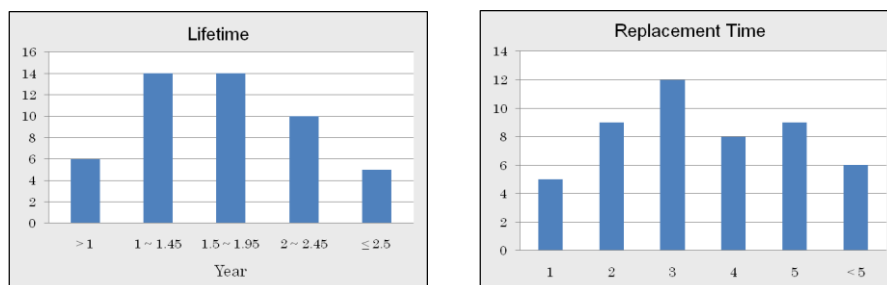
## Results

### Replacement Circumstances

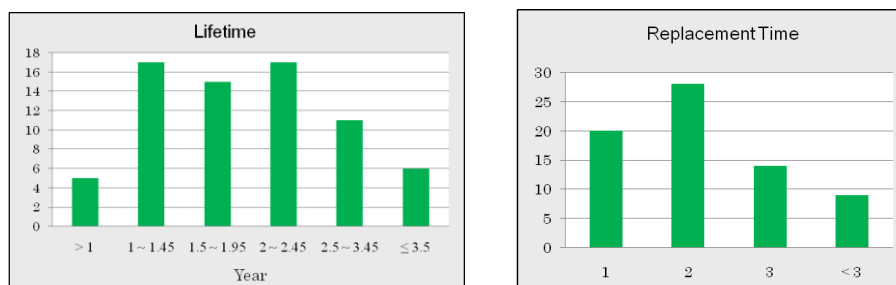
The general results of investigating the Japanese and Iranian subjects regarding mobile phone replacement are as follows. Indifferently, a Japanese subject and an Iranian one have already used respectively '3.6' and '2.4' mobile phones (Av.MP) from '5.37' and '3.75' years ago. The average lifetimes of mobile phone used by the Japanese and Iranian subjects are respectively '1.59' and '1.88' years. Besides, just 65% of the Japanese subjects are satisfied with their current mobile phone and 80% of them like it. But 85% of the Iranian subjects are satisfied with their current mobile phone while 80% of them like it. For more easily comparison, the above mentioned results are presented in Table 1. The histograms of Japanese and Iranian subjects' mobile phone lifetimes and replacement times are also shown respectively in Figures 1, 2, 3 and 4.

Subjects	Tot No.	Av.MP used	Start of use	Av. Lifetime	Satisfied with current MP	Like current MP
Japanese	49	3.6	5.37 yrs ago	1.59 yrs	65%	80%
Iranian	71	2.4	3.75 yrs ago	1.88 yrs	85%	80%

Table 1 Comparison of mobile phone replacement circumstances between Iran and Japan



Figures 1 & 2 Histograms of Japanese subjects' mobile phone lifetime and replacement time



Figures 3 & 4 Histograms of Iranian subjects' mobile phone lifetime and replacement time

The Japanese subjects' reasons for replacing mobile phone are summarized into 11 items including Boring, Broken, Defect, Form, Found Favorite, Lost, Novelty, Oldness, Price, Service and Tattered. The ones of Iranian subjects' are also summarized into 18 items including Boring, Broken, Defect, Facilities, Fashion, Form, Gift, Individuality, Interest, Lost, Novelty, Oldness, Performance,

Physics, Price, Quality, Service and Variety. To distinguish the most ongoing and frequent reasons and compare them between the Japanese and Iranian subjects, the reasons are sorted followed by their frequency into the bar-graphs shown in Figures 5 and 6. As it can be seen, the most ongoing and frequent reasons are respectively Defect, Oldness, Novelty and Broken in the context of Japanese subjects and Facilities, Defect, Broken and Form in the context of Iranian subjects.

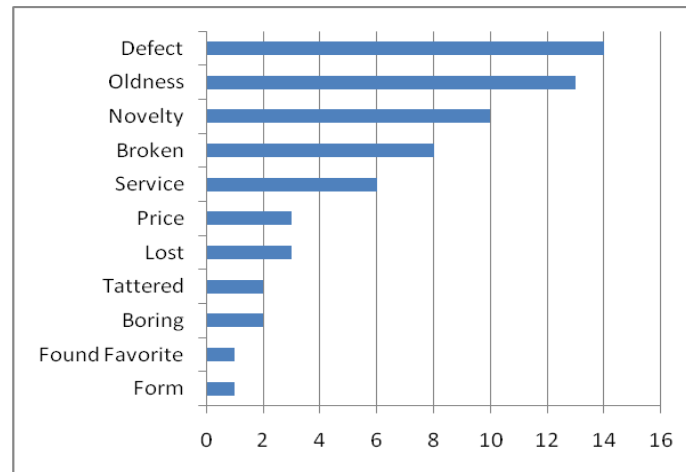


Figure 5 The Japanese subjects' main reasons for replacing mobile phone

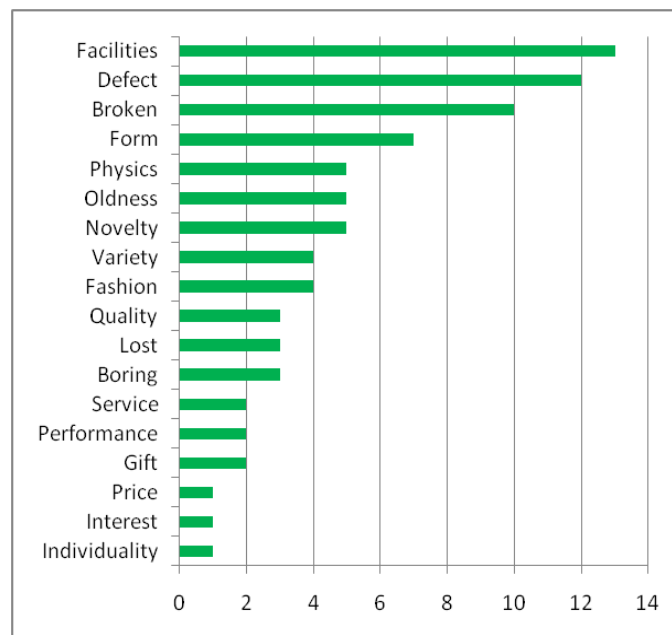


Figure 6 The Iranian subjects' main reasons for replacing mobile phone

### ***Derived Kansei Items Groupings***

In total, 626 Japanese *Kansei* keywords (including 136 ones for R stage, 278 ones for P stage and 212 ones for KU stage) and 635 Persian ones (including 190 ones for R stage, 224 ones for P stage and 219 ones for KU stage) are derived respectively from the Japanese and Iranian subjects' responses regarding their *Kansei*, emotion or feeling about their mobile phone in its different lifecycle stages. These two groups of keywords are separately summarized into 41 and 42 *Kansei* items or descriptive words through KJ Method. The Japanese and Iranian subjects' responded data about their *Kansei* regarding all of the three lifecycle stages of their mobile phones are separately adapted to these 41 and 42 *Kansei* items and processed by using QT3 and Cluster

Analysis. The overall output distributions of the *Kansei* items in the lifecycle stages of mobile phone regarding each country's subjects are shown into X-Y and X-Z graphs in Figures 7 and 8.

The chosen cut-off lines for the clustering algorithms have yielded five clusters marked from C.1 to C.5 in the X-Y graph and eight clusters marked from G.1 to G.8 in the X-Z one regarding the Japanese subjects (Fig. 7), and six clusters marked from Ci.1 to Ci.6 in the X-Y graph and six clusters marked from Gi.1 to Gi.6 in the X-Z one regarding the Iranian subjects (Fig. 8). This choice of cut-off is carefully made in order to arrive at the most meaningful groupings for understanding of the relationship between various *Kansei* items. The lists of *Kansei* items, their output dimensions in X, Y and Z axis, their belonging clusters in X-Y and X-Z graphs and their frequencies in each lifecycle stage according to the Japanese and Iranian subjects' responses are presented in Tables 2 and 3. To illustrate the lifecycle stage (P, KU or R) each item associates with rather than the other stages, the different point shapes and colors are used in the graphs. This suggested association is decided on the basis of the higher frequencies of each item in the lifecycle stages highlighted in Tables 2 and 3.

