Exploring constituents for kansei design

Towards a framework

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Abstract: Next to the well-developed and recognized kansei engineering and kansei science, the discipline of kansei design still appears as emerging and explorative. In this paper, after presenting succinctly the theoretical basis of the first two disciplines, I compare them with and focus more in detail on the bases of kansei design, along with an inspiration in Japanese philosophy and culture. In order to structure further the discipline, necessary for the creation of a robust and specific design framework, I describe the constituents of the discipline, i.e., the notions the designers should take into consideration to either describe and explore kansei through designing, or to reflect upon and validate kansei designs (especially interactivity aspects). Finally, these constituents are illustrated by two kansei design projects showing their value and the current explorations done on the topic of interactive materiality in kansei design.

Key words: kansei design, kansei, constituents, Nishida, interactive materiality

1. Introduction

Previous research has introduced the discipline of kansei design as a new field of kansei research [12]. In this paper, after drawing again the main descriptive lines of this discipline and of its relation to a few other disciplines in the field of kansei research, I explore conceptual fundaments (called constituents in this paper) of the discipline. Although in this research I aim to create a framework for kansei design, it is not presented here. This work-in-progress research still requires further clarification and validation. However, throughout the determination of and based on the constituents presented in this paper, design projects have enabled the creation of insights towards the creation of the framework. After describing these constituents of kansei design, a few of these design projects output from teaching activities at the Department of Industrial Design of Eindhoven University of Technology are presented and analyzed in light of the description.

2. Three disciplines in kansei research

The field of kansei research gathers three main disciplines focusing on the creation of artifacts: kansei engineering, kansei science, and kansei design. In this section, I briefly introduce the three disciplines and show how the emergent discipline of kansei design is placed next to the two others and more established disciplines. More detailed work on this section can be found in [12].

Kansei engineering (KE), probably the most well known and elaborated of the three approaches, was mainly initiated by Mitsuo Nagamachi in the eighties [20]. KE is part of a family of engineering methods (such as Quality Function Deployement (QFD) or Voice of the Consumer (VoC) [17]) aiming at translating user's feelings into concrete product parameters. However, Simon Schütte [30] clearly explains that "KE does not develop new

theories or tools in the different areas at all. Rather, it is an all-embracing methodology containing rules for how different tools can interact with each other in order to quantify the impact a certain product trait has on the users' perception". Tools come from other fields of research (mathematics, computer science, psychology...) and are collected and organized for the purpose of KE. This structure explains both why and how KE evolves over time, and why it has been claimed not only in the discipline of product engineering, but e.g., in marketing or robotics. KE is defined by a structure and a purpose; tools, technologies and topics to follow.

Kansei science (KS) was first proposed by Akira Harada during the same period as the creation of KE [6]. While KE has been a meeting between kansei and engineering, KS is at the crossing of kansei and cognitive sciences. The research initiated in the eighties by Harada aimed at describing holistically users' cognitive processes related to preference and choice of products. KS is built upon brain science, mostly cognitive neuroscience and psychophysiology, and relies on related philosophies. The mind/brain identity theory [33] is for example used extensively in KS. Human's thinking and resulting behaviors can be best understood by using a model involving mental representational structures and mental procedures that operates on these structures [36]. These models and structures can be studied by psychophysiological approaches [39]. In this academic context, KS research aims to characterize and to evaluate emotional experiences and creativity, to contribute to a better understanding of the mind based on physiological and psychological approaches. Moreover, it is important to notice that KS has very often worked with design research to develop conjointly new methods for design and communication [16].

Kansei design (KD) is, on the other hand, an emergent discipline in the field of kansei research. Although KE literature has often used the term 'kansei design' to characterize KE works which have output actual industrial products, in the present work KD is introduced as a novel kansei approach based strictly on design and design research [10]. KD intends to return to earlier philosophical or cultural works related to kansei, and to use them as inspirational means for design.

