Pleasure with Products: Design based on *Kansei*

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1. Introduction

When a designer starts to design the form of a new product, she needs to integrate many demands and wishes that the prospective users of the product may have. Not only technical and objective demands are important, but also aesthetic, emotional, and other experiential factors, some of which are hard or impossible to express objectively. In design practice, the designer has to balance between objective and subjective properties, between functional technology and emotional expressiveness, between information and inspiration. Design development by '*Kansei* (subjective criteria) science' or '*Kansei* engineering' is a new approach which originated in these conditions.

When a design approach uses *Kansei* engineering, we give our attention to the behaviors of people when they perceive images or objects including products, and study how their personal preferences or cultural bases work to their feelings. 'Pleasure' would be one of the major feelings from the impression occured by *Kansei*. However, when designing products, designers are not only concerned with the visual appearances but also the other properties of the product. Objects are not only looked at in isolation, but are seen in a context, are handled, touched, sometimes also heard or even tasted. Therefore it is important that a wider range of experience, a fuller integrated *Kansei* appreciation, is incorporated into the design approach.

In this chapter, we introduce the basic ideas and the movement of figuring out the structure of *Kansei* in Japan, and how to apply *Kansei* to design approaches.

2. The definition of *Kansei*

2.1. What is Kansei?
In Japan, the terminology of *Kansei* draws back on the German philosopher, Baumgarten. His work AESTHETICA (1750) was the first study that influenced *Kansei* engineering[1]. The aim of *Kansei* study is to seek the structure of emotions which exists beneath human behaviors. This structure is reffered to as a person's *Kansei*. In the art and design field, *Kansei* is one of the most
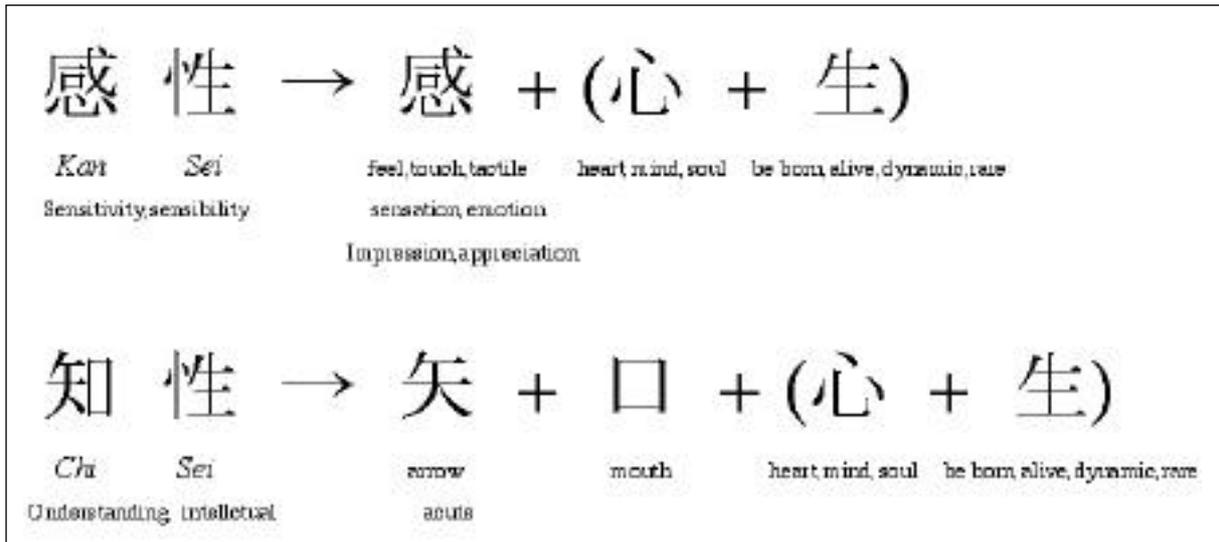
Figure 1: The Etymology of *Kansei*

important elements which brings the willing or power of creation. In research by Harada, it was found that the attitude of a person in front of art work and design is not based on logic but on *Kansei*[2].