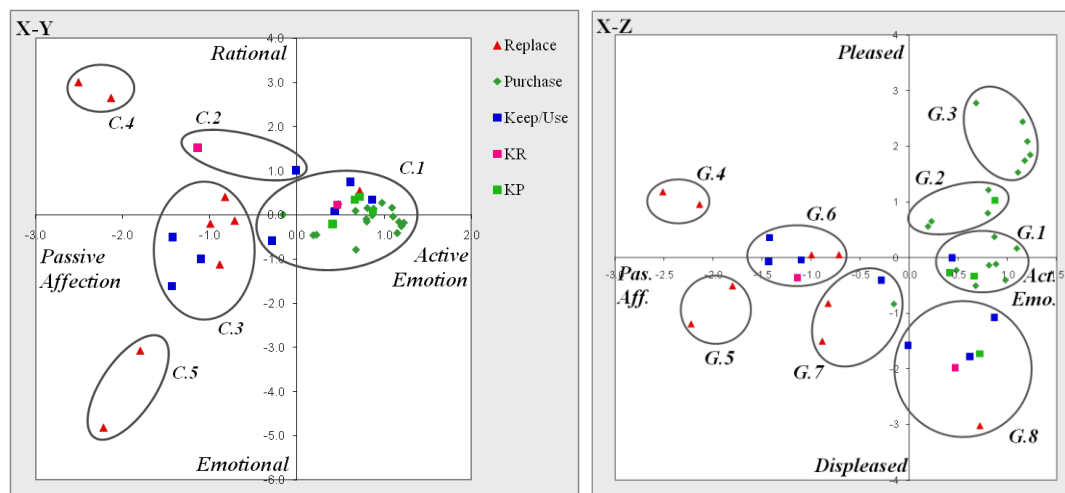


Figure 7 Distributions and groupings of 41 *Kansei* items in X-Y and X-Z graphs of Japanese subjects

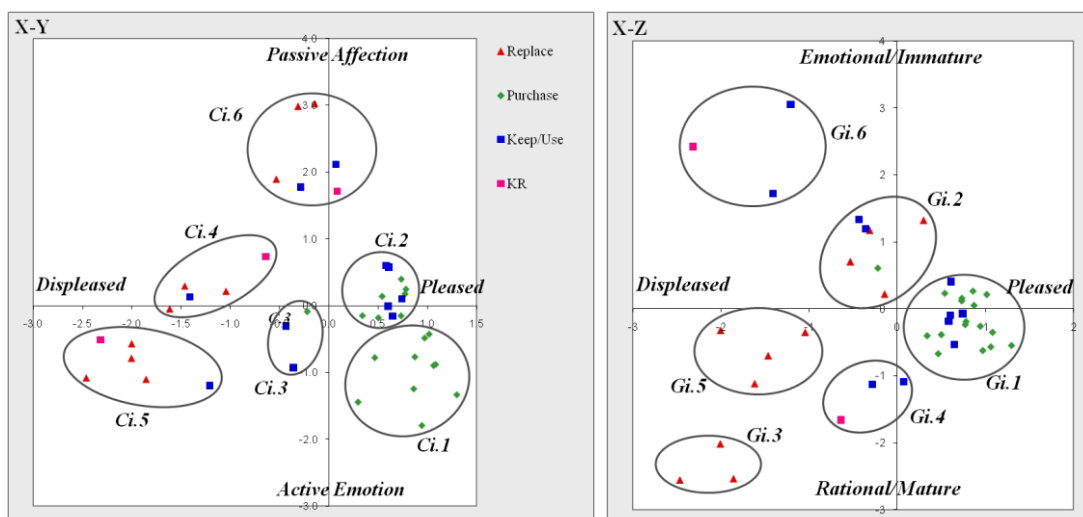


Figure 8 Distributions and groupings of 42 *Kansei* items in X-Y and X-Z graphs of Iranian subjects

In the graphs relevant to the Japanese subjects (Fig. 7), the directions of the three axis of X, Y and Z are respectively named as 'Passive Affection - Active Emotion' (Pas.Aff - Act.Emo), 'Emotional - Rational' (Emo - Rat) and 'Displeased - Pleased' (Disp - Ples). The clusters C.1 to C.5 can be characterized respectively as Gratification/Concerns, Old, Enduring, Ally and Lonely. Similarly,

clusters G.1 to G.8 can be characterized respectively as Practical Concerns, Pleasant, Joy/Fresh, Ally, Lonely, Attached, Undergone and Dissatisfied. As it can be seen, the items having more association with the lifecycle stage of P and R are located respectively in the right and left sides of the graphs.

In the graphs relevant to the Iranian subjects (Fig. 8), the directions of the three axis of X, Y and Z are respectively named: ‘*Displeased - Pleased*’; ‘*Active Emotion - Passive Affection*’; and ‘*Rational/Mature – Emotional/Immature*’ (Rat/Ma – Emo/Im). The clusters Ci.1 to Ci.6 can be characterized respectively as Joy/Fresh, Satisfaction, Concerns, Dissatisfaction, Displeasure and Attachment. The clusters Gi.1 to Gi.6 can be also characterized as Joy/Fresh, Affected, Riddance, Ally, Displeasure and Boring. Similarly, the items having more association with the lifecycle stage of P and R are located respectively in the right and left sides of the graphs. All of the above given names are decided on the basis of the context and distribution of the *Kansei* items in the graphs.

<i>Kansei Items</i>	QT3 Output			Groupings		Freq. in Subj. Clus. X-Y					Freq. in Subj. Clus. X-Z					Freq. in L. Stage			Total Freq.
	X	Y	Z	X-Y	X-Z	A	B	C	D	E	F	G	H	I	J	P	KU	R	
Accustom	-0.29	-0.59	-0.40	C.1	G.7	3	6	0	0	0	4	0	0	5	0	1	8	0	9
Achievement	0.68	-0.80	2.78	C.1	G.3	1	8	0	0	0	1	0	4	0	4	7	2	0	9
Anger	0.72	0.55	-3.02	C.1	G.8	0	2	0	0	0	0	0	0	2	0	0	0	2	2
Anxiety	0.81	0.15	-0.14	C.1	G.1	0	12	0	0	0	0	0	4	8	0	10	1	1	12
Appreciation	-2.51	3.00	1.18	C.4	G.4	1	0	4	10	0	9	6	0	0	0	0	5	10	15
Attachment	-1.44	-1.61	-0.07	C.3	G.6	17	1	0	0	1	18	0	0	1	0	0	12	7	19
Boasting	1.11	-0.04	1.53	C.1	G.3	0	3	0	0	0	0	0	3	0	0	3	0	0	3
Boring	-0.16	0.00	-0.84	C.1	G.7	0	6	0	0	0	3	0	0	3	0	3	2	1	6
Cherished	-1.43	-0.50	0.36	C.3	G.6	12	3	0	3	1	15	2	1	1	0	2	10	7	19
Complain	0.72	0.41	-1.73	C.1	G.8	0	16	0	0	0	0	0	0	16	0	7	7	2	16
Complication	0.67	0.09	-0.51	C.1	G.1	1	27	0	0	0	1	0	8	19	0	18	6	4	28
Curiosity	0.19	-0.47	0.56	C.1	G.2	1	3	0	0	0	1	0	2	1	0	3	0	1	4
Desire	0.87	-0.01	0.37	C.1	G.1	1	11	0	0	0	1	0	7	4	0	7	5	0	12
Discovery	1.20	-0.26	2.09	C.1	G.3	0	4	0	0	0	0	0	3	0	1	4	0	0	4
Easy	0.23	-0.46	0.65	C.1	G.2	6	21	0	0	0	8	0	11	7	1	14	13	0	27
Excite	1.17	-0.16	1.74	C.1	G.3	0	6	0	0	0	0	0	5	0	1	6	0	0	6
Familiarity	-1.10	-1.00	-0.04	C.3	G.6	6	2	0	1	0	8	0	0	1	0	0	6	3	9
Flaw	0.46	0.23	-1.98	C.1	G.8	1	8	0	0	0	1	0	0	8	0	1	4	4	9
Fragile	0.41	-0.21	-0.27	C.1	G.1	1	3	0	0	0	1	0	1	2	0	2	2	0	4
Functional	0.48	0.24	-0.23	C.1	G.1	2	55	0	3	0	6	0	21	33	0	31	16	13	60
Good-look	0.80	-0.10	0.80	C.1	G.2	1	12	0	0	0	1	0	9	3	0	10	2	1	13
GUL-like	0.88	0.13	-0.12	C.1	G.1	0	10	0	0	0	0	0	3	7	0	6	4	0	10
Important	-1.00	-0.20	0.05	C.3	G.6	10	7	0	4	0	16	0	0	5	0	5	5	11	21
Longevity	-0.72	-0.13	0.05	C.3	G.6	14	16	0	5	0	21	0	4	10	0	6	14	15	35
Lost	-0.89	-1.12	-1.50	C.3	G.7	2	2	0	0	0	2	0	0	2	0	0	1	3	4
Nostalgic	-1.80	-3.07	-0.51	C.5	G.5	7	0	0	0	4	11	0	0	0	0	0	2	9	11
Novelty	0.86	0.35	-1.07	C.1	G.8	0	18	0	0	0	0	0	4	14	0	7	10	1	18
Old Style	-0.01	1.01	-1.58	C.2	G.8	0	9	0	2	0	2	0	0	9	0	2	5	4	11
Partner	-2.14	2.65	0.96	C.4	G.4	1	0	2	8	0	7	4	0	0	0	0	4	7	11
Pity	-2.22	-4.81	-1.19	C.5	G.5	1	0	0	0	2	3	0	0	0	0	0	1	2	3
Pleasure	0.80	-0.16	1.22	C.1	G.2	1	30	0	1	0	3	0	22	4	3	28	2	2	32
Puzzled	0.98	0.27	-0.41	C.1	G.1	0	10	0	0	0	0	0	3	7	0	8	2	0	10
Reasonable	0.66	0.35	-0.33	C.1	G.1	0	8	0	0	0	0	0	2	6	0	4	4	0	8
Refresh	1.23	-0.18	1.85	C.1	G.3	0	10	0	0	0	0	0	8	0	2	10	0	0	10
Regret-Wasteful	-0.83	0.41	-0.82	C.3	G.7	3	7	0	5	0	9	0	0	6	0	0	3	12	15
Superfluous	1.09	0.16	0.16	C.1	G.1	0	3	0	0	0	0	0	2	1	0	2	1	0	3
Surprise	1.15	-0.42	2.44	C.1	G.3	0	4	0	0	0	0	0	2	0	2	3	1	0	4
Tattered	-1.14	1.52	-0.36	C.2	G.6	1	1	0	2	0	3	0	0	1	0	0	2	2	4
Temporary	0.61	0.75	-1.78	C.1	G.8	0	13	0	1	0	1	0	0	13	0	2	9	3	14
Toy	0.87	0.08	1.03	C.1	G.2	0	2	0	0	0	0	0	1	1	0	1	1	0	2
Uniqueness	0.43	0.08	0.00	C.1	G.1	0	4	0	0	0	0	0	1	3	0	1	2	1	4

