

Kansei Engineering and Design Thinking Methodology for Product/Service Design

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Abstract

This study discusses the similarity and difference between Kansei Engineering (KE) and Design Thinking (DT) methodology. Inherently, KE focuses on the exploration of customer emotional needs and translates them into product and service properties. Through customer experience with product/service, which product/service attributes are found to be critical. On the other hand, DT starts with the identification of problem dealt with empathy and ends with product testing. These KE and DT methodologies have some similarities and differences. This study integrates these two methodologies and provides a unified framework of KE-DT putting forward the customer emotional needs which are accommodating the customer empathies and complex human-environment interaction and ending with the testing of proposed solutions. It is hoped that the proposed framework of KE-DT provides more efficient, effective, and sustainable approach addressed to the development of products and services.

Keywords

Kansei Engineering, Design Thinking, Product, Service, Emotional Needs

1. Introduction & Motivation

Everyone has a Kansei. When we see a beautiful flower, we will then say, “What an amazing flower!”, “It’s so beautiful!”, “An amazing creation!” Also, when we meet a friendly staff in a shopping center or a luxurious hotel, we talk in our heart and say, “I like the way the staff serves me!”, “He has a heart”, “You’ve got the heart of customer!” That is called Kansei; it is something beyond the words, it is more on satisfaction. It will be a good remembrance for a certain product or service. Not only positive impression, Kansei will occur when we have a bad experience. When we feel dissatisfied due to certain product or service experience, for instance, when the staff in a hotel is not so responsive to our request, then we will have a bad feeling. People with lots of emotions will show their feelings fully once there is a stimulus which matches their emotions. The manifestation of their emotions will be optimal.

Looking at the interaction between employee and customer; a happy employee due to the perception of training and/or the meaning of work given will produce good emotions. Later, it will be contagious to the customers. As a result, the customers will be happy and satisfied. The basis for Kansei is the human five senses. Among five senses, the visual-based emotion is found to be the most dominant sensory stimulation. It counts about 70% of the whole information and perception which impacts Kansei (Nagamachi & Lokman, 2015). It would be great once the stimulus is fully accepted by all senses; it could be a combination of eyesight, taste, and touch. The perfection of full emotion or Kansei of someone is expected. More senses impacted, more Kansei accepted.

Kansei-based design for products or services offers a practical guideline for product or service designer and also an evaluation tool for the existing products or services. A popular Kansei-based design methodology is called as Kansei Engineering (KE). KE has a unique superiority in terms of its flexibility to engage with other methods in improving

the quality of product and service design. In understanding the user expectation and experience better and better, the modified adjusted KE methodology is always open (Hartono, 2020).

In general, KE methodology starts with the choice of service or product – human interaction system. Once a product is of interest, it will be a focus of exploration. Based on the prior similar product interaction and experience, the product attributes (forms, shapes, and functions) are explored and defined. All product attributes perception will bring impact on user/customer Kansei. Kansei consists of hearing, eyesight, smell, touch, and taste; they are known as human five senses. Also, there is an internal receptor to complement the human senses. When something is experienced, perceived, and met with the similar previous experience, then our emotion will be revealed. It is also applied in product interaction. For instance, someone eats a chocolate bar, the crunchiness, smell, and taste of that chocolate bar will be sensed. Kansei works. We will say, “This chocolate is so tasty and crunchy, also milky”, “The smell is appetizing, it brings to Switzerland.” Also, the feeling of current experience is strengthened by the previous experience, and indirectly, this feeling or impression or Kansei can be predicted. In other words, Kansei is strongly defined once it is confirmed. More human senses influenced, the stronger the Kansei is. This mechanism is shown in Figure 1. Apart from physical products, Kansei is also experienced by someone in a service environment. Using the same mechanism of Kansei expression, through service stimuli received by human senses, all those inputs will be perceived and influence Kansei. For instance, a staff in a department store should be aware of customer response through facial expressions and verbal communication due to service perception.

Actually, Kansei is deemed to be an indicator of customer or user satisfaction due to service or product delivered. Kansei might be a symptom of customer problem. It is either spoken or even unspoken problems. It can be potential problems or latent needs. Kansei can also be deemed as the representation of customer satisfaction. Everything is simplified and fully satisfied, or perhaps there are rooms for improvement. In KE methodology, the identification of both service or product attributes and their respective Kansei is the most critical part. Afterward, the analysis of which service or product attributes are significantly connected to certain Kansei will be conducted. It is important to identify which service or product attributes are critical to be improved. The entire step of KE simple methodology is shown in Figure 2. In addition, the KE methodology is extended into service design and development, as shown in Figure 3. A study by Hartono (2020) shows the importance of KE for service development and sustainability.

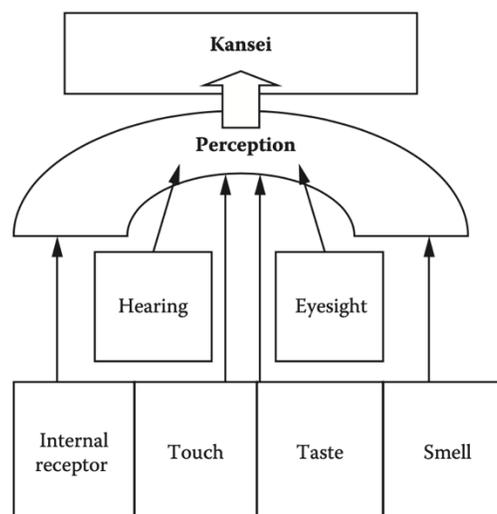


Figure 1. Kansei as a function of perceived human senses (adopted from Nagamachi & Lokman, 2015)

Related to the first step in DT methodology, it is advised to observe, engage, and empathize with customer or user to understand what his/her motivation in using products, experiencing services, and to probe any possible problems. Moreover, immersing us in the real physical environment is critical in gaining a deeper understanding of any issues or problems faced by customer or user. This step is crucial as well to set aside the designer’s point of view and initial assumptions about any phenomenon. What perceived by the designers may be different from what have been addressed by customer. Thus, it needs a wiser approach to come out with any possible human-product/service system interaction.