3. Kansei design

Currently, there are two approaches in the discipline of KD, which can be differentiated by their focus. The first approach focuses on the physical materiality of artifacts (i.e., their intrinsic properties), and their evaluation or preference by the user [8, 11, 23, 38]. This approach is very close to KS in terms of domains of application, in term of tools (often based on semantics), but differs by their attitude towards ambiguity and uncertainty. While KS intends to avoid it or to "solve" it by means of logic reasoning, KD deals with it by means of design skills. The second approach focuses on the interactive materiality [34] of artifacts (i.e., the qualities of the artifact in interaction) [14]. Further on, this paper focuses on this second type of kansei design.

Whereas KE and KS have found their roots in scientific establishment, KD intends to return to earlier philosophical or cultural works related to kansei, and to use them as inspirational means for design. Therefore, KD explores Japanese culture and philosophy (mostly the Kyoto School of philosophy and the related ones) as a source of knowledge and opportunities to be addressed by design. Moreover, KD embraces the stance of design, as a guide for what we do, where we go, and what strikes us: KD is about people, about our beliefs and our dreams, about beauty and society. It is about being in the world [24], as kansei is about as well.

Finding its roots in the Japanese culture, KD takes Japanese tradition for craftsmanship into the highest consideration [31, 39], as well as the relation the craftsman has with the artifact, and through it, with the users. The stance of an artifact is not revealed only by the experience of the users. It also acquires meaning by the motives and the beliefs of the designer. It is how and why kansei should be explored through designing, from all the varieties of points of view composed of the designer's one and the users' ones.

4. Constituents of kansei design

To explore kansei by design, a few constituents of the discipline (and consequently of the framework) need to be clarified. These constituents are the points of attention and the space of application of the framework, inherently required while designing. As pointed out previously, KD finds its roots in the Japanese culture and philosophy. This is where these constituents should be found as well. Father of the philosophical School of Kyoto, Kitaro Nishida is one of the most influential philosophers in Modern Japan. Although Nishida has not been focusing on the notion of kansei, his work is immensely influential on Japanese philosophy, and has crucial implications in the understanding of kansei.

In this paper, we often make a parallel between the Nishidian philosophy and the Phenomenology of Perception [19]. Their relation is indeed strong, first historically (Nishida is often considered to be the introducer of phenomenology in Japan), but philosophically as well, as they share numerous philosophical positions, notably concerning pre-reflective experience [9] ("Over time I came to realize that it is not that experience exists because there is an individual, but that an individual exists because there is experience", Nishida [22]) and the central role of the body (cf. section on perception). This parallel will be used to the extent of explaining some constituents from a phenomenological perspective, rather than from a Nishidian (or other Japanese) one. This is mostly due to, apart from the closeness between the two philosophies just expressed previously (the differences appear not to be yet significant in regard to the current state kansei design clarification), the fact that the phenomenological understanding and approach in interaction design is consistently investigated [3, 25, 34] and that the Nishidian ones is yet to be developed. However, we would like to note here that these concepts might evolve in the future for better accuracy regarding the understanding of the kansei design approach and its relation to Japanese philosophy. Moreover, being out of the scope of this paper, the comparison of the definitions or descriptions of these constituents in comparison with other approaches, such as behaviorism or perceptual psychology, will not be discussed.

4.1. Describing/exploring

The first set of notions supports the designer to apprehend the design challenge by clarifying the way the user is in the world and by addressing valuable foci by which the design can impact the qualities in interaction and in experience. This set aims at assessing the sensorial, perceptive, experiential and contextual qualities in interaction between the user and the artifact, and at providing the designer with means to address them through designing.

Senses

The notion of *sense* can simply be defined by the 'faculty by which a stimulus is captured'. This definition points out well the physiological quality of sensing, and should obviously not be mixed with the notion of *sensorial perception* (e.g., [26]), which is at the perceptive level and consequently is concerned with the

emergence of meaning in perception. Thus, because of the absence of meaning at the strict sensorial level, design would have no reason to focus on the sensory process.

However, other viewpoints have provided practical elements for design. James J. Gibson [5] has proposed to distinguish what is used 'to have sensation' (as defined in the previous paragraph) and what is used to 'detect' something. His work focuses on the latter and names it 'perceptual systems', detecting perceptive information. This approach has been taken into consideration and has significantly contributed to design research [25, 29].

A phenomenological perspective also suggests the value of the 'phenomenological qualities of the senses' [14]:

- The 'reciprocity' quality concerns the fact that sensing implies being sensed as well (e.g., I am touched by what I touch (touch is *reciprocal*), whereas I can hear without being heard (hearing is *non-reciprocal*)).
- The 'distance' qualifies where my body should be relative to the artifact to sense it (e.g., I can see at a distance (sight is *distant*), but I cannot touch at a distance (touch is *local*)).
- The 'privacy' quality concerns the fact that one element of an artifact can be sensed by more than one person at a time (e.g., many people can hear the same thing at the same time (hearing is *public*), while nobody can touch what I touch at the same time as it is covered by my skin (touch is *private*)). Sight is considered to be an exception: two persons cannot see the same artifact from the same angle. Sight is *point-of-viewed*.

These perspectives on the senses are valuable for designing, as they provide a practical view on senses from a design perspective, towards sensorial experiences. The focus on the qualities of the senses can, for example, support the design for novel experiences, involving technology capable of transforming the qualities of the senses. In other words, the qualities of the senses are considered here as a starting point to design for perceptive qualities. A simple example of such approach is headphones. They change hearing from public-distant-nonreciprocal to private-local-nonreciprocal. Their use profoundly changes both the way one can behave (action-possibilities), the way one can sense the surrounding and augmented information (the music), and therefore the perceptive relation one has with the environment. The project *BeTouched!* (introduced in the portfolio in section 5) is an explorative design based on the qualities of the senses (namely the reciprocity of touch).

Perception

Based on the Nishidian philosophy, KD acknowledges the primacy of action ("We see a thing by action, and the thing we see determines us as much as we determine the thing. That is action-intuition." – Nishida [21]) and the primacy of the body ("Just as the body of an artist is the organ of art, so is the body of a scholar the organ of scholarship; the life of an artist exists in beauty and that of a scholar in truth. Even the activity of thinking does not exist separately from our physical body" – Nishida [21]). In other words, action-intuition suggests that intuiting entails acting, and the other way around. Both the world and the subject are formed mutually and are reflected in one another [18]. Moreover, this relation is possible only through the senses and the physical movements, stressing the necessity of the body to perceive and to potentially act, while being in the world.

Considering that a very similar stance has been taken by phenomenology inspired design [2, 25], research on KD has not started from scratch in the past. Rather, it has found acquaintance at an international and philosophically intercultural level already [13, 14].

These two primacies are fundamental for the KD approach: Kansei designers explore kansei through action (both the designer's action and making, and the user's action) and reflect upon it. Moreover, it is clear as well that

the meaning and the value of a design are not based on the sole properties of the artifact. They are also dependent on the way both the designer and the user interact with the artifact. We can here notice the complexity of the relation between the designer, the user, and the artifact; complexity leading to an obvious ambiguity in interaction, which should be embraced by design.

Experience

Focusing on the 'here' and the 'now', KD especially pays attention to the pure experience: 'To experience is a knowing for which real facts are presented as is, a knowing that one can acquire by being subjected to the reality of facts, by dropping down all (intellectual) artifacts. The term 'pure' in the expression 'pure experience' indicates an experience in a pure state, without thought (*shii*) nor judgment, different from what is usually called as 'experience', the later always associated with a certain thought. [...] When one has a pure experience of a conscious state, it is possible to notice that there is no differentiation between the subject and the object, and consequently between the knowledge and its object. Such an experience is the purest of all experiences' – Nishida [22].

Nishida describes here a pre-predicative experience, prior to the differentiation between the experiencing subject and experienced objects, between intellectual intuition and reflective thought, between objectified nature and objectifying mind [18]. This approach is also rendered by Naoto Fukasawa in the no-thought project: 'I thought about how people do not think about the tools they are using while they are using them.' [7]. Defining the pure experience as a 'knowing for which real facts are presented as is' makes this notion at the core of KD: it focuses on the very 'here and now' experience, i.e., as it happens, and not as based on past or memories. However, this does not mean that the past experience. Rather, studies in KD take culture as a 'given', i.e., as a 'quality' of the subject by which kansei is influenced [1]. It is interesting to notice here that although KD constituents are of a cultural nature, KD is not essentially focusing on cultural aspect of the experience. Rather, it focuses on the prepredicative qualities, when no judgment has occurred yet, when the user is not reflecting yet on the interaction.

KD, inspired by Japanese philosophy and culture, focuses on what makes us subjective bodies, acknowledging the primacy of action through the concept of action-intuition. Further qualities of the experience are seen as either 'pre-kansei' or 'post-kansei' factors.

Context

The last notion described in this section is the locus (*basho*), suggested by Nishida as: 'All what is is situated in something' [21]. The notion of *basho* suggests the idea of an envelope encompassing a content determining and determined by the *basho* itself. Consequently, this *basho* is itself a content, and therefore a part of a broader enclosing *basho*. Recursively, this implies that any space is inherently the content of a 'larger' space. Although this notion is very complicate in its details and in its construct, it remains practical for a design perspective as it proposes a way to look at and describe interaction from different levels (i.e., different *basho*). Interaction is itself a *basho* encompassing the constitution of meaning, and is as well a content within a context of interaction, itself being a part (i.e., a content) of the experience space, itself the content of the physical world.

This fundamental notion in the Nishidian philosophy is arguably a point kansei designers need to address: perception and experience are both the locus of something (meaning creation in interaction) and are situated in

something (the world). This 'geography' of loci invites the design to look at interaction and experience at specific levels (one-to-one interaction, contextual implications, past experiences implications...), while keeping in mind the relation between them.

Conclusion

This first set of constituents presented in this section informs the kansei designer what aspects of the interaction between the subject and the artifact to focus on. However, it is not shown here which approach should be taken, and how this aspects should be valued in the process. While the later will not be discussed here and it is still a work-in-progress, the latter is actually discussed through another set of constituents aiming at supporting the designer in reflecting or validating a kansei design.

4.2. Reflecting/validating

Constituents presented in this section aim at providing the kansei designer with means to reflect on designing and on their designs. They support decision taking, critical reflection, as well as overviewing a design work.

Kansei descriptors

The kansei descriptors are a set of terms that can be used to describe an artifact from a kansei perspective. Shimokawa and Endo [32] have proposed a list of *wakotoba* ('Japanese words') which can be used as kansei descriptors. However, we believe this list is not exhaustive and may as well be not restricted to Japanese terms. Indeed, the quality of these terms is their relation to delicate and refined aspects of a sensorial/perceptual experience. Therefore, non-Japanese terms with similar qualities that resonate better with the designer's subjective feelings can also be considered as kansei descriptors.

These kansei descriptors are structured by three dimensions which focus respectively on how the artifact appears in, invites for, and resonates in interaction [32] (the description is illustrated by artifacts, presented in Figure 1, which strongly embody the three dimensions):

- The expression (*hyojo*) refers to how the artifact stands in the *basho* of perception and radiates to the perceptive system of the subject. The teapot Ciacapo is a brilliant example of this dimension: it expresses the craftsmanship (mastering of materials, of shaping, and of texture *kime*) and stands strongly in the space (also called appearance *tatazumai*). In this set of descriptors, the consideration for shadow and light (*kagerou*) is essential, and is to be associated with the renowned Japanese aesthetics introduced by Junichirō Tanizaki's Praise of Shadow [35].
- The gesture (*dosa*) refers to how the artifact invites for a perceptive exploration or for action within the interaction. It refers not only to the engagement in the interaction with the artifact, but also to the designing of the artifact. The *chasen*, tea ceremony whisk, is made of a unique piece of bamboo cut in a very skillful way (yet again *kime*), to which a thread is added to spread the tines. It is structurally an extremely simple object; how it is physically directly relates to how it meant to be used; and it invites for a specific and delicate way of use. The same goes for the cedar sake cup. The elimination of the superfluous (*habuku*), to invite the user to reconsider the essential and to "restate" the affordance the artifact stands for, is a well-known characteristic of many Japanese designs. Moreover, the use of techniques, such as bending (*shinaru*) or folding (*oru*), imparts

to the artifact a formal dynamics suggesting both the designing activity and its subtleties, and the possible dynamics of the artifact in interaction.