Table 2 *Kansei* items and their dimensions, belonging clusters and frequencies relevant to Japanese subjects

Kansei Items	QT3 Output			Groupings		Freq. in Subj. Clus. X-Y					Freq. in Subj. Clus. X-Z					Freq. in L. Stage			Total
	X	Y	Z	X-Y	X-Z	Ai	Bi	Ci	Di	Ei	Fi	Gi	Hi	Ii	Ji	P	KU	R	Freq.
Accustomed	-0.29	1.77	-1.13	Ci.6	Gi.4	0	1	0	5	2	0	0	0	6	2	0	6	2	8
Anxiety	-0.22	-0.09	0.61	Ci.3	Gi.2	2	6	14	6	0	0	0	6	17	5	12	8	8	28
Appeal	0.97	-0.48	-0.63	Ci.1	Gi.1	0	0	12	1	0	0	0	0	13	0	10	3	0	13
Big	-1.47	0.29	-0.70	Ci.4	Gi.5	1	4	0	1	0	0	0	1	0	5	0	0	6	6
Bored	-2.32	-0.51	2.42	Ci.5	Gi.6	10	2	0	0	0	0	4	5	0	3	0	6	6	12
Broken/Lost	-0.31	2.98	1.17	Ci.6	Gi.2	0	1	0	5	4	0	0	4	6	0	0	1	9	10
Companion	0.07	2.11	-1.09	Ci.6	Gi.4	0	1	0	9	4	0	0	0	13	1	1	7	6	14
Confident	0.74	0.10	-0.07	Ci.2	Gi.1	0	0	6	2	0	0	0	0	8	0	3	5	0	8
Decreasing Value	-0.36	-0.93	1.20	Ci.3	Gi.2	3	3	8	0	0	0	0	3	8	3	2	11	1	14
Dislike/Bad-Feel	-2.00	-0.57	-0.32	Ci.5	Gi.5	10	4	0	0	0	0	0	3	1	10	0	6	8	14
Ease/Utility	0.34	-0.15	-0.40	Ci.2	Gi.1	1	2	11	4	0	0	0	0	16	2	8	6	4	18
Embarrassment	-2.01	-0.79	-2.02	Ci.5	Gi.3	2	2	0	0	0	1	0	0	0	3	0	1	3	4
Excited	1.30	-1.33	-0.55	Ci.1	Gi.1	0	0	4	0	0	0	0	0	4	0	4	0	0	4
Expiring	-0.53	1.89	0.70	Ci.6	Gi.2	0	1	1	1	2	0	0	2	2	1	0	2	3	5
Flaw	-1.05	0.21	-0.35	Ci.4	Gi.5	7	10	6	4	0	0	0	2	13	12	0	12	15	27
Good-feeling	0.87	-0.76	0.05	Ci.1	Gi.1	0	1	41	0	0	0	0	0	42	0	27	13	2	42
Good-look	0.77	0.18	-0.24	Ci.2	Gi.1	0	0	18	3	0	0	0	0	21	0	10	8	3	21
Happy-R-End	-2.47	-1.09	-2.56	Ci.5	Gi.3	12	3	0	0	0	7	0	1	1	6	0	0	15	15
Individual	0.61	0.58	0.40	Ci.2	Gi.1	0	0	9	3	0	0	0	0	12	0	4	5	3	12
Light	0.50	-0.18	-0.39	Ci.2	Gi.1	0	1	6	0	0	0	0	0	6	1	4	2	1	7
Like	0.78	0.25	-0.19	Ci.2	Gi.1	0	0	28	6	2	0	0	0	36	0	17	12	7	36
Longevity	0.58	0.60	-0.19	Ci.2	Gi.1	0	0	13	4	2	0	0	0	19	0	2	13	4	19
Love	0.08	1.71	-0.57	Ci.6	Gi.1	0	1	4	8	3	0	0	1	14	1	2	7	7	16
Mod-Replace-Think	-1.41	0.13	1.72	Ci.4	Gi.6	9	6	2	5	0	0	2	12	4	4	2	13	7	22
Nostalgic	-0.14	3.02	0.22	Ci.6	Gi.2	0	1	0	9	9	0	0	2	16	1	0	1	18	19
Novelty	0.86	-1.24	0.27	Ci.1	Gi.1	0	0	19	0	0	0	0	0	19	0	16	3	0	19
Old	-1.62	-0.05	-1.12	Ci.4	Gi.5	4	10	0	1	0	1	0	1	1	12	0	3	12	15
Ordinary	-1.21	-1.20	3.05	Ci.5	Gi.6	4	4	3	0	0	0	1	7	2	1	1	8	2	11
Perfection	0.74	0.40	0.16	Ci.2	Gi.1	0	0	9	2	1	0	0	1	11	0	7	3	2	12
Pleasure	1.08	-0.88	-0.35	Ci.1	Gi.1	0	0	25	0	0	0	0	0	25	0	23	2	0	25
Prestige	0.47	-0.78	-0.67	Ci.1	Gi.1	1	1	10	1	0	0	0	0	11	2	7	4	2	13
Proud	1.02	-0.42	0.21	Ci.1	Gi.1	0	0	10	0	0	0	0	0	10	0	7	3	0	10
Reasonability	0.54	0.14	0.23	Ci.2	Gi.1	0	1	9	2	0	0	0	0	12	0	8	0	4	12
Riddance	-1.86	-1.11	-2.54	Ci.5	Gi.3	9	0	2	1	0	4	0	0	3	5	2	1	9	12
Satisfied	0.60	-0.01	-0.09	Ci.2	Gi.1	0	2	26	5	0	0	0	2	31	0	7	23	3	33
Simplicity	0.65	-0.16	-0.53	Ci.2	Gi.1	0	1	7	1	0	0	0	0	9	0	4	5	0	9
Tattered	-0.64	0.74	-1.66	Ci.4	Gi.4	0	2	1	1	0	0	0	0	2	2	0	2	2	4
Techno-Advantage	0.73	-0.15	0.12	Ci.2	Gi.1	0	1	21	2	0	0	0	0	24	0	13	8	3	24
Thirst/Discovery	1.06	-0.89	-0.57	Ci.1	Gi.1	0	0	4	0	0	0	0	0	4	0	3	1	0	4
Tolerable	-0.44	-0.31	1.33	Ci.3	Gi.2	1	14	12	1	0	0	0	12	14	2	9	16	3	28
Unaccustomed	0.30	-1.44	1.32	Ci.1	Gi.2	0	0	4	0	0	0	0	1	3	0	3	1	0	4
Variety	0.94	-1.79	-0.26	Ci.1	Gi.1	0	0	7	0	0	0	0	0	7	0	7	0	0	7