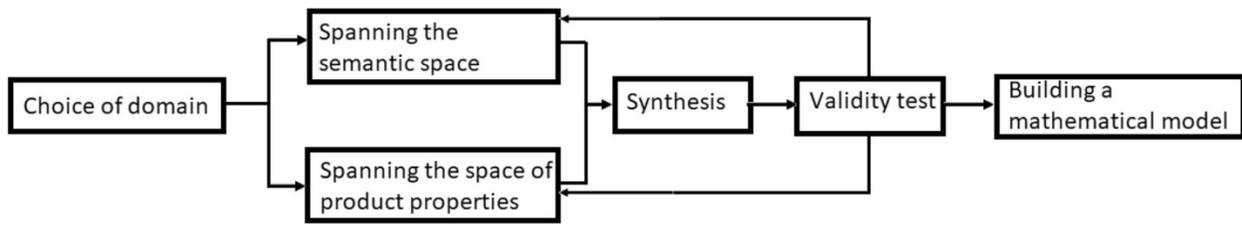


Figure 2. General KE methodology for product experience (adopted from Schütte et al., 2004)

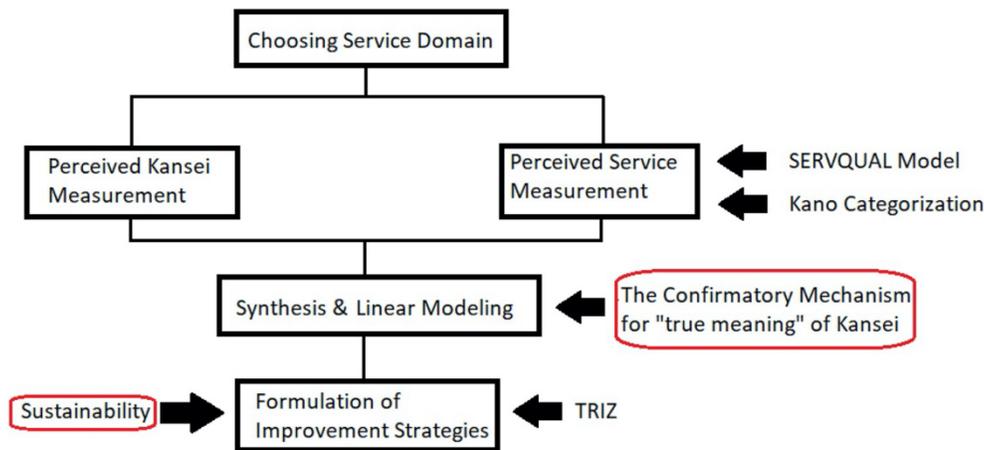


Figure 3. KE Framework in service design and sustainability (adopted from Hartono, 2020)

Since KE methodology deals with customer emotional needs (known as Kansei) and translates them into product or service attributes, the understanding of customer needs deeper and clearer is highly required. Once the synthesis of product/service attributes and Kansei finalized, a proposed improvement (it may be accompanied by a prototype or model or another type of outcome) will be implemented and tested. The feedbacks from the lead user and potential customer/user are expected to justify the appropriateness of proposed solution, and potentially give inputs to a new problem. It is a room for improvement in the KE methodology by engaging DT methodology.

Regarding the research gap, it is summarized as follows. There is questionable whether Kansei Engineering is closely related to Design Thinking. If it is so, how they are explained as both methods put a concern on empathy and human-system problem for product/service setting and experience. Hence, as an objective, this study will discuss a refined KE methodology incorporating DT methodology called as KE-DT methodology for product/service design and development.

2. Brief Literature Review and Proposed Framework Development of Kansei Engineering – Design Thinking (KE-DT)

Design has been regarded as the main activity in the engineering field, and also extended in the social engineering area. What are needed and whether the customers are satisfied with the existing condition are the trigger for understanding potential problems, and should be followed with appropriate engineering action. It is the start of a design process (Razzouk & Shute, 2012). Designing products and services which satisfy customer is a major component of business competition. More specifically, design process which deals with social problem is of beneficial.

Thus, Design Thinking (DT) methodology is proposed. This DT methodology promotes product and service design in line with the customer and provider expectation and also the improvement of quality (Stickdorn, 2018).

Kansei Engineering (KE) is well known as a powerful ergonomic product design methodology taking into account customer emotional needs (Nagamachi & Lokman, 2015; Nagamachi, 2002). Recent studies show that some have done the implementation of the proposed design, some haven't yet. It is especially for service design. Usually, it stopped at the proposed solution recommendation (see Hartono & Tan, 2011; Hartono, 2020). Hence, a more complete KE methodology can be done through adopting the DT methodology.

The consolidation of KE and DT is believed to provide deeper understanding of user experience and interaction taking into consideration the entire related product/service attributes and customer emotional needs. The main backbone of this study is DT methodology. DT is inherently defined as a systematic process which engages someone or group to do experiment, build and test prototype, gaining feedback from user, and redesign it. Empathy, creativity, and visualization should be appealing in the design process. According to Owen (2007), the concept of design thinking is more on process of synthesis and addressing the real problