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Design Approach to Improve *Kansei* Quality Based on *Kansei* Engineering

Nam-Gyu Kang
Future University Hakodate, Japan

1. Introduction

In recent years, design has improved with development of manufacturing techniques. Only products that satisfy the consumer survive. *Karino* [1] has suggested the 3 types of quality based on relationship with physical fulfillment and individual satisfaction of designed objects; 1) *Must-be* quality, 2) *One-dimensional* quality, such as usability and operability and 3) *Attractive* quality, such as pleasantness, preference. *Attractive* quality is especially related to the user's potential needs because it is deeply related with the user's *Kansei* (emotional) satisfaction. Furthermore, Noman [2] has suggested 3 levels in design; visceral, behavioral, and reflective design engaging the appearance, efficiency and satisfaction (personal, memories etc) respectively.

Against this background, many approaches based on *Kansei* engineering have been conducted in Japan with the aim of offering more likeable designs. However, *Kansei* engineering does not have a long history. In a 1986 lecture at the University of Michigan the president of *Mazda* Motor Corporation introduced Professor *Nagamachi*'s car design process based on *Kansei* engineering. In the design process, perceptions of users' were analyzed statistically. *Kansei* engineering has since then been used worldwide leading to the development of the Japan Society of *Kansei* Engineering (JSKE). JSKE quantifies various characteristics of design to meet vast individual needs. In 2007 the Japanese Ministry of Economy accepted a 'Declaration for creating *Kansei* Value' as a national declaration further boosting public interest in *Kansei* quality [3]. These foregoing highlights the importance of *Kansei* quality in the future design. Clarifying the role and potential of *Kansei* engineering in design is crucial to the development of *Kansei* quality. Using *Kansei* engineering case studies this paper examines the role and potential of *Kansei* and *Kansei* quality.

2. *Kansei* and *Ksei* quality

The word *Kansei* has been used variously by researchers in relation not only to design but also to other research fields. It is therefore imperative to define *Kansei, Kansei quality* and subsequently, to address the relationship between the two in relation to the design process.

2.1 What is *Kansei* in design?

According to the Japanese dictionary, origin of *Kansei* is a German philosopher "Sinnlichkeit" of *Kant*. Elsewhere *Kansei* is interpreted as "the ability of sense", "the power of intuition" and "Sensibility".

According to many *Kansei* researches, *Kansei* is different from *Chisei* (This word is Japanese meaning intelligent), which works to increase knowledge or understanding by verbal description of logical facts also [4]. *Kansei* and *Chisei* are processed by the mind when information is received from the external world. *Tsuji* also refers to *Kansei* as the opposite of *Chisei* [5]. *Harada* [6] goes further to list three major characteristics of *Kansei* as; 1) human expression based on added knowledge and experience to inborn dispositions; 2) the ability to react to and evaluate external stimuli intuitively; and 3) the interaction of intuition and intelligent activity. P. Levy [7] defines *Kansei* as 'an internal process (or function) of the brain, involved in the construction of intuitive reaction to external stimuli'. For purposes of this paper therefore *Kansei* is defined as "the intuitive reaction to external stimuli based on one's past experiences".

In design, *Kansei* is understood as the important action of the heart to express imagery. *Kansei* works to evaluate an ambiguous feeling and impression of intuitive facts. The A design created through a designers' *Kansei* becomes a stimulus which the user psychologically evaluates. The designer must therefore understand his/her own *Kansei* as well as the user's *Kansei.*

2.2 What is *Kansei* quality in design?

As I have described previously, there are 3 types of qualities, *Must-be* quality, *One-dimentional* qulity and *Attractive* quality, in the designed object (Fig.1). Even if anyone evaluates the *Must-be* quality or *One-dimentional,* the evaluation results of those are almost same because those qualities were evaluated with the basic demand or the changing demand based on one's conscious standard. In contrast, the evaluation results of *Attractive* quality are different depend on the individual because the *Attractive* quality was evaluated with the potential demand based on the one's subconscious standard. The basic demand is the factor what is satisfied no matter what. The changing demand is depend on change of satisfaction level. However, the potential demand is factor to exceed the expectation of a user. In that case, almost of the users did not expectant or didn't even notice the potential demand.

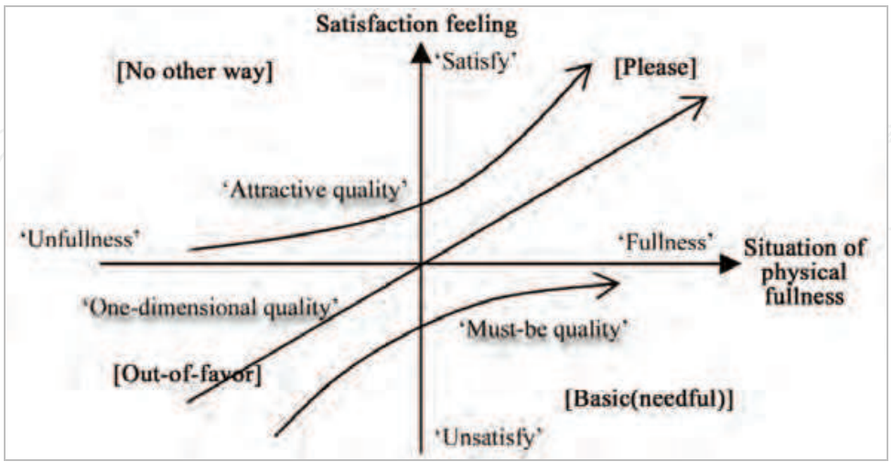

Fig. 1. A reflection of physical fulfillment and user satisfaction from an object

According to *Shimaguchi*'s research, there are extensional meaning (=dictionary meaning) and intentional meaning (=implicative meaning) in a designed object. If anyone evaluates

the intentional meaning in the object, the results of evaluation are almost same. However, the evaluation results of intentional meaning are different depend on the individual. To synthesize the previous research, *Kansei* quality can be summarized as following; *Kansei quality is the intentional meaning of the object, it is evaluated intuitively with the tacit knowledge based on the human's past experiences.* This *Kansei* quality was related in human's potential demand. If we improve *Kansei* quality in design, we have to understand a users' tacit knowledge (they don't even notice.) based on their daily experiences.