Table 3 *Kansei* items and their dimensions, belonging clusters and frequencies relevant to Iranian subjects

### Subjects' Groupings and Kansei Statuses in Lifecycle Stages

In order to delineate the subjects' *Kansei* statuses concerning their mobile phone during its P, KU and R lifecycle stages, the resulted graphs of distribution of the Japanese and Iranian subjects in X-Y and X-Z axis are shown in Figures 9 and 10. These distribution graphs and the ones of *Kansei* items grouping (Figures 7 and 8) are built on the basis of the 'sample score' and 'category score' of the same output of QT3 analysis on the same input data derived from each country's subjects, and hence can be overlapped. The same names are therefore given to the directions of X, Y and Z axis in both sets of distribution graphs. The purposely chosen cut-off lines for clustering within the resulted X-Y and X-Z dimensions have yielded respectively five clusters marked from A to E and five clusters marked from F to J in the graphs relevant to Japanese subjects, and five clusters marked from Ai to Ei and five clusters marked from Fi to Ji in the graphs relevant to Iranian subjects.



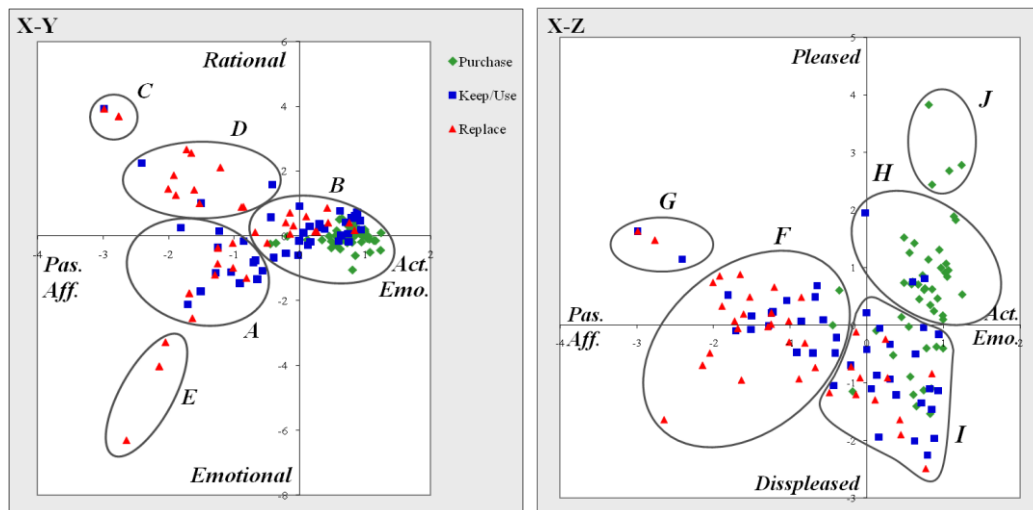


Figure 9 Distribution and groupings of Japanese subjects' *Kansei* status in the lifecycle stages of their mobile phones

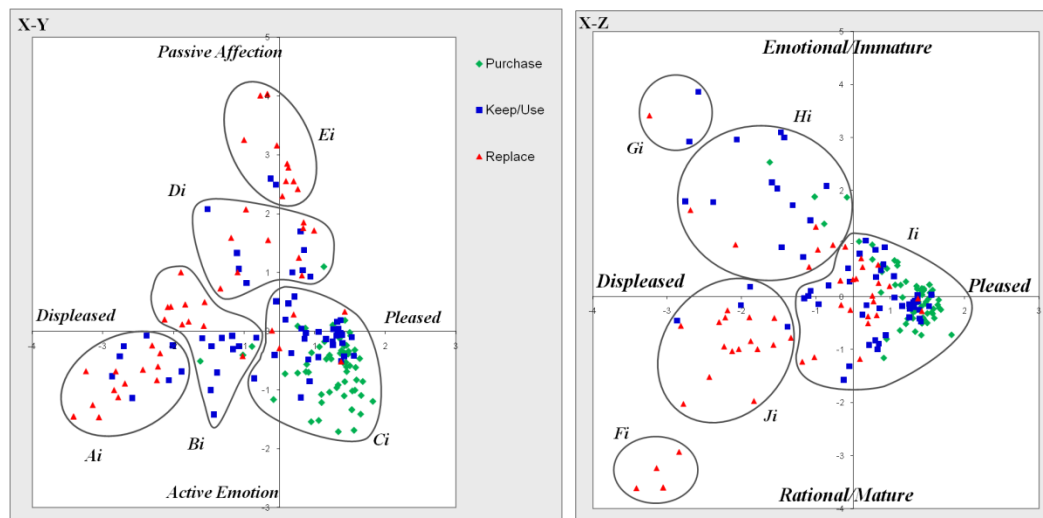


Figure 10 Distribution and groupings of Iranian subjects' *Kansei* status in the lifecycle stages of their mobile phones

According to the *Kansei* items responded by majority of the subjects belonging to each cluster highlighted in Tables 2 and 3, the following appropriate names can be given to the clusters to express each cluster's exceptional characteristic. Regarding the graphs relevant to Japanese subjects (Fig 9), the given names to clusters A to E are: Attached; Gratification/Concerns; Gratitude; Ally; and Lonely. Clusters F to J are also named as Attached/Lonely, Gratitude, Pleasant, Dissatisfied/Concerned, and Joy/Fresh. Regarding the graphs relevant to Iranian subjects (Fig 10), clusters Ai to Ei are named as Bored/Displeased, Concerned, Joy/Pleased, Attached and Affected, while clusters Fi to Ji are named as Ridded, Bored, Detached, Joy/Pleased and Dislike/Bothered.

In these graphs (Figs 9 and 10) each point represents a subject's *Kansei* status in each of the three lifecycle stages, which are discernible by three different colors and shapes in the graphs. The subjects' *Kansei* statuses in P stage are almost located in the left side of the graphs. The resulted clusters indicate each subject's *Kansei* statuses in the three lifecycle stages of his/her mobile phone.

## Patterns of Subjects' Kansei Evolutions

In order to distinguish the various patterns of the subjects' *Kansei* evolution during the three lifecycle stages of their mobile phones, the clusters to which each subject belongs in each lifecycle stage (presented in Tables 4 and 5) are used as indicators for sorting the subjects into various types.