The word "*Kansei*" is interpreted variously and has been used in many researches related with not only design but also other research fields. It is a word which inclusively involves the meaning of words such as sensitivity, sense, sensibility, feeling, aesthetics, emotion, affection and intuition. Fig.1 shows the etymology of *Kansei* and *Chisei* interpreted from Chinese characters, both of which are processed in human minds when they receive the information from the external world. As you see in the figure, *Chisei* works to increase the knowledge or understanding which is matured by verbal descriptions of logical facts. And *Kansei* works to increase the creativity through images with feelings or emotions.

But we cannot doubt the fact that both *Chisei* and *Kansei* have the same level of power to stimulate human behaviors. So far, the practice of most designers has focused on *Chisei*. *Kansei* has been regarded as a totally subjective phenomenon so that anyone in the world has their own individual way of absorbing and presenting. In front of a painting, we appreciate it without thinking of any rules but 'just' feel a pleasure.

Kansei has an effect to create more various feelings in the human mind which appear as individualized emotions. But then in the history of product design, the emphasis on mass production caused a disregard for the individual's preferences and feelings. That's the reason why it
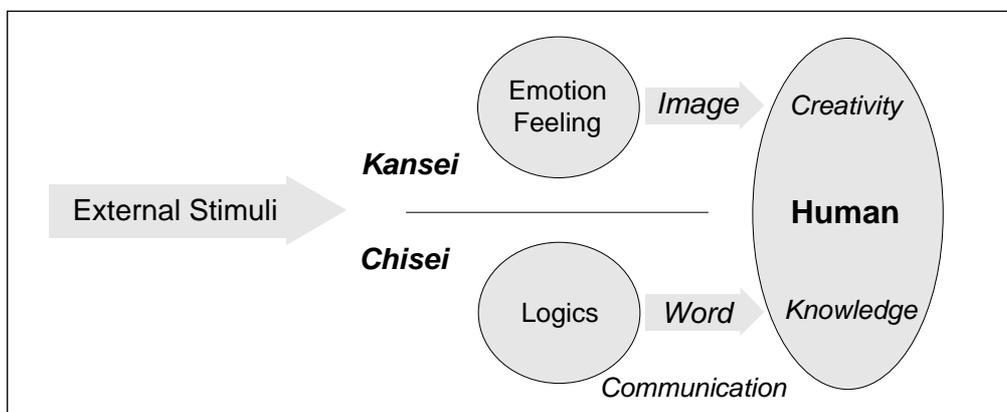

Figure 2: The effect of *Kansei and Chisei*

has been hard for people to realize the relevance of *Kansei* for design. Nowadays, people's need for emotional satisfaction is growing and being acknowdged by manufacturers.The functional requirements can often besolved by *Chisei*, logical knowedge of technology. But the fulfilling of emotional requirements, including pleasure, requires attention for *Kansei*. Regarding those changes, we need to know the structure of *Kansei* and how to apply it to product design.

In 1997, the *Kansei* evaluation special project started as a five-year interdiciplinary project at University of Tsukuba in Japan. Because it was found that the term'*Kansei*'was used in different meanings by different participating researchers, an initial study mapped there meanings[3]. The researchers in the project were asked to give their definition of *Kansei*. These statements were analysed, and key words were clustered to five main aspects as follows.

1. *Kansei* is a subjective effect which cannot be described by words alone.
2. *Kansei* is a cognitive concept, influenced by a person's knowledge, experience, and character.
3. *Kansei* is a mutual interaction between the intuition and intellectual activity.
4. *Kansei* entails a sensitivity to aspects such as beauty or pleasure.
5. *Kansei* is an effect for creating the images often accompanied by the human mind

Most of all, it's important to understand *Kansei* implies that human behaviors can change dynamically, and indicates flexible and dynamic approaches are needed in the various fields of study.

2.2. Why is it important to develop modeling of the structure of Kansei ?

Before *Kansei* can be applied to product design, its structure should first be mapped. For design, this requires a human centered approach.

The *Kansei* evaluation special project includes various research fields divided into three research groups (Fig.3-7). The 1st group is working to figure out the *Kansei* evaluation using the art and design works. They approach from the art critics, design history and cognitive science to know how people interact with art through their appreciation behaviors. The 2nd group is devel-

Figure 3: International Network of Controlling the Robot

Figure 4: Robot in the art museum

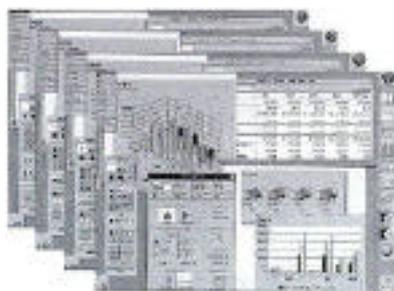**Figure 5**: Example of Tracking Robot Views

Figure 6: Analysis of Viewing Behavior

Figure 7: Design of Remote Control Robot

oping network programming and user interface which is used to make these artworks accessible over the internet by studying. And the 3rd group is designing the remote control robot which allows remote viewers to virtually more through a museum. This robot was made to let people explore an art museum over the internet.

The remote control robot is utilized as a tool to get the experimental data of human behaviors. By tracking the robot, these three groups can measure the viewing behaviors. These behaviors will be analysed on the basis of *Kansei* evaluation. We concentrate to find out not only the differences of behaviors but also the characteristic common points of people with different cutural backgrounds.

Based on the aim of *Kansei* study, many researchers not only from Japan but also from overseas are invloved to uncover its structure.

3. How to apply *Kansei* to Design and How to evaluate *Kansei* ?

In a design context, *Kansei* emphasized the designers imagery skills: the power to produce a mental image and use this in the creative process. It means, when a designer creates a new shape, she must enriched express the impressions gathered in the process. Generally, people hope to get a pleasant feeling from the appearance of the products. Here we introduce explorative design studies which attempt a new approach concerning *Kansei* in the early phase of design which would be one of the solution to improve the feeling of pleasure into design.

3.1. Design Approach with Abstracted Images

Many designers use image collages at the first step of the design process. They try to communicate or confirm what the users/clients wish for a new design. Actually, the image collages often give the essential concepts of clients' wish to the designers (Fig.8). But in practice, these collage are rarely used after that point, when the designer is conceiving the form of the product.

From a point of view of *Kansei,* images are more effective than words to deliver feelings and concepts of formgiving in general. In this research, we developed a new method of formgiving based on the images that express the users' positive feelings including a pleasure [4].

Image abstraction was suggested as a method of creating new shapes of products. When some images are chosen by users/clients subjectively, this choice expresses their preferences of shapes, colors or atmospheres. But each of us may get different impression from the images.

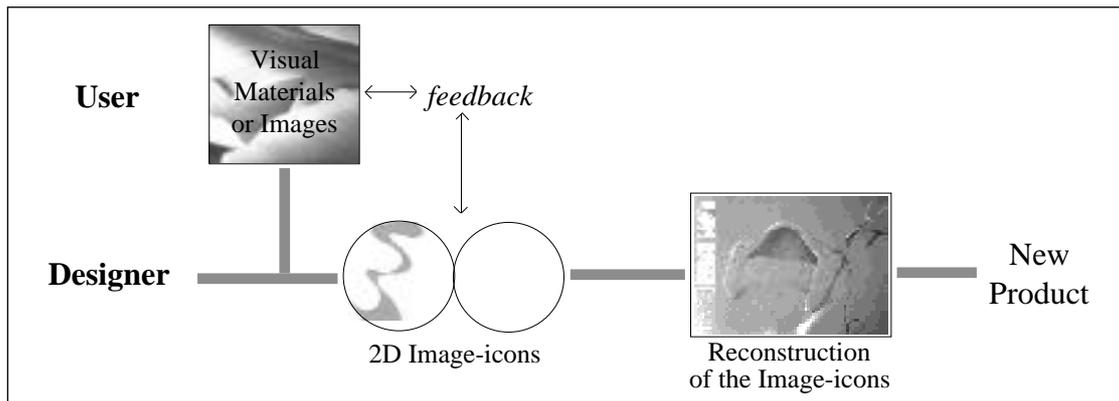**Figure 8**: Image Collages based on users/clients' Preferences

Figure 9: Mutual Design Approach with Image-icons

How then can we catch the subjective impressions? Here we introduce the 'Image-icon' which shows a characteristic shape from the picture image. The users/clients and designers can communicate about the subjective, experiential, *Kansei* qualities of the new product form through the inspirational visual materials and the abstracted image-icons. Designers seek for impressive parts on the image and draw this as a simple abstracted sketch. The user examines these image-icon sketches and selects those icons that best express their preferences for the new design. This feedback provides the designer with focused, nonverbal information on which she can base the new form of the product. The abstracted 2D image-icons carry the 'visual language' of the inspirational material as it is experienced by the designer and user. In creating the new form, the designer uses the images for visual elements. The 2D image-icons produced by the designers reveal the way in which they treat the images. They integrate the shapes of the image-icons and capture the essential impression in the 3D form of the new design. This process is shown in Fig.9.

In an experiment, we recorded image-icons made by designers and which form aspects analysed the designers chose to present in the icons. Fig.10 shows examples of image-icons abstracted from different image pictures. The designer who made these icons concentrated on visible edges in the images and suggested a linear shape of recombination for a new design. We found designers used different strategies in this process, some drew very geometric icons, and designed a geometric form. Others enlarged a small part of the visual materials and used this in their design. Other designers transform the icons in more complex ways, for instance by combining and rotating several icons into a single form. These differences and similarities between designers' behavior showed more study is needed to find out how the designers' *Kansei* influence their creativity [5].
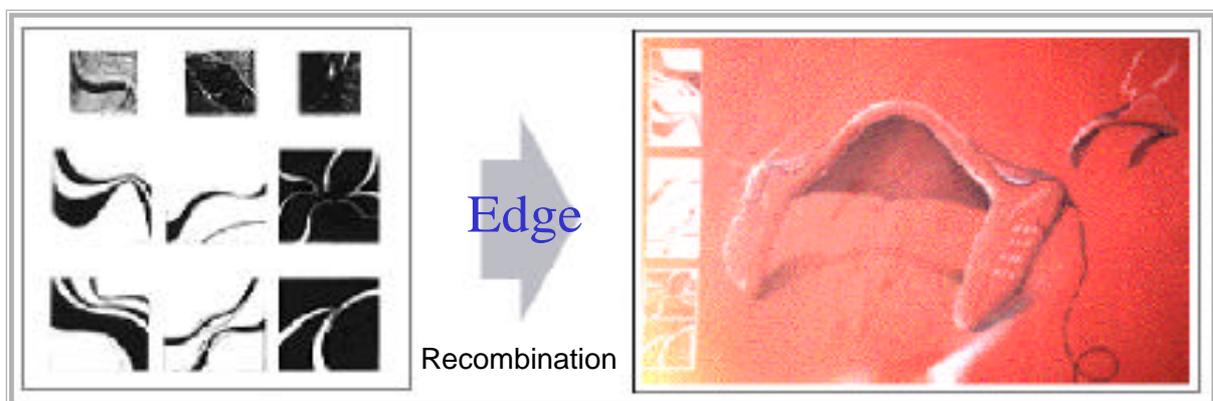

Figure 10: Speaker Design by Abstracted Image-icons

3.2. Extending of Design Approach based on Kansei by Dynamic Manipulation of 3D Object

In a current cooperative project, we are exploring how the *Kansei* Design approach can be extended from 2D images into richer product experiences, by introducing spatial materials and 3D icons. In this research, we describe the theoretical background of this project, and describe the experiment that was conducted at Delft Univerity of Technology [6]

In the *Kansei* design approach developed by Lee & Harada [4][7], visual imagery is used to carry the subjective meanings, and the designer extracts form elements from inspirational material into abstracted image-icons. 2D images may be too limited to capture the dimensions of product appreciation, and the experiment sought to uncover ways in which the approach can be extended. Using 3D materials and 3D icons is an important first step. This experiment compares 2D and 3D viewing techniques, and full tactile-visual exploration, for different product types; the effect of these interaction modes on the richness of the 3D and 2D image-icons that designers produce is analysed using both objective (image processing parameters) and subjective (expert judgement) measures.

3.2.1. Tools and Techniques for Inspiration
External stimuli produce subjective responses in the observer. The impression often contains emotions such as favor, pleasure or wonder and these feelings reflect the individuals and the situations they face. The problems in design arise when the products reflecting the designer's feelings are not in accordance with the users, or when the analysis of the users' preferences are not accurately modeled in the designer's planning stage resulting in inappropriate products. Here, objective preference analysis becomes necessary.

The *Kansei* design approach is to let the client and designer communicate through the icons which visually represent the favorite shapes of both parties. To make a more creative shape and dynamic impression of the products, they need such a mutual supported communication.

The 'image' was introduced as a tool to narrow the gap of concept cognition between designers and users in the planning of product design, and to effectively reflect the sensibility each held in the design process. The evaluation or impressions of a form sometimes involves feelings that evade expression. This research also employed 'Images' as a main information for the design support system, focusing on the shapes that were formerly regarded as difficult to apply so far.

3.2.2. Including 3D in the Kansei Design Approach
The way in which three-dimensional objects play a role in the design approach is different for the inspirational materials and for the image-icons. The inspirational materials are only evaluated or inspected, but not created, by the designer and client; the objects are also created by the designer. Moreover, inspirational materials, even for 3D forms, often come in the form of a visual representation rather than the real object. With the developments in the internet, it can be expected that both 2D and 3D catalogues and databases of forms become a prominent part of the designer's world; a part from which inspiration can be taken. For this reason it is interesting to study in how far the relevant form information can be supplied through 3D or 2D spatial visualisations of a form, or what information is only supplied through the designer actually touching or handling the real product (Fig.11). Therefore we distinguish (at least) three levels of inspecting or evaluating the inspirational 3D materials: direct handling, visual inspection from many sides but without touching, and visual inspection through a virtual representation (such as QuickTimeVR or QuickDraw 3D).

The 3D icons preferably are real 3D objects, sculpted from clay. Current computer model-

ling techniques are still too clumsy to assist the designer in the very explorative type of shape modelling that is involved in creating the abstracted 3D icons. However, because many designers create some 3D sketches before they start modelling, we also let the designers create sketches (half the designers are asked to create the sketches before the clay icons, the other half in the other order).

3.2.3. About the Experiment

The conditions included in the present experiment, where we also make a distinction between the type of product that is being designed, viz., products that are only looked at, such as speakers and clocks, versus products for which using implies touching them such as cassette radios. One can expect these different ways of using the product to have important implications for how their forms are experienced.

In this research, we chose a loudspeaker as a product which does not involve a touch, a cassette radio as a product that is frequently touched by its user. As for the subjects, we invited 24 students from 3rd to 5th grade in Industrial Design Engineering of TU Delft. The first session was a training session, to let the subjects get used to the method. Subjects were shown a picture of a camera, their task was first to sketch the most impressive parts using pen and paper, then to model impressive parts in clay. This resembled the earlier 2D version of the method. In the second session, the subject could view the loudspeaker (or cassette radio) in one of three observation conditions (see Fig.11,12). Either the product was displayed on a computer (different views were provided using a Quick Time VR-like display). In a 2nd condition, the product was shown on a turn table and the subject was instructed not to touch it. Finally, subject in the 3rd condition could look at and touch the product freely.

In the end of 2nd session, all the subjects filled in a personality test. This personality test was used earlier to show the strong relationship between the impressions on images[7]. It is the Maudsley Personality Inventory (by Eysenck) which is known for a high reliability and general validity in psychology and medical science[8]. In our earlier research, it showed clear results of impressions on images according to the personalities, such as substantial vs. unsubstantial and emotional vs. tactile. It provided the results based on two dimensions, one is extraversion-introversion (X) and the other is neurotic-stable (Y).

3.2.4. Measurement

Given the explorative nature of this research, and the great amount of variability involved

Figure 11: Three different Conditions of Observation

in creative processes of form generation, we could not expect a clear-cut single objective measurement to work. First, we put the all outputs of image-icons and clay-icons from each subject on the personality space, as was done in the previous study. Also, the image-icons and clay-icons were classified on the expressiveness of their shapes by a panel of experts (design teachers), who are shown the original materials and the icons produced by the designers.

1.Influence of different conditions of observation

One of the aims of this study is to seek the differences of unconscious perception or impression when user or designer faces various use of products in different situations.

Especially for the look-and-touch condition we expected the icons to reflect those shape elements which play a part in holding or operating the object, such as the scale and texture of grips. This effect should be stronger for the products that are meant to be handled than for the visual-only products, which would be dominated by the visual, geometrical shape alone. We also expect virtual and no-touch viewing not to differ much for objects of the latter category; this result might be of great practical importance, as it supports the credibility of the internet
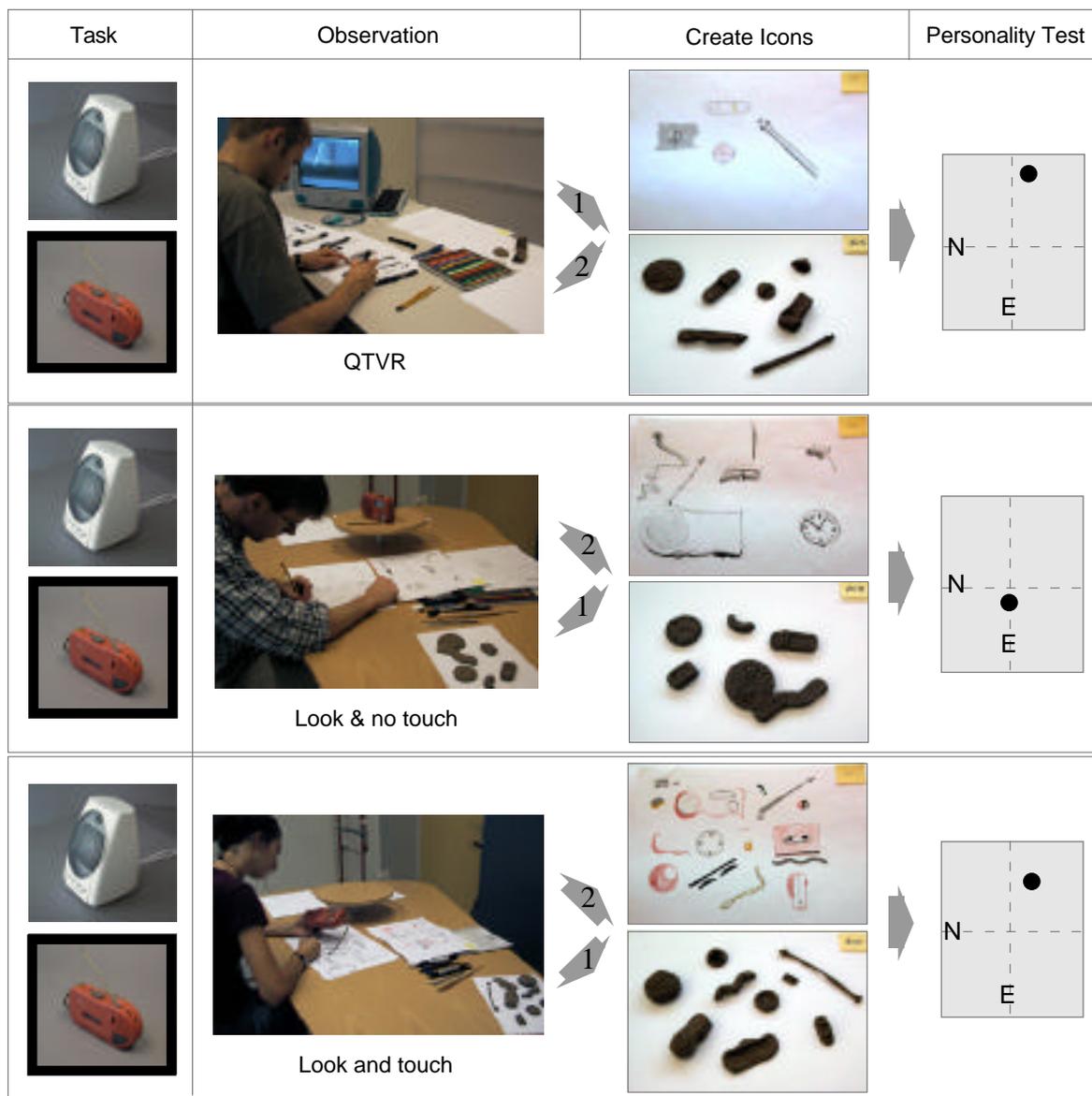
Figure 12: Abstracted Impressions by Sketching and Modelling in the 2nd Session

VR-catalogues of products mentioned in the introduction.

2. Relationship between frequency of views and output of impressions

In case of QTVR condition, the frequency of views were stored automatically while the subjects produced the sketches and clay-icons. The model display program used in the QTVR viewing condition kept a log of the total time that each view was on the screen. These times were converted to percentages of viewing times and averaged over the subjects, for each product class.

3. Parallel way of creations

Designers can approach to grasp the impressions or ideas of product by easier way of their own, such as 'sketching--> modelling' or 'modelling --> sketching' in the design process. We expect which impressions or elements of design could be easily created in each formgiving behavior, sketching or modelling.

4. Relationship between the personality and design impressions

As far as noticed in the previous research, designers often scored high on extraversion. In this experiment, we found the same tendency for the design students. The clay-icons were placed in the personality space (see. Fig.13). The experts (design teachers) remarked mostly about the variations along the neurotic/stable axis (note: the axis were not labeled). We got some dimensions of evaluation, such as simplicity (stable) vs.complexity (neurotic) and abstract (stable) vs. realistic (neurotic). These proved mostly the same tendency with the previous research which have collected impressions in words from the images.
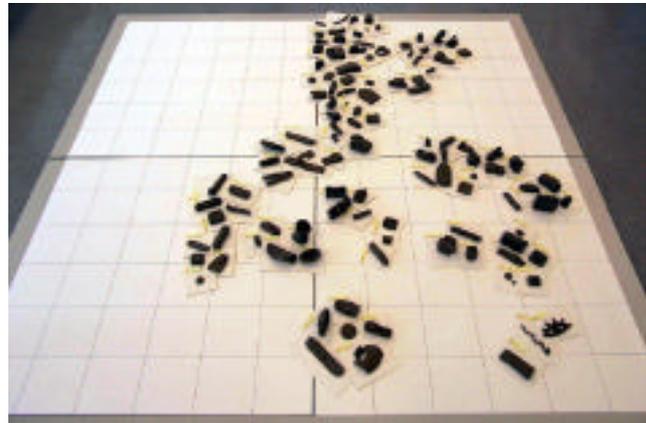

Figure 13: Clay Image-icons on the Personality Space

3.2.5. Discussion

When designers begin creating a product, they need to explore new shapes and elements which represent the preferences of the target users. Increasingly, users meet the products first through 2D images in internet catalogues but they use them in real conditions. Because designers also change to use VR tools, it is important to study and progress the validity and workability of these VR conditions.

In this research, we compared the conditions of 2D, 3D viewing and handling in appreciations and observed how designers develop their shape ideas. We registered how people looked at the object and where they concentrated on the objects through a photograph, 2D image sketches and 3D clay-icons. To find patterns in the appreciation behaviour based on *Kansei*, the QTVR tool is an efficient method to register viewing of the forms by subjects [10]. Building the *Kansei* appreciation structure on 3D objects, we study the dimensions such as forms (appearance), scale, surface textures and colors from 2D sketches, and tactile textures, physical emphasis from 3D clay-icons. Extending approach from 2D image-icons to 3D image-icons for manipulating in virtual space, we expect the 3D clay-icons play a role of rapid formgiving tool showing the essential elements of design for new products in searching among the 3D object database.

4. Conclusion

In this chapter, we introduced about the basic meaning of *Kansei* and the movement of structuring appreciation model based on *Kansei* of people from all over the world. With this trial, we can

easily find out people's ways to seek for pleasure through the art works. For the evaluation based on *Kansei*, we needed a new tool to communicate with other people in emotional way.

We could develop a new method of design approach of communicating with users/clients using images to convey *Kansei* information. Furthermore, images give us many messages as impressive forms, colors, textures or atmospheres. Designers can interpret those characteristic impressions into abstracted simple drawings or models which we call 'image-icons'. With the image-icons, we've done several experiments so far to find a way to evaluate *Kansei* in design.

We believe that *Kansei* design which has a power of interpretation of people's emotion and feeling is possible to create pleasure with products in our lives. Because it focuses on human behaviors including emotional actions and responses. Finding the structure of *Kansei* related with art works and design, will give us important ideas how to create pleasant products for human beings.

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