3. Case study 1: *Kansei* library search system '*MegLook*'

There are several search systems in a library. However, almost of all of these systems use keywords such as author, title or genre for searching. These systems require previous knowledge of what is being searched for. In other words, these systems can be called *Chisei* (=intelligence) dependent systems. These library search (LS) systems are very useful for users such as adults who have previous specific knowledge about what they are searching for. However, these systems are not helpful for children who don't have previous specific knowledge. Sometimes a user lacks sufficient literal or specific information about a book they need. Moreover, in addition to keywords many library search systems re several require multiple step processes that can be time consuming and difficult.

The purpose of this study was to propose a new *Kansei* LS system for children based on behavior and to demonstrate the superiority of the *Kansei* LS system. The '*Kansei* system' in this case was defined as a system that can be operated intuitively with nothing but the tacit knowledge gained through one's past experiences. No special knowledge would be required to operate the system. Moreover, in the process of operating the system users would be able to experience positive changes of emotion such as 'comfort', 'pleasantness', 'a desire to use the system more' and so on [7].

In this chapter a *Kansei* quality LS system developed by our research team based on observation of child behavior is discussed.

3.1 Survey

3.1.1 Method of survey

Many researchers use human behavior as *Kansei* information that is rich and varied. There is even an 'Association for Behavior Analysis' in Japan [8]. It is therefore feasible to meet potential needs of users by observation of their behavior. In other words, observation of user behavior is very important for the development of *Kansei* quality in design.

3.1.2 Results of survey

There are two types of LS system in *Hakodate* City Library; one is for adults and the other is for children. However, if a child wants to search using the LS system for children, the child has to input the keywords such as author, title or genre etc. Many children cannot use the LS system without the previous specific knowledge about what they are searching for. Actually, there were few cases in which children successfully used the LS system in without assistance.

An analysis of behavioral patterns (Fig 2) revealed that the keyword search system was difficult for many users, especially children. Many children searched for and selected books based on ambiguous information such as graphical images from the front book cover, the book spine and perceptions from looking at 3 or 4, 5 pages.

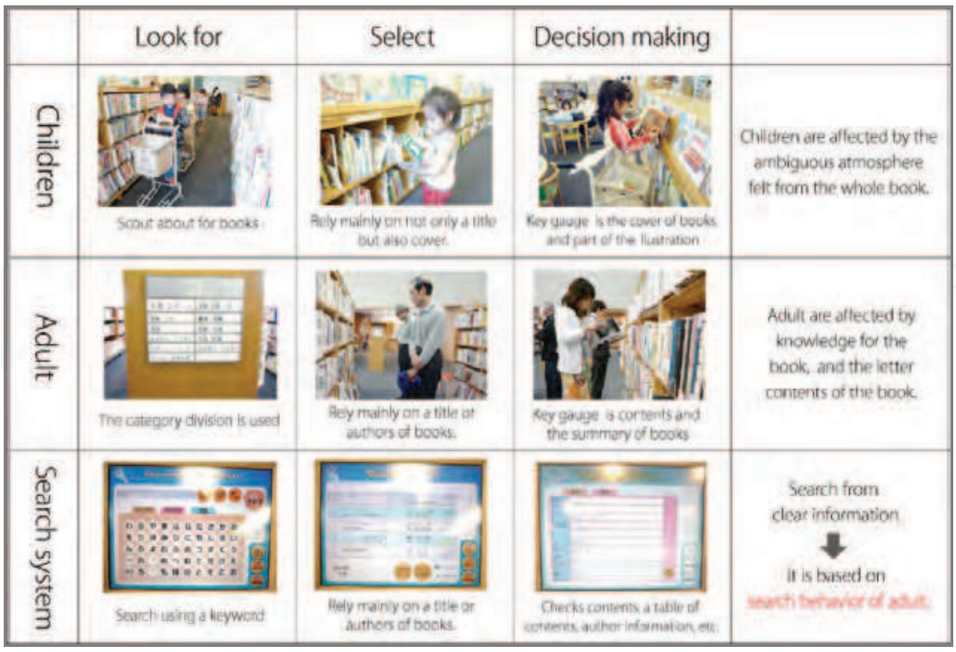

Fig. 2. Analysis of behavioral patterns in selection of books at *Hakodate* Library

3.2 Proposal of Kansei LS system *'MegLook'*

Based on these results, we proposed a new *Kansei* Library search system called '*MegLook*' [9]. With the '*MegLook*' system, users can intuitively select by simply looking at the book spines. After making an initial selection, users can look at graphical images of the book cover and five pages (Fig. 3). Using this information, users can decide if they like the book. Using a touch screen, users can also save or print this information for future reference.