• The heart (*kororo*) refers to the values and the impressions emerging in interaction. This set is quite rich and diverse. It is of course about the experience of the essential value(s) (*mottai*) embodied in the artifact, i.e., the 'value substance' of the artifact which might resonate with the user's values, but also about how it engages itself towards the user: the values expressed by the way the artifact is prepared and presented (*motenashi*).



Figure 1: Examples of 'kansei' products – *chasen* (tea ceremony whisk), teapot Ciacapo (by Covo), cedar wood sake cup

There is a great variety of terms which can be used as kansei descriptors, and much exploration is necessary to understand the implication of these descriptors in the kansei design process. However, this kansei design 'lexicon' is valuable as it is a means for reflecting upon designing, while daring the subtleties of ambiguity in interaction.

Engagement

To illustrate the notion of engagement, Marco Rozendaal [27] proposed the following example: "Imagine the experience of cooking. Compare cooking that involves preparing a dinner from scratch to cooking that involves heating up a TV- dinner in the microwave. In the first situation, cooking involves cutting and washing the raw ingredients, spicing and cooking the food, and serving it out on a plate. In the second situation, cooking involves placing the TV-dinner in the microwave, setting the timer and then waiting for a few seconds. Preparing a meal from scratch can be considered a richer [*and engaging*] experience compared to preparing a TV-dinner since the cooking involves a considerable amount of choice, involves extensive physical action in manipulating the ingredients and involves increased sensorial stimulation." Then he proposes the Richness, Control & Engagement (RC&E) framework to assess the level of engagement in an experience, and suggests the following aspects:

- 'Sensorial stimulation' relates to the richness of the information for a sensorial modality (e.g., monophonic vs. stereophonic sound vs. multichannel sound), and to the variety of modalities involved in the experience.
- 'Physical involvement in the event' corresponds to the range of body actions involves in the experience (e.g., manual embroidery vs. the use of presets of an automatic embroidery machine).
- 'Intellectual stimulation' refers to cognitive stimulation (such as curiosity or reflecting) in the experience.
- 'Amount of choices' allows freedom and discovery of new possibilities. Consequently, it offers a space for exploration and for growth.

- Requirement for effort corresponds to the amount of effort a person feels he/she needs to invest to attain his/her goals.
- Expertise is seen as the knowledge and the skills a person has about a particular domain.

While the first three points are describing together the notion of richness, the last three ones describe the notion of control. The value of this framework resides in the possibility to explore and to clarify the way an interaction can be involving and enjoyable, and shows how engagement arises when the activity supports the functioning and growth of the subject [28].

Rituals

The assessment of the ritual by which the experience occurs is the last piece of this set of constituents. The notion of ritual suggests the way the experience occurs, inherently constituting a certain meaning thanks to the actions taken within this experience. A previous research focused on tea making [15] compared seven different rituals, such as getting a tea in a PET bottle from a vending machine, using an electric water kettle and a tea bag in a cup, or using gas stove boiled water and tea leaves in a teapot. The variations in the evaluation of the engagement and the appreciation of the experience in the various rituals showed:

- the influence of the context, both in its physical and its social dimensions, on the quality in interaction, i.e., interaction is contextualized. This invites the designer to seek in the context for details involved and enabling the enrichment of the experience,
- the influence of other actions and interactions occurring within the same ritual (e.g., the experience of cutting vegetables with a knife is influenced by the cutting board, both by its material and interactive materiality).

Paying attention to rituals is therefore a way for the designer to estimate the quality of inclusion of the design in the activity and in the experience of the user. It invites the designers to look at details in the *basho* of interaction and to explore interaction in a comprehensive way, rather than in a segregating way tending towards (meaningless) decontextualized interaction.

4.3. Conclusion

The constituents of kansei design presented here, which have been determined and then explored by the present research, form a vast yet structured set of notions supporting the kansei designer. These determinations and explorations have been done by a series of iterative design projects and by reflecting upon them, following a Research-through-Design approach [4].