	QT3 output X, Y and Z in lifecycle stages									Dist. of 2 stages			Importance			Belonging clusters		
	P			KU			R			P-KU	KU-R	P-R	P-KU	KU-R	P-R	P	KU	R
S <sub>1</sub>	0.92	0.07	0.46	-0.65	-1.34	0.69	-2.05	-3.27	-0.49	2.12	2.66	4.57	0	0	1	BH	AF	EF
S <sub>2</sub>	0.95	-0.18	1.31	0.06	0.10	-1.10	-0.21	0.42	-0.72	2.59	0.56	2.41	0	0	0	BH	BI	BI
S <sub>3</sub>	0.91	0.21	-0.38	0.64	0.01	-0.50	-0.49	-0.21	-1.17	0.36	1.33	1.66	0	0	0	BI	BI	BI
S <sub>4</sub>	1.24	-0.43	2.78	-0.70	-0.81	-0.48	-2.01	1.46	0.74	3.81	2.89	4.28	1	0	1	BJ	AF	DF
S <sub>5</sub>	1.16	-0.14	1.83	0.79	0.57	-2.26	-1.89	1.27	0.33	4.16	3.79	3.68	1	1	0	BH	BI	DF
S <sub>6</sub>	1.08	-0.50	2.68	-1.51	-1.71	-0.08	-1.68	-1.76	-0.06	3.97	0.18	4.09	1	0	1	BJ	AF	AF
S <sub>7</sub>	0.45	0.00	0.14	0.13	-0.29	-0.87	-0.14	0.07	-0.12	1.10	0.88	0.65	0	0	0	BI	BI	BI
S <sub>8</sub>	0.83	-0.01	0.35	0.85	0.63	-1.46	0.27	0.14	-0.92	1.92	0.93	1.39	0	0	0	BH	BI	BI
S <sub>9</sub>	0.61	0.52	-1.21	0.30	0.27	-0.33	-1.64	-2.53	-0.95	0.96	3.46	3.80	0	0	1	BI	BI	AF
S <sub>10</sub>	1.04	-0.07	1.07	-0.41	1.59	-0.48	-1.65	2.57	0.88	2.69	2.09	3.77	0	0	1	BH	DF	DF
S <sub>11</sub>	0.99	0.17	0.17	0.82	0.55	-1.11	0.76	0.42	-2.49	1.34	1.39	2.68	0	0	0	BH	BI	BI
S <sub>12</sub>	1.00	0.14	0.10	-2.41	2.25	1.15	-2.76	3.70	1.47	4.14	1.53	5.36	1	0	1	BH	DG	CG
S <sub>13</sub>	1.05	0.00	0.84	0.00	0.92	-0.42	0.10	0.61	-1.30	1.88	0.94	2.42	0	0	0	BH	BI	BI
S <sub>14</sub>	0.12	-0.11	-0.10	0.60	-0.16	0.75	-1.29	-1.19	-0.03	0.98	2.29	1.78	0	0	0	BI	BH	AF
S <sub>15</sub>	0.55	0.01	-0.03	0.94	0.19	-0.16	0.44	0.42	-1.90	0.45	1.83	1.92	0	0	0	BI	BI	BI
S <sub>16</sub>	0.84	0.48	-1.10	0.16	0.29	-1.94	-1.73	2.68	0.07	1.11	3.65	3.58	0	0	0	BI	BI	DF
S <sub>17</sub>	0.65	0.55	-1.41	0.17	-0.19	-0.05	0.24	0.15	-0.24	1.62	0.40	1.29	0	0	0	BI	BI	BI
S <sub>18</sub>	0.57	0.17	-0.90	-1.22	0.15	0.23	-1.02	-0.98	-0.30	2.12	1.26	2.04	0	0	0	BI	AF	AF
S <sub>19</sub>	0.76	-0.09	0.64	0.88	0.72	-1.96	-0.86	0.91	0.48	2.73	3.00	1.90	0	0	0	BH	BI	DF
S <sub>20</sub>	1.00	0.21	-0.40	0.38	0.22	-1.21	-1.25	-0.85	0.02	1.01	2.30	2.52	0	0	0	BI	BI	AF
S <sub>21</sub>	-0.45	-0.24	0.00	-0.68	-0.75	0.49	-0.09	0.32	-0.92	0.75	1.87	1.13	0	0	0	BF	AF	BI
S <sub>22</sub>	0.83	0.32	-1.54	-0.57	-1.07	0.09	-1.02	-0.21	0.07	2.56	0.97	2.51	0	0	0	BI	AF	AF
S <sub>23</sub>	0.75	0.02	0.61	0.00	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.97	0	0	0	BH	0	0
S <sub>24</sub>	0.80	-0.19	1.14	0.71	0.42	-1.35	-0.68	0.12	-0.74	2.56	1.54	2.41	0	0	0	BH	BI	BF
S <sub>25</sub>	0.49	-0.36	1.52	-1.28	-1.14	-0.01	-1.25	-0.36	0.21	2.47	0.81	2.17	0	0	0	BH	AF	AF
S <sub>26</sub>	0.34	-0.12	-0.52	-2.41	2.25	1.15	0.00	0.00	0.00	3.99	3.49	0.64	1	0	0	BI	DG	0
S <sub>27</sub>	1.07	-0.10	0.95	0.62	0.77	-2.01	-0.89	0.90	-0.93	3.12	1.86	2.89	0	0	0	BH	BI	DF
S <sub>28</sub>	0.74	0.32	-1.13	-0.91	-1.46	-0.47	-2.65	-6.30	-1.64	2.52	5.27	7.45	0	1	1	BI	AF	EF
S <sub>29</sub>	0.73	-0.20	0.87	0.30	0.36	-0.94	0.43	0.87	-1.64	1.94	0.88	2.75	0	0	0	BH	BI	BI
S <sub>30</sub>	0.60	-0.16	0.75	-1.28	-1.14	-0.01	-2.14	-4.02	-0.70	2.25	3.08	4.95	0	0	1	BH	AF	EF
S <sub>31</sub>	0.48	-0.15	0.74	-0.39	-0.67	-0.22	-1.92	1.88	0.85	1.39	3.16	3.15	0	0	0	BH	BF	DF
S <sub>32</sub>	0.85	-0.60	2.44	-1.81	0.25	0.53	-1.53	1.01	0.49	3.39	0.82	3.47	0	0	0	BJ	AF	DF
S <sub>33</sub>	0.88	0.11	0.25	-1.50	1.01	0.16	-1.61	1.43	0.19	2.55	0.44	2.82	0	0	0	BH	DF	DF
S <sub>34</sub>	0.62	-0.39	1.42	-1.71	-2.11	-0.09	0.00	0.00	0.00	3.27	2.72	1.60	0	0	0	BH	AF	0
S <sub>35</sub>	0.67	-0.12	0.71	0.75	-0.18	0.81	0.00	0.00	0.00	0.15	1.12	0.98	0	0	0	BH	BH	0
S <sub>36</sub>	-0.19	0.00	-1.15	0.93	0.47	-1.14	-1.68	-1.76	-0.06	1.21	3.60	2.56	0	0	0	BI	BI	AF
S <sub>37</sub>	0.85	0.03	0.62	-1.05	-1.12	0.43	-2.76	3.70	1.47	2.23	5.22	5.22	0	1	1	BH	AF	CG
S <sub>38</sub>	0.97	0.01	1.00	-0.01	-0.15	0.22	0.00	0.00	0.00	1.26	0.27	1.39	0	0	0	BH	BI	0
S <sub>39</sub>	0.60	-0.16	0.75	0.93	0.47	-1.14	-1.21	2.12	0.66	2.02	3.24	2.92	0	0	0	BH	BI	DF
S <sub>40</sub>	0.68	0.02	0.45	-0.02	-0.60	1.95	-0.14	0.72	-1.21	1.77	3.43	1.98	0	0	0	BH	BH	BI
S <sub>41</sub>	1.14	-0.13	1.89	0.00	0.00	0.00	0.00	0.00	0.00	2.21	0.00	2.21	0	0	0	BH	0	0
S <sub>42</sub>	-0.36	-0.21	0.61	-2.99	3.93	1.63	-2.99	3.93	1.63	5.01	0.00	5.01	1	0	1	BF	CG	CG
S <sub>43</sub>	0.81	-1.04	3.83	-0.85	-0.17	0.07	-2.14	-4.02	-0.70	4.20	4.13	6.17	1	1	1	BJ	AF	EF
S <sub>44</sub>	0.56	-0.27	1.26	0.00	0.00	0.00	-0.81	-1.29	-0.31	1.40	1.56	2.32	0	0	0	BH	0	AF
S <sub>45</sub>	1.25	0.11	0.53	-0.21	-0.54	-0.70	0.00	0.00	0.00	2.01	0.91	1.36	0	0	0	BH	BI	0
S <sub>46</sub>	1.02	0.02	0.91	0.74	0.07	-0.04	-2.14	-4.02	-0.70	1.00	5.04	5.38	0	1	1	BH	BI	AF
S <sub>47</sub>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0
S <sub>48</sub>	0.78	0.21	-0.40	-1.25	-0.36	0.21	-1.25	-0.36	0.21	2.19	0.00	2.19	0	0	0	BI	AF	AF
S <sub>49</sub>	0.58	-0.17	0.71	-0.44	0.58	-1.05	0.85	0.18	-0.84	2.17	1.36	1.61	0	0	0	BH	BI	BI

Table 4 Dimension, distance, importance and clusters of Japanese subjects' *Kansei* in the lifecycle stages