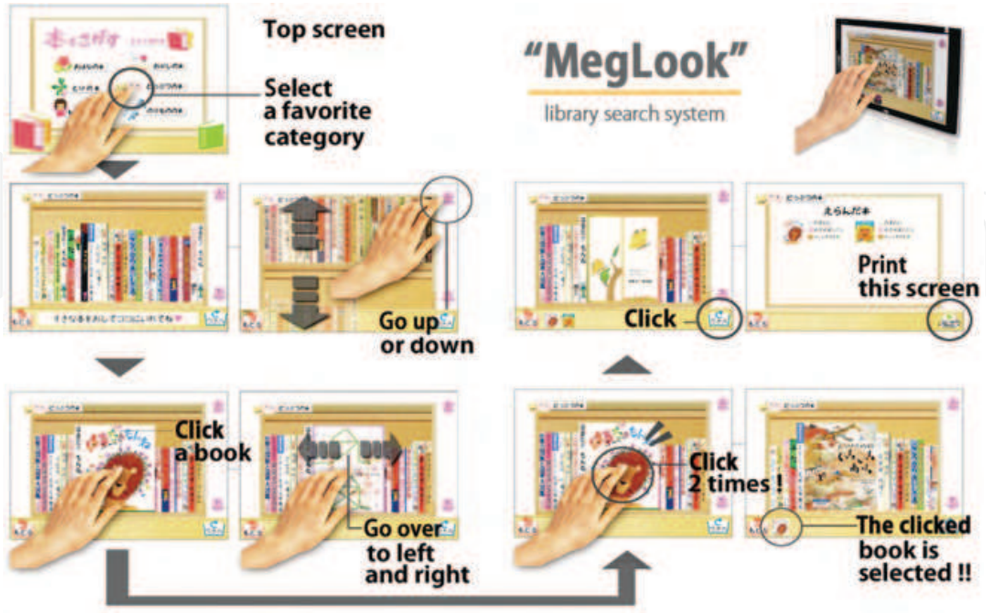

Fig. 3. The 'MegLook' Library search system based on *Kansei*

3.3 Evaluation experiment

The purpose of this experiment was to compare '*MegLook*' with the existing LS system. Special emphasis was given to *Kansei* quality of both systems.

3.3.1 Method of evaluation

Our field evaluations were conducted with two subject groups at the '*Hakodate* City Library'. There were 20 subjects in the child group (6 boys, 14 girls, average age 9.45 years old) and 10 subjects in the adult group (the children's parents). Subjects compared '*MegLook*' and the conventional LS system, using seven criteria: 1) Pleasantness (Pleasantness of experience), 2) Easy to understand (Ease of understanding system), 3) Easy to operate (Ease to operation), 4) Friendly (User-friendliness), 5) Preference (System preference), 6) Ease with which books could be found (Ease of search success) and 7) Wish to use the system more (User loyalty).
They also wrote comments after their evaluations. We gave the subjects only three evaluation choices because most of them were children.

3.3.2 Results of evaluation

For each of the criteria *MegLook*' was preferable to the conventional LS system (Table 2). This was especially significant for criteria 1, 5 and 7. The results show that the subjects were more satisfied with '*MegLook*' than the existing LS system. The adults found Meg Look preferable with respect to criteria 1, 4, 5 and 7. However, the '*MegLook*' did not do well criteria 3. The adults even found the conventional system preferable in terms of criterion 6 (Fig 3). For the adult group, finding a book on the current LS system was rather easier. We feel this is because they already have the specific knowledge and keywords (author, title and genre) to know what they are looking for. Adults also do not *browse* the books like children do so '*MegLook*' does not greatly enhance their search. It must also be noted that '*MegLook*' system was designed mainly for children thus the lower performance on criterion 6 among adults was considered to be insignificant. The results were compared with with Karino's 3 types qualities; *Must-be* quality, *One-dimensional* quality and 3) *Attractive* quality.
'*MeguLook*' did not score highly among the adult group in *One-dimensional* quality such as usability and operability, but it scored very highly in terms of *Attractive* quality such as *pleasantness, friendliness and preference*. Results from the children's group were however different from the adults (Fig. 4). All seven of their evaluation scores for '*MegLook*' were higher than the conventional LS system. '*MegLook*' scored very highly in the *wish to use more, preference, friendliness* and *pleasant* categories. They also scored *easy to operate* and *easy to find a book* higher than the existing LS system. The results prove that children can use '*MegLook*' without specialized knowledge on how to operate the system. Overall '*MegLook*' was the preferred system for both groups.

	Child			Adult			Total		
	A	Neither A nor B	B	A	Neither A nor B	B	A	Neither A nor B	B
Pleasant	1	2	17	0	0	10	1	2	27
Easy to understand	6	3	11	1	2	7	7	5	18
Easy to operate	2	4	14	2	4	4	4	8	18
Friendly	4	4	12	0	0	10	4	4	22
Preference	1	1	18	0	1	9	1	2	27
Easy find of book	3	5	12	5	1	4	8	6	16
Wish to use more	1	0	19	0	1	9	1	1	28