The findings presented here have been regularly valued by different designers in numerous projects, indicating a tendency towards the robustness of their efficacy in the design process. The next section presents a couple of results output from the teaching activities.

5. Portfolio

Because of practical reasons, it is not the aim of this section to show the complete scope of the design explorations done in relation to the present research. Rather, two illustrative projects that provide strong cues on how the constituents can be implemented by kansei design are presented. Both projects are the outcome of project-based educational activities done at the department of Industrial Design of Eindhoven University of Technology.

5.1. Passage

The first project presented is *Passage*, a bachelor project output from a 7-week (2 ects) assignment. During the assignment, the background of kansei design and its constituents were taught to students who also did a design project iteratively throughout the 7 weeks. The assignment was concluded with a reflection and a discussion on kansei design and on the resulting projects. *Passage* focused on the transitory space between two places. The challenge given to students of this specific project was to design an experience in-between two rooms, without designing for any of the two rooms. After numerous short iterations, the challenge was successfully achieved: *Passage* is composed of an array of LEDs projected on a small aluminum foil, reflecting the light on a door being opened. The airflow caused by the opening of the door impacts the way the aluminum foil waves, providing a different expression each time. Figure 2 gives an impression of the artifact. When the door is closed or fully opened, the installation cannot be perceived. It is only during the opening or the closing of the door that *Passage* is experienced on the door.



Figure 2: Passage

This design is a very nice physical expression of the notions of *basho* and pure experience, as it allows a rich experience through action, in a (in-between) space which is usually experientially poor. Through their design, the students were able to trigger a *basho* that exists only in pure experience. The level of engagement was so high during the experience of it that people were repeatedly trying it again and again, enjoying each time the experience of interacting with *Passage*.

5.2. BeTouched!

This project is the result of a one-week module for graduate students, during which they explored one of the qualities of the senses and its influence on perception. In a final assignment, the students designed an artifact that engaged the person in a rich sensorial and active interplay with an artifact exploring such a sensorial quality. The students who designed *BeTouched!* focused on the concept of 'reciprocal touch'. The artifact the students designed exists out of several flexible bodies, gathered on one platform. All these bodies are touch-sensitive by the integration of a capacity sensor at both the front and back of the body. They are enabled to act as they are connected to a servomotor at the bottom. Figure 3 gives an impression of the artifact. A video can be seen at https://vimeo.com/41899996.



Figure 3: BeTouched!

When one of the bodies is touched on the front it really let itself been stroked. It moves forward, in the direction of your hand, and you are touched back. At the backside the body is more ticklish: the body immediately moves away from your touch. The beauty of this artifact is that the material structure and the form do most of the work towards engagement. The shape and material of the body enhance the dynamics of the servomotor tremendously and give the body a continuous and sustained movement. This makes that it really feels that the body actively lets itself being stroked. Moreover, sensing and acting are strongly embodied: the sensors move along with the moving body. When it is ticklish it moves away from the touch, literally getting the senses away from the hand. And when it likes to get stroked, on the front, it really moves its senses towards the hand, moving the whole length of the sensitive area along the hand.

BeTouched! is a clear example of how the three dimensions used to categorize the kansei descriptors (expression, gesture, heart) are valuable to evaluate an artifact from a kansei perspective. Although the qualities of it are mainly at a perceptive level, the three dimensions are used to comprehend the beauty of the artifacts.

expression – The simplicity of the materials used (waved paper and aluminum), paying attention to their visual, mechanical and electrical properties, is the reason of an immediate understanding on the way to interact with it, and for the movement enhanced compared to the basic rotation of the servomotors.

gesture – The smoothness of the movement is first the source of the elegancy of the dynamics of *BeTouched!*. Second, this movement makes the caress and the ticklishness very rich experiences, as the artifact seems to express its involvement and 'enjoyment' in the interaction.

heart – Finally, the reciprocal interplay, between the artifact and the subject, triggers beauty in interaction, the quest of this kansei design exploration.

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