	QT3 output X, Y and Z in lifecycle stages									Dist. of 2 stages			Importance			Belonging clusters		
	P			KU			R			P-KU	KU-R	P-R	P-KU	KU-R	P-R	P	KU	R
S <sub>1</sub>	0.85	-0.12	0.20	0.37	-0.03	0.49	-0.47	2.07	0.89	0.57	2.30	2.66	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>DHi</i>
S <sub>2</sub>	0.73	-0.48	-0.42	-0.66	-0.30	-0.03	0.00	-0.29	0.33	1.45	0.75	1.06	0	0	0	<i>Cl</i>	<i>Bl</i>	<i>Cl</i>
S <sub>3</sub>	0.93	0.18	0.03	-0.88	-0.70	-0.57	0.49	1.71	0.20	2.10	2.88	1.60	0	0	0	<i>Cl</i>	<i>Bji</i>	<i>Dli</i>
S <sub>4</sub>	0.94	-0.53	-0.40	0.91	-0.43	-0.47	-0.17	4.04	0.31	0.13	4.66	4.75	0	1	1	<i>Cl</i>	<i>Cl</i>	<i>Eli</i>
S <sub>5</sub>	0.56	-1.52	0.68	-0.81	-0.12	1.72	0.00	0.00	0.00	2.22	1.91	1.76	0	0	0	<i>Cl</i>	<i>BHi</i>	<i>0</i>
S <sub>6</sub>	0.38	-0.69	0.08	-2.20	-0.25	2.92	-2.55	-1.46	-3.60	3.86	6.64	4.76	1	1	1	<i>Cl</i>	<i>AGi</i>	<i>AFi</i>
S <sub>7</sub>	0.92	-0.25	-0.18	0.89	-0.06	-0.25	-0.52	-0.42	-1.14	0.20	1.71	1.73	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Bl</i>
S <sub>8</sub>	1.14	-0.47	-0.16	0.87	-0.52	-0.03	-1.39	1.00	-0.39	0.30	2.75	2.94	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Bji</i>
S <sub>9</sub>	0.90	-0.54	0.13	0.75	-0.18	-0.14	0.34	1.85	0.26	0.47	2.11	2.46	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Dli</i>
S <sub>10</sub>	1.07	-0.32	0.12	0.36	-0.13	-0.22	-2.55	-1.46	-3.60	0.82	4.65	5.32	0	1	1	<i>Cl</i>	<i>Cl</i>	<i>AFi</i>
S <sub>11</sub>	1.03	-1.02	0.07	0.83	0.01	-0.10	0.20	0.28	-0.37	1.06	0.74	1.61	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Cl</i>
S <sub>12</sub>	0.63	1.10	-0.64	0.30	1.70	-0.83	0.09	2.55	-1.17	0.71	0.94	1.64	0	0	0	<i>Dli</i>	<i>Dli</i>	<i>Eli</i>
S <sub>13</sub>	0.86	-0.38	0.14	-0.96	-0.25	0.93	-0.16	1.55	-0.15	1.99	2.25	2.20	0	0	0	<i>Cl</i>	<i>BHi</i>	<i>Dli</i>
S <sub>14</sub>	0.92	-0.38	-0.41	0.13	0.47	-0.34	0.26	2.42	0.02	1.17	1.98	2.90	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Eli</i>
S <sub>15</sub>	0.00	0.00	0.00	0.66	-0.14	-0.18	0.00	0.00	0.00	0.70	0.70	0.00	0	0	0	<i>0</i>	<i>0</i>	<i>0</i>
S <sub>16</sub>	1.02	-1.34	0.22	0.55	-0.44	0.38	-2.74	-0.68	3.42	1.03	4.48	4.98	0	1	1	<i>Cl</i>	<i>Cl</i>	<i>AGi</i>
S <sub>17</sub>	-0.52	-0.41	1.88	-0.13	2.60	-1.57	-2.28	-1.12	-2.02	4.59	4.32	4.34	1	1	1	<i>BHi</i>	<i>Eli</i>	<i>Aji</i>
S <sub>18</sub>	1.18	-0.86	-0.25	-0.97	-1.00	3.10	-2.55	-1.46	-3.60	3.98	6.89	5.05	1	1	1	<i>Cl</i>	<i>BHi</i>	<i>AFi</i>
S <sub>19</sub>	1.01	-0.08	-0.05	0.33	1.04	-1.00	-2.32	-0.68	-0.55	1.62	3.19	3.41	0	0	0	<i>Cl</i>	<i>Dli</i>	<i>Aji</i>
S <sub>20</sub>	1.05	-1.69	0.03	0.76	0.03	-0.23	-1.33	0.46	-1.97	1.77	2.76	3.78	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Bji</i>
S <sub>21</sub>	0.57	-0.27	0.22	1.02	-0.10	-0.18	-0.04	3.16	-0.25	0.63	3.43	3.51	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Eli</i>
S <sub>22</sub>	0.81	-0.96	-0.14	0.31	0.04	0.37	-1.54	0.42	-0.98	1.24	2.32	2.86	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Bji</i>
S <sub>23</sub>	0.71	-1.04	0.28	-0.57	-0.26	0.11	-2.34	-1.00	-2.93	1.51	3.59	4.43	0	0	1	<i>Cl</i>	<i>Bl</i>	<i>AFi</i>
S <sub>24</sub>	0.59	-1.08	0.59	-1.51	-0.24	-0.16	-1.69	-0.38	-0.26	2.38	0.24	2.53	0	0	0	<i>Cl</i>	<i>Aji</i>	<i>Aji</i>
S <sub>25</sub>	0.26	0.09	0.70	0.09	0.20	0.81	-1.06	0.49	-0.40	0.23	1.69	1.77	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Bji</i>
S <sub>26</sub>	1.02	-1.34	0.22	-1.02	2.08	2.04	-0.50	3.25	1.32	4.38	1.47	4.96	1	0	1	<i>Cl</i>	<i>BHi</i>	<i>EHi</i>
S <sub>27</sub>	0.76	0.10	-0.22	0.76	-0.23	-0.39	-1.38	0.12	-0.84	0.38	2.21	2.22	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Bji</i>
S <sub>28</sub>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	<i>0</i>	<i>0</i>	<i>0</i>
S <sub>29</sub>	0.08	-0.73	1.04	-0.93	-1.42	3.00	0.87	-0.52	-0.03	2.31	3.64	1.35	0	0	0	<i>Cl</i>	<i>BHi</i>	<i>Cl</i>
S <sub>30</sub>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	<i>0</i>	<i>0</i>	<i>0</i>
S <sub>31</sub>	0.83	-1.71	-0.66	-0.07	-0.41	0.53	0.34	1.76	0.60	1.99	2.20	3.73	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Dli</i>
S <sub>32</sub>	1.00	-0.02	-0.50	0.17	-0.37	1.06	-1.80	-0.24	-0.48	1.79	2.50	2.81	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Aji</i>
S <sub>33</sub>	0.45	-1.54	-0.80	0.00	0.00	0.00	-0.68	1.59	-1.22	1.80	2.12	3.36	0	0	0	<i>Cl</i>	<i>0</i>	<i>Dli</i>
S <sub>34</sub>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	<i>0</i>	<i>0</i>	<i>0</i>
S <sub>35</sub>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	<i>0</i>	<i>0</i>	<i>0</i>
S <sub>36</sub>	0.45	-0.37	0.53	-1.38	-0.69	0.19	-2.19	-0.89	1.64	1.90	1.67	2.91	0	0	0	<i>Cl</i>	<i>0</i>	<i>AHi</i>
S <sub>37</sub>	1.05	-0.41	-0.30	-0.93	-1.42	3.00	0.20	2.55	-0.50	3.97	5.41	3.09	1	1	0	<i>Cl</i>	<i>BHi</i>	<i>Eli</i>
S <sub>38</sub>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	<i>0</i>	<i>0</i>	<i>0</i>
S <sub>39</sub>	-0.08	-1.17	1.87	0.22	0.59	-0.91	0.00	0.00	0.00	3.31	1.11	2.21	0	0	0	<i>CHi</i>	<i>Cl</i>	<i>0</i>
S <sub>40</sub>	0.80	0.03	-0.41	0.44	0.93	-0.73	-0.17	4.04	0.31	1.02	3.33	4.18	0	0	1	<i>Cl</i>	<i>Dli</i>	<i>Eli</i>
S <sub>41</sub>	0.39	-0.57	0.47	0.82	0.16	-0.20	0.92	0.33	-0.27	1.08	0.21	1.28	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Cl</i>
S <sub>42</sub>	0.71	-0.41	-0.51	-0.67	-0.08	0.75	0.00	0.00	0.00	1.90	1.01	0.97	0	0	0	<i>Cl</i>	<i>BHi</i>	<i>0</i>
S <sub>43</sub>	0.64	-0.18	0.22	-1.56	-0.84	2.96	0.00	0.00	0.00	3.58	3.45	0.70	0	0	0	<i>Cl</i>	<i>AHi</i>	<i>0</i>
S <sub>44</sub>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	<i>0</i>	<i>0</i>	<i>0</i>
S <sub>45</sub>	0.66	-0.48	-0.01	0.87	-0.03	-0.10	-0.59	1.00	0.57	0.50	1.90	2.03	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>DHi</i>
S <sub>46</sub>	-0.52	-0.41	1.88	0.00	0.00	0.00	0.04	2.30	0.34	1.99	2.32	3.16	0	0	0	<i>BHi</i>	<i>0</i>	<i>Eli</i>
S <sub>47</sub>	0.97	-0.39	-0.13	0.35	1.38	-0.89	0.00	0.00	0.00	2.02	1.67	1.06	0	0	0	<i>Cl</i>	<i>Dli</i>	<i>0</i>
S <sub>48</sub>	0.95	-0.69	-0.43	-0.05	2.49	-1.31	0.00	0.00	0.00	3.45	2.82	1.25	0	0	0	<i>Cl</i>	<i>Eli</i>	<i>0</i>
S <sub>49</sub>	0.26	-0.71	0.98	0.41	-0.48	0.61	0.00	0.00	0.00	0.46	0.88	1.24	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>0</i>
S <sub>50</sub>	-1.12	-0.51	2.53	-0.33	-0.11	0.21	0.27	1.25	-0.08	2.49	1.52	3.45	0	0	0	<i>BHi</i>	<i>Bl</i>	<i>Dli</i>
S <sub>51</sub>	0.95	-0.61	0.12	0.83	0.04	-0.08	-1.93	-0.65	-1.51	0.69	3.19	3.31	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Aji</i>
S <sub>52</sub>	1.09	-0.83	-0.41	-0.57	1.06	1.44	0.00	0.00	0.00	3.12	1.87	1.43	0	0	0	<i>Cl</i>	<i>DHi</i>	<i>0</i>
S <sub>53</sub>	0.60	-1.22	0.65	-0.36	-0.80	2.09	-0.84	0.73	-0.77	1.78	3.28	2.80	0	0	0	<i>Cl</i>	<i>CHi</i>	<i>Dji</i>
S <sub>54</sub>	0.92	-1.10	-0.73	-2.26	-0.43	1.80	0.00	0.00	0.00	4.11	2.92	1.61	1	0	0	<i>Cl</i>	<i>AHi</i>	<i>0</i>
S <sub>55</sub>	0.81	0.00	-0.30	-1.09	-0.12	2.16	-1.07	0.09	-0.91	3.10	3.07	1.98	0	0	0	<i>Cl</i>	<i>BHi</i>	<i>Bji</i>
S <sub>56</sub>	1.08	-0.62	-0.23	1.05	-0.42	0.04	0.00	0.00	0.00	0.34	1.13	1.27	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>0</i>
S <sub>57</sub>	0.92	-0.23	0.15	0.81	-0.08	-0.11	-2.64	-1.25	-3.23	0.32	4.80	5.02	0	1	1	<i>Cl</i>	<i>Cl</i>	<i>AFi</i>
S <sub>58</sub>	0.95	-0.24	0.15	-2.20	-0.25	2.92	-2.91	-1.45	-3.61	4.20	6.68	5.52	1	1	1	<i>Cl</i>	<i>AGi</i>	<i>AFi</i>
S <sub>59</sub>	1.32	-1.20	-0.72	-0.47	0.82	-0.15	0.00	0.00	0.00	2.75	0.95	1.92	0	0	0	<i>Cl</i>	<i>Dli</i>	<i>0</i>
S <sub>60</sub>	1.00	-0.59	-0.32	-1.09	-0.12	2.16	0.13	2.78	0.56	3.27	3.53	3.59	0	0	0	<i>Cl</i>	<i>BHi</i>	<i>Eli</i>
S <sub>61</sub>	1.16	-1.10	-0.21	0.30	-1.13	0.88	-2.91	-1.45	-3.61	1.39	5.53	5.31	0	1	1	<i>Cl</i>	<i>Cl</i>	<i>AFi</i>
S <sub>62</sub>	0.88	-0.33	-0.10	0.87	0.19	0.03	-1.58	0.41	0.98	0.54	2.64	2.79	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>BHi</i>
S <sub>63</sub>	0.37	0.05	0.58	-0.05	0.51	0.28	-0.11	0.01	0.95	0.69	0.83	0.60	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Cl</i>
S <sub>64</sub>	0.83	-0.92	-0.28	0.18	1.00	-0.17	0.32	0.95	-0.35	2.03	0.23	1.94	0	0	0	<i>Cl</i>	<i>Dli</i>	<i>Dli</i>
S <sub>65</sub>	1.07	-1.01	-0.32	0.43	-0.85	0.93	-1.72	-0.60	-0.39	1.41	2.53	2.82	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Aji</i>
S <sub>66</sub>	0.41	-0.70	-1.16	0.56	-0.01	-0.02	-1.73	-0.83	-0.94	1.34	2.60	2.16	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>Aji</i>
S <sub>67</sub>	0.85	-0.05	-0.25	-1.88	-0.08	1.78	-1.63	0.20	-1.02	3.40	2.83	2.61	0	0	0	<i>Cl</i>	<i>AHi</i>	<i>Bji</i>
S <sub>68</sub>	-0.39	-0.26	1.37	-0.60	1.33	0.01	-1.29	0.16	-0.99	2.11	1.68	2.56	0	0	0	<i>BHi</i>	<i>Dli</i>	<i>Bji</i>
S <sub>69</sub>	0.92	-0.86	-0.50	0.89	-0.20	-0.41	0.00	0.00	0.00	0.67	1.00	1.36	0	0	0	<i>Cl</i>	<i>Cl</i>	<i>0</i>
S <sub>70</sub>	0.98	-0.34	-															