A: the existing LS system B: *MeguLook*

Table 2. Results of evaluation

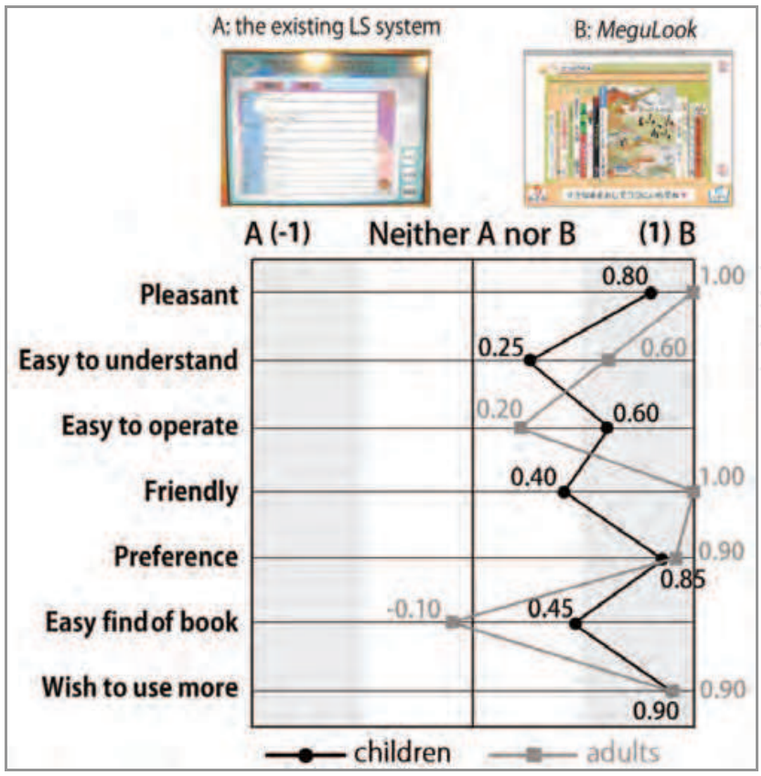

Fig. 4. Results of evaluation

3.4 Summary

We proposed '*MegLook*' based on behavioral analysis of how children search for and select books at a library. And through our field trials we proved '*MegLook*' is superior to existing LS systems. Since adults already have specific knowledge and are probably accustomed to the to the conventional LS system, their preferences for '*MegLook*' were not as high as those for the children's group. Even then, in terms of *Attractive* quality, '*MegLook*' was preferable for both groups. And in terms of one-dimension quality '*MegLook*' was preferable for the children's group. It can be concluded that '*MegLook*' was the preferable system that brought the most pleasure to the search experience.

4. Case study 2: Kansei medical information system '*mellonet*'

Recently, several proposals for the development of new medical environments for elderly patients through medical information systems (MI systems) have been made. However users often fail to adjust to the fast pace at which information technology products evolve. As a result many of proposed MI systems are of little use to elderly patients. Against this background, a new MI system, named *'mellonet'* was developed by our research team[10].

4.1 Proposal of *'mellonet'*

'mellonet' was proposed based on two observations; 1) usage of MI systems in a hospital by elderly patients and 2) behavior of elderly patients using special equipment during hospitalization. 'm*ellonet'* is operated using an intuitively operated simple touch screen or a

device similar to television remote control. Both of these tools were deemed easy for elderly users. *'mellonet'* helps to check patient's MI and to support communication between the elderly patient and the his/her caregiver or the medical staff. For easy accessibility, the system is placed at the bedside in a hospital or living room at home (Fig 5).

Fig. 5. *mellonet* system

4.2 Evaluation experiments

4.2.1 Method of evaluation

The purposes of this research were to visualize the characteristic of *Kansei* quality in our new MI system *'mellonet'* and to determine effectiveness of *'mellonet'*. The subject searched for medical information with *'mellonet'* and a conventional MI system. Two analyses were performed; 1) familiarity with information devices as a factor of age and 2) evaluation of *Kansei* quality in our new MI system *'mellonet'* by factor analysis using the SD method. The subjects were divided into 3 groups; 1) 20's group (19 subjects, average age: 20.8), 2) 30's to 40's group (8 subjects, average age: 42.5) and 3) 50's to 60's group (8 subjects, average age: 59.5). Each subject selected a familiar information device such as 'TV', 'internet device', 'cellular phone' and 'fixed-line phone'.

The subject then performed 15 tasks such as 'Checking for operation schedules', 'Watching the TV', 'looking up drugs' with *'mellonet'* and the existing MI system (Fig. 6). To improve reliability the order in which the systems were operated was random. Behavior of the subjects was recorded with a video camera for protocol analysis. Finally, the subject's perception of each system was evaluated using the SD method based 15 criteria selected from previous research [11] information system evaluation. A 5 level evaluation was used for each criterion.

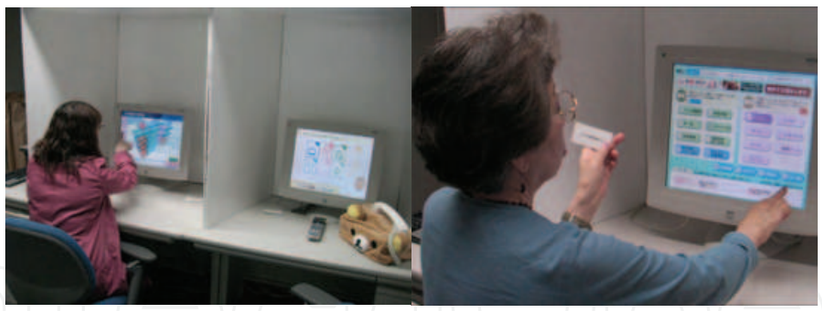

Fig. 6. Scenes from the experiment

4.2.2 Results of evaluation

From the survey of familiar devices, all subjects of the 50′ to 60′ group were more familiar with 'TV' and 'fixed-line phone', and fewer were familiar with 'internet device'. On the other hand, all subjects of the 20′ group were more familiar with 'internet device' and 'cellular phone'. Table 3 shows these results. From these results it was TV and TV remote control in were selected for use in *'mellonet'*.

	20's	30's-40's	50's-60's	Average
Television	84.2	100.0	100.0	94.7
Internet device	100.0	75.0	37.5	70.8
Cellular phone	100.0	75.0	62.5	79.2
Fixed-line telephone	15.8	100.0	100.0	71.9

Table 3. Adoption rate by age (Familiar device as a factor of age of subjects)

On behavior of subjects, protocol analysis revealed that average time for completion of tasks with the conventional MI increased with advancing age ($F(2.32) = 19.00$, $p < 0.01$) (Table 4). However with '*mellonet*' average completion time per taks was shortened and there were no significant differences between age groups. Similarly the average number errors in operation increased with advancing age ($F(2.32) = 14.88$, $p < 0.01$) when subjects used the conventional MI. However with '*mellonet*' there were fewer errors and no significant differences between age groups in the number of errors. The results indicate that even elderly patients can use '*mellonet*' intuitively without the special knowledge on how to operate the system.

Subject	Average time for one operation (sec.)		Average number of times of error in operation	
	the exisitng MI system	*mellonet*' MI system	the exisitng MI system	*mellonet*' MI system
20's	20.73	14.48	0.67	0.03
30's to 40's	28.53	16.22	1.75	0.25
50's to 60's	34.99	19.63	2.5	0.00
Variance analysis	$F(2.32)=19.00$, $p<0.01$	n.s	$F(2.32)=14.88$, $p<0.01$	n.s

Table 4. Average taken time per task and average number of errors in operation

On the subject's perception of each system using SD method, '*mellonet*' was evaluated higher than the conventional MI system on most of the criteria (Figure 7). Significant differences

between subject perceptions of the two systems were observed for 8 criteria including convenience, unpleasantness, kindness, constraining, simplicity, gracefulness, harmony and complexity.

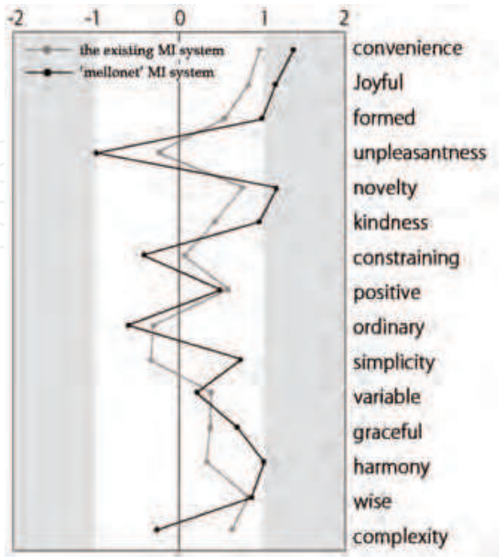

Fig. 7. Result of SD method

We conducted factor analysis using results from SD method. Table 5 shows the result of factor analysis. As a result of factor analysis, we could extract the 3 factors as comprehensive impression of both systems (table 5).

Variable	Factor 1: **Friendliness**	Factor 2: **Innovativeness**	Factor 3: **Sophisticatication**
simplicity	-0.832	0.325	0.250
difficult	0.734	-0.144	-0.034
free	-0.526	-0.232	0.069
unpleasantness	-0.542	-0.287	-0.206
convenience	0.510	0.198	0.233
kindness	0.491	0.004	0.321
formed	0.480	-0.191	0.427
original	0.021	-0.779	-0.037
variable	0.063	0.777	-0.486
positive	-0.153	0.667	0.160
novelty	0.090	0.551	0.072
joyful	0.377	0.434	0.213
awkward	0.013	-0.051	0.671
wise	-0.004	0.297	0.581
harmony	0.425	-0.118	0.444
Eigenvalues	3.987	2.976	3.698
Variance explained (%)	31.714	17.191	3.624
Cummulative variance explained (%)	31.714	48.905	52.529

Table 5. Results of factor analysis

The 3 factors analyzed were 'Friendliness', 'Innovativeness' and 'Sophistication' (table 5). The Figure 8 shows the scores of each factor for the two systems. These results show that many subjects, including the elderly, could operate the '*mellonet*' more quickly and easily than the conventional system. Moreover failure rate while using '*mellonet*' was lower than that while using the existing MI system. SD method results also showed that scores of "friendliness" and "refinement" were higher for the '*mellonet*' system. Moreover on analysis of the friendliness and sophistication factors shows that '*mellonet*' is significantly more friendly than the conventional system.

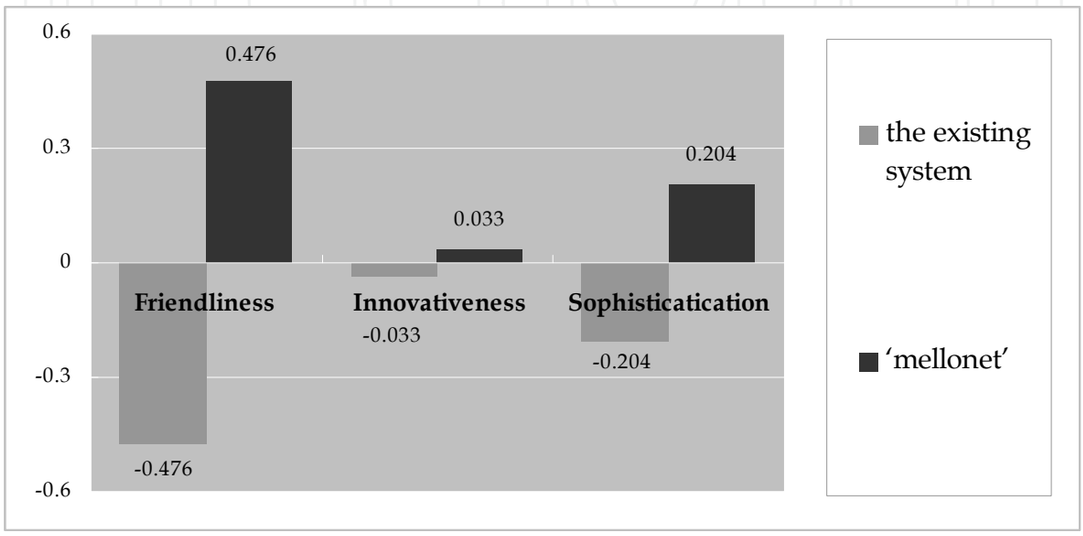

Fig. 8. Result of factor score of both systems.

4.3 Summary

From the results, we confirmed *mellonet*'s effectiveness and superiority as a *Kansei* MI System enabling even operation by elderly users through gained tacit knowledge based on daily experiences and without need for special knowledge. In other worlds, friendly characteristic of system is an indication of its *Kansei* quality.

5. Case study 3: *Kansei* photo browser system '*KanSya*'

Everyone has moving experiences resulting from stimuli such as movies, novels and so on. Such moving experiences can be described as *Kansei* (intuitive reaction to external stimuli based on one's past experiences). If we apply *Kansei* to photo browser system (PBS) design process, more users can have moving experiences. However, with the advent of digital photography and the resultant sheer volume of photographic data, browsing for a particular photograph can be difficult. One solution has been to add tags to the photos [4-6]. However, most tagging systems are based on the people in the photos, the places or dates. Unfortunately, such tagging methods do not allow *Kansei* based searches.

Therefore, this research focused on the construction of a PBS, with special attention paid to the emotive impressions from the photos. We propose creating *emotags (emotive + tags)* in addition to the tags already in use.

5.1 Survey

5.1.1 Method of survey

In order to design a PBS based on impression we must first define the characteristics of what one believes to be impressive. This survey sets out to clarify this by noting the details of the impression, the results of the impression (What made it impressive?) and emotions felt when recollecting these impressions, especially as to how they affected change. A questionnaire survey was conducted among 71 university students (40 men, 31 women). The survey method closely followed that of *Tokaji* [12]. With the help of three others, we categorized the results of the questionnaire survey using the KJ Method.

5.1.2 Results of survey

Most impact from photos (81.7%) was found to be from "Experience through others" (Table 6) rather than from "Self-Centered experiences." We concluded that people are impressed by experiences that are shared through and with other people.

Experience Through Others		Self-Centered Experience	
Friends・Family・Lovers	18(25.4%)	Live Concert	1(1.4%)
Club Activities	31(43.7%)	Test	4(5.6%)
Graduation	4(5.6%)	Movie・TV	3(4.2%)
People	1(1.4%)	Nature	2(2.8%)
Birth	4(5.6%)	Music	1(1.4%)

Table 6. Results based on the KJ Method

The reasons for impressions can be seen in Table 7. Many of the subjects gave many different reasons for one impression, leading us to believe that it is possible to have various reasons for an impression. Having totaled the results, we found that 'Unexpectedness & Surprise', 'Achievement', 'Thoughtfulness & Love' and 'Strength of Memory' were the most common.

Type	Subjects (%)	Details
Unexpected Surpised (26)	Friends / Family / Lovers 11 (42.3%)	Surprise birthday parties Getting a farewell note from a friend when moving from Sapporo
	Club 7 (26.9%)	Teacher always being angry but praising me at the end....
Achievement (26)	Club 22 (84.6%)	Winning All-Hokkaido, Personal & Group, in Jr. High School Receiving big applause at concert.
Thoughtfulness Love (23)	Friend / Family / Lovers 10 (43.4%)	Receiving strength and courage from a friend.
	Club 6 (26.0%)	What people said after winning or losing a match or game.
Strength of Memory (22)	Club 9 (40.9%)	The Finals (sports) in high school
	Friend / Family / Lovers 8 (36.3%)	The feeling after a school play.

Table 7. Reasons and Details of Impressions

The results of changes by impression were categorized to the three groups, 'motivation' (36.8%), 'outlook on others' (34.7%) and 'change in attitude' (28.5%). Within the group 'motivation', the criterion to try and/or try harder was the largest (20.8%). Within the group 'outlook on others', criteria of 'trust' (19.5%) and 'human love' (12.5%) were high. And finally, the criteria of 'broadened outlook' (11.1%) and 'change in thinking' (10.4%) were high in the group 'change in attitude'. We concluded that in terms of changes, these three groups are representative.

5.2 Proposal of PBS *'KanSya'*

The PBS '*KanSya*' [13] was proposed based on these results. The outline of the '*KanSya*' is shown figure 9.

1. Tag adding photo ;
   The user browses photos and sets an attribute such as 'Surprise', 'Achievement', 'Love' and 'Strength of Thought' (1). By this operation, photos are added tags and compiled into a database.
2. Photo browsing
   In photo browsing, the user enters the attribute of 'Surprise', 'Achievement', 'Love' and 'Strength of Thought' depending on their feelings (2). Then, the photos with the attribute similar to the entered one are displayed in sequence (3). By using this system, the user can browse photos using attributes such as 'moving experience by surprise', 'moving experience by achievement' for the many previous experiences.