As each subject's *Kansei* status in the three lifecycle stages is quantifiably represented by three points specified by X, Y and Z dimensions, the distance between these points indicates the level of the subject's *Kansei* changes during the stages. Accordingly, the higher distance than 'Av.+SD' is considered important while indicating a drastic change of a subject's *Kansei* status during two lifecycle stages. The resulted Average distances, SD and the addition of these two parameters relevant to the Japanese subjects are respectively 2.27, 1.45 and 3.72 (Av.+ SD=2.27+1.45=3.72). The ones relevant to the Iranian subjects are also 2.23, 1.58 and 3.81 (Av.+ SD=2.23+1.58=3.81). As the result, the important cases of the Japanese and Iranian subjects' *Kansei* evolution during the lifecycle stages of their mobile phones being identified through their belonging X-Y and X-Z clusters in each stage are also highlighted respectively in Tables 4 and 5.

Figure 11 Important patterns of *Kansei* evolution extracted from Japanese subjects' responses

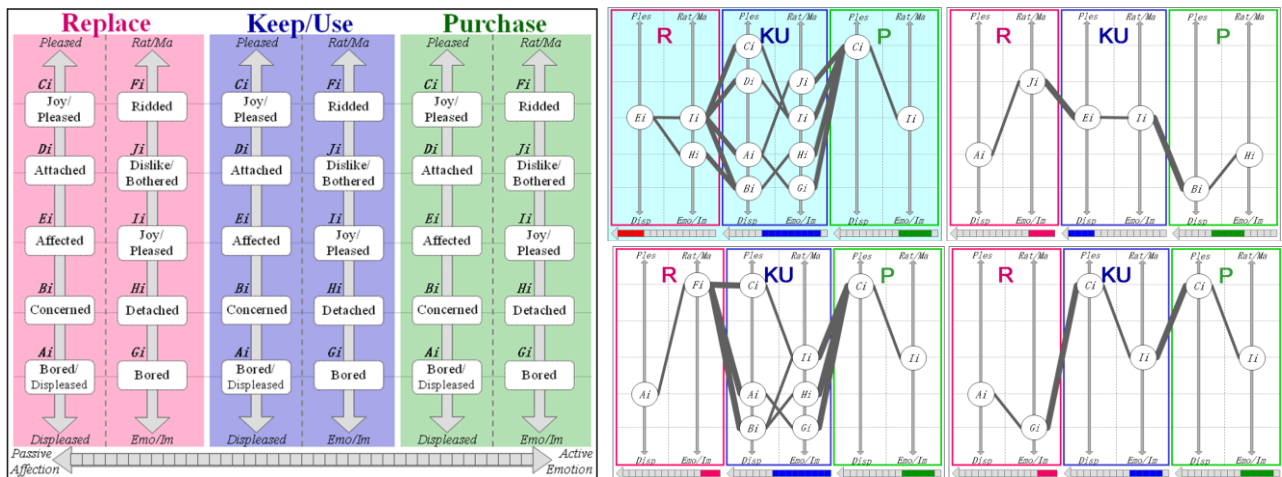


Figure 12 Important patterns of *Kansei* evolution extracted from Iranian subjects' responses