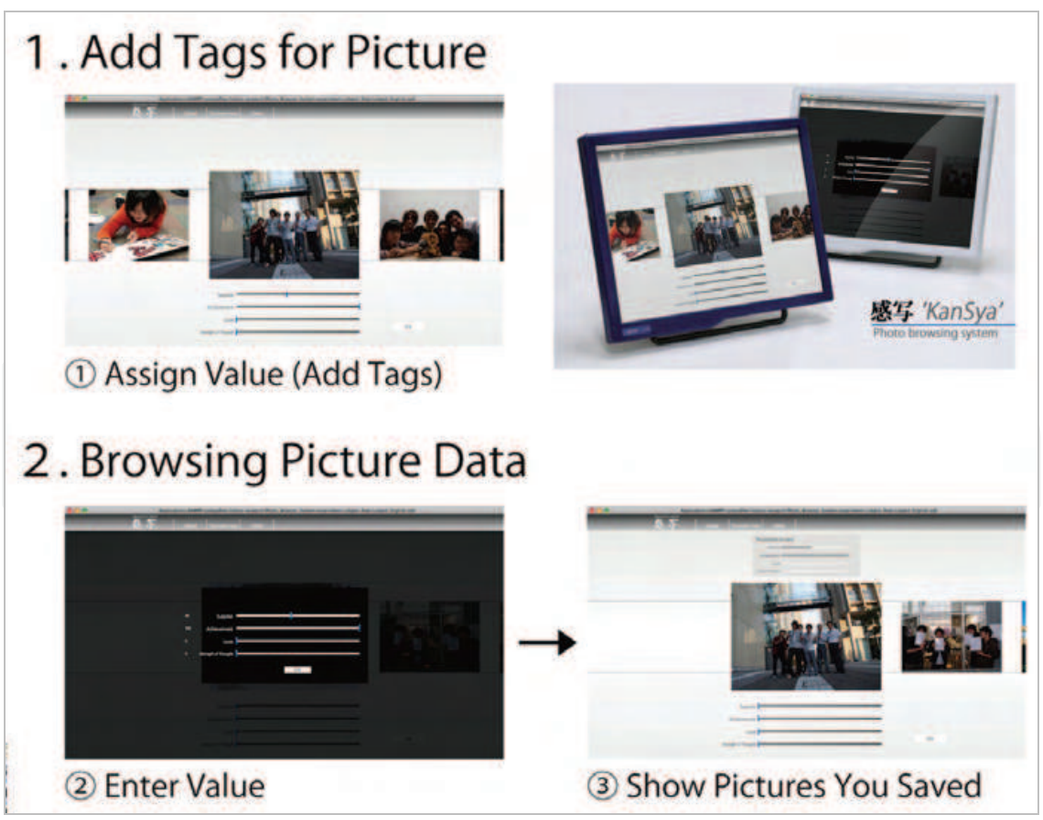

Fig. 9. PBS '*KanSya*'

5.3 Evaluation experiment

The purpose of this experiment is to determine whether the browsing with '*KanSya*' helped the impressed (moved) subjects more than browsing with a conventional PBS.

5.3.1 Method of evaluation

Each subject browsed the photos with '*KanSya*' and a conventional PBS (Mac OS X application 'Preview') to examine effectiveness of '*KanSya*'. The evaluation was divided it into two phases; 1) preparatory phase in which subjects set the attributes for selected personal photos and 2) main phase in which subjects browsed photos. A 3 week period was allowed between the two phases. The place was Future University Hakodate, and the subjects were 7male and 3 female university students.

During the first phase, each subject submitted 30 personal photos and set attributes like 'Surprise', 'Achievement', 'Love' and 'Strength of Thought'. The subject then answered a questionnaire about the difficulties in setting attributes ('Where you able to set the attributes easily?'). Alternatives answers included 'very easily', 'a little easily', 'neither easy nor difficult', 'a little difficult' and 'very difficult'. The subjects were allowed to freely give reasons for their answers.

In the main phase, subjects 1) browsed the photos with the conventional PBS or *'KanSya'* in random order. 2) answered a questionnaire, 3) browsed the photos with a PBS which was not used in the first phase and 4) answered another questionnaire. Question included 'How much were you moved by browsing photos with the two PBSs?' Answers were selected from among 'was very moved', 'was moved a little', 'neither 'moved' or 'not moved'', 'wasn't moved a little' and 'wasn't moved at all'. Another question was "feelings from browsing photos 'to which subjects were allowed to answer freely.

5.3.2 Results of evaluation

With the conventional PBS only 20% of the subjects felt 'moved' or 'moved a little'. However with '*KanSya*', the figure rose to 80% (Figure 10). The results indicate that '*KanSya*' enhances moving experiences more than the conventional PBS.