On the basis of the similarity of the clusters belonging to the important cases in R stage, namely the eventuation of their *Kansei* evolutions, these cases could be set into four main classes regarding each country's subjects. The resulted classes of the extracted patterns of the Japanese and Iranian subjects' *Kansei* evolutions during the lifecycle stages of their mobile phones are visualized into two diagrams respectively shown in Figures 11 and 12. The colored part in the scaled arrow located below each stage in the diagramed classes is to indicate the position of the ongoing clusters in that stage beside '*Passive Affection - Active Emotion*' directions. As there is a reversely similarity between the axis directions in the distribution graphs derived from the Japanese and Iranian subjects' responses, the axis (X-Y-Z) directions order relevant to the Japanese subjects is considered as the base in the format of diagrams. Accordingly, in the

diagram relevant to Iranian subjects (Fig. 12), the axis directions are adapted to the same order as Japanese subjects' one to be more easily comparable. As the result, the eventual *Kansei* statuses in all four classes of the patterns extracted from the Japanese subjects' responses are good or positive, whereas such statuses in the classes extracted from the Iranian ones are almost negative. However, just in one class relevant to the Iranian subjects, which is highlighted in Figure 12, there is a low degree of positivity namely eventual affective relation.

## Interpretation and Discussion

Iran and Japan have two quite different contexts of mobile phone market. In Japan, the presented mobile phone devices are almost the regionally localized product designed specifically for Japanese users while the carriers are offering the very advanced and wide services. But the presented mobile phone devices in Iran almost belong to the global market. The Iranian mobile phone users are bereft of so many services such as internet, online search and navigation. Comparing with last 5 years, the number of mobile phone users is drastically increased in Iran. Nowadays the Iranian students almost have their own mobile phone, whereas 5 years ago only less than half of them had it (Zafarmand, Sugiyama, Watanabe, & Ono, 2006b).

As the general results of investigation show, mobile phone is approximately a short-lived product in both countries. However, its lifetime is actually a little longer in Iran than Japan. Considering the contextual differences between Iran and Japan from socio-cultural, economic and industrialization points of view, the Japanese subjects' backgrounds and experiences in mobile phone use and replacement are naturally higher than the Iranian subjects. But mobile phone replacement reasons in Iran are more various than in Japan; seemingly the more standardized individuals belonging to a more industrialized country. In both countries, the similar top/main reasons for replacing mobile phone including 'defect', 'broken' and 'oldness' are almost actual, rational or somehow objective. Nevertheless, for the Japanese users 'novelty' and 'service' and for the Iranian users 'facilities', and 'form' are also among the top main reasons of replacement. Majority of both countries' subjects are satisfied with and interested in their current mobile phones. However, in Japan the percentage of those being satisfied is lower than of those liking their current mobile phones, but in Iran vice versa.

The *Kansei* items derived from the investigations of the Japanese and Iranian subjects despite of having some similarity are not the same. This point emphasizes the highly effect of context socio-culturally and linguistically on a user's *Kansei* about a product and his/her responded words in this regard. As the distribution graphs of the items (Figures 7 and 8) show, the main axis (X) directions relevant to the Japanese and Iranian subjects, which generally identify the most ongoing reciprocal trend of the items derived from each context, are not the same. The one relevant to the Japanese subjects is 'Active Emotion - Passive Affection', whereas the one relevant to the Iranian subjects being 'Displeased - Pleased'. Furthermore, numerous clusters of the items are located near the directions of 'Passive Affection' in the graphs relevant to Japanese subjects and of 'Displeased' in the ones relevant to Iranian subjects.

A pattern of *Kansei* evolution eventuating in a cluster of *Kansei* items with a positive *Kansei* status indicates a state of PSjS. As all of the classes of the patterns of *Kansei* evolution extracted from the Japanese subjects' responses have eventuated in the positive statuses, there is seemingly a tangible state of PSjS in mobile phone market of Japan. Unlikely, most of the classes of the patterns of *Kansei* evolution extracted from the Iranian subjects' responses have eventuated in the negative statuses. Therefore, it seems that product subjective un-sustainability is an ongoing issue in mobile phone market of Iran. Nevertheless, there is a low or potential degree of PSjS in one of the classes relevant to Iranian subjects.

Combining the X-Y and X-Z clusters of the subjects' *Kansei* status in R stage regarding the resulted classes of the important patterns of the subjects' *Kansei* evolution, on the one hand, there are four main trends of PSjS being ongoing in mobile phone market of Japan. The first one identified by clusters A and F characterized as Attached and Attached/Lonely can be called Affectional Attachment. The second one identified by clusters C and G both characterized as Gratitude can be called Gratification. The third one identified by clusters D and F characterized as Ally and Attached/Lonely can be called Rational/Associational Attachment. And the last one identified by clusters E and F characterized as Lonely and Attached/Lonely can be called

Emotional Attachment. The above-mentioned three kinds of attachment imply that there is a clear demarcation between various kinds of relationship, which could be in affective, collaborative and/or emotive way between a user and his/her object as well as human, and the consequent attachments in Japan.

On the other hand, there are three main trends of product subjective un-sustainability occurring in mobile phone market of Iran. The first one identified by clusters *Ai* and *Fi* characterized as Bored/Displeased and Riddled can be called Affectional Detachment. The second one identified by clusters *Ai* and *Gi* characterized as Bored/Displeased and Bored can be called Boredom or Emotional Detachment. The third one identified by clusters *Ai* and *Ji* characterized as Bored/Displeased and Dislike/Bothered can be called Emotional Objection/Dissatisfaction. However, there is also a potential trend of PSjS in Iran. This potential trend can be identified by cluster *Ei* characterized as Affected in R stage followed by clusters *Ci* or *Di* and *Ii* characterized as Joy/Pleased or Attached and Joy/Pleased in KU stage. As this trend involves a degree of affective, emotive and/or associative relation with mobile phone at the same time, it can be called generally Psychological Attachment. Therefore, unlike the Japanese subjects, the Iranian subjects' responses have not indicated a clear demarcation of the various kinds of affective, collaborative and/or emotive relationship with their mobile phones and the consequent psychological attachment. Such a point reemphasizes the highly effect of context on PSjS.

## Conclusion

The actual lifetime of Mobile phone, as an approximately short-lived product, is not the same in different contexts. The majority of Iranian users cannot afford to quickly replace their mobile phone, even though they don't like it. Despite of the longer actual lifetime of mobile phone in Iran than Japan, product subjective un-sustainability is seemingly an ongoing and egregious problem in mobile phone market of Iran. This point led us to conclude that PSjS is not necessarily analogous to a longer lifetime of product. Product subjective un-sustainability at least has three main trends including: Affectional Detachment; Boredom or Emotional Detachment; and Emotional Objection or Dissatisfaction. On the other hand, PSjS has at least four major trends including three different kinds of attachment and a state of gratification. Attachment, as the most important trend of PSjS, may appear into the following levels: deep, permanent, passive or affective; partnership, association or collaborative; and shallow, temporary, active or emotive. Besides, the trend of gratification indicates a good utility of mobile phone and at the same time cherishing it as an important and valuable object. In order to extend the subjective lifetime of mobile phone various design solutions or means being fit to the above-mentioned trends of PSjS should be applied. According to the findings of this research, PSjS in fact is not necessarily the issue of a constant *Knasei* toward a product. Rather, it would be the result of various emotions, feelings or moods, etc regarding a product and their evolution while being mostly good or pleasant or dynamically positive and becoming mature alongside the product's expected lifespan being over.

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