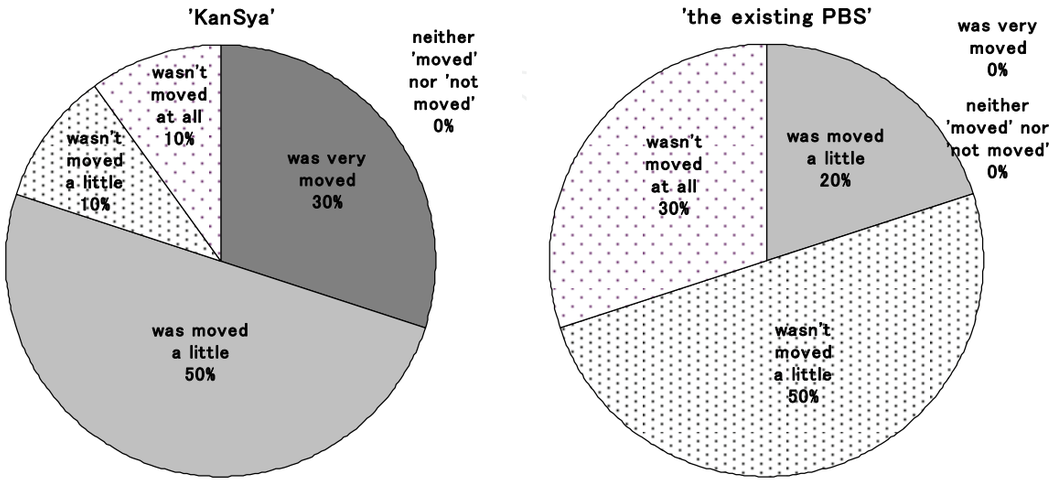

Fig. 10. Comparisons between *'KanSha'* and the existing PBS to evoke moving experiences

It is also notable that after the first phase, only 20% of the subjects found it difficult to set attributes for their photos (Figure 11). After browsing with the conventional PBS, there were many unspecific comments about 'nostalgia' such as "I felt nostalgic." And there were also feedback comments like "I could remember a past event, but I can't really remember what I thought or felt." However, browsing with *'KanSya'*, comments reconfirmed specific feelings such as "It was good for me to reconfirm what I love" and "It's fun for me to be able to get an opportunity to think of the feeling at that time" and so on. The results mean that photo browsing with *'KanSya'* gave a users an opportunity to experience some feelings again and notice the change.

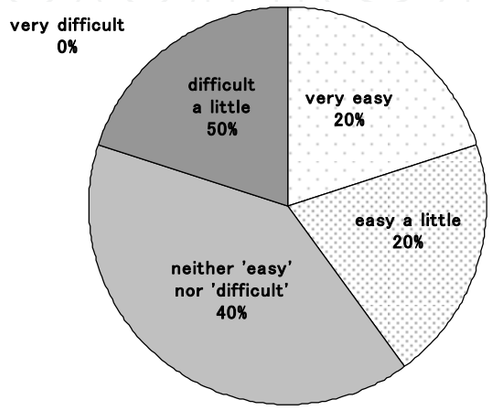

Fig. 11. How much smoothly the subjects set the parameter

5.4 Summary

This research identified the 4 key attributes that most people related to moving experiences. These are '**Surprise**', '**Achievement**', '**Love**' and '**Strength of Thought**'. Based on the results of our survey, we proposed *'KanSya'* which can enhance moving experiences through the use of *emotags* like 'Surprise', 'Achievement', 'Love' and 'Strength of Thought' depending on the user's feelings. Enhanced moving experiences from browsing with *'KanSya'* seemed to be related to the opportunity to reconfirm an emotion from a previous experience for oneself [14]. The results highlight the new *Kansei* qualities in the *'KanSya'* PBS.

6. Summary

The purpose of this paper was to examine the role and potential of Kansei and Kansei quality using Kansei engineering case studies, and introduced the 3 case studies which were approached to improve *Kansei* quality in system design. In the case studies, I conducted various evaluation methods such as factor analysis, SD method, behaviour protocol analysis, questionnaire investigation and observation of user's daily experiences to comprehend the users' various psychology evaluations to design. From those results, it is revealed that *Kansei* quality is related with evaluator or user' past experiences.

If we improve *Kansei* quality of a system, a user can use intuitively the system without the special knowledge about operating system. Moreover, the user will feel the positive emotion such as 'pleasant' and 'friendly', thereby the change of emotion affects up making a decision such as 'want to have it' or 'want to use more' etc. This *Kansei* quality was related in

human's potential demand. To improve *Kansei* quality in design, we have to understand a users' tacit knowledge based on daily experiences that they don't even notice.
The observing user's experiences is a good method to understand user's potential demand, these may be effective various the other methods. To visualize the characteristic of each method is in the future work.

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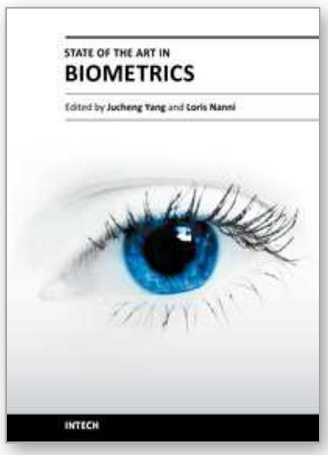

State of the art in Biometrics

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Biometric recognition is one of the most widely studied problems in computer science. The use of biometrics techniques, such as face, fingerprints, iris and ears is a solution for obtaining a secure personal identification. However, the â€œoldâ€ biometrics identification techniques are out of date. This goal of this book is to provide the reader with the most up to date research performed in biometric recognition and descript some novel methods of biometrics, emphasis on the state of the art skills. The book consists of 15 chapters, each focusing on a most up to date issue. The chapters are divided into five sections- fingerprint recognition, face recognition, iris recognition, other biometrics and biometrics security. The book was reviewed by editors Dr. Jucheng Yang and Dr. Loris Nanni. We deeply appreciate the efforts of our guest editors: Dr. Girija Chetty, Dr. Norman Poh, Dr. Jianjiang Feng, Dr. Dongsun Park and Dr. Sook Yoon, as well as a number of anonymous reviewers

InTech Europe
University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
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Unit 405, Office Block, Hotel Equatorial Shanghai
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中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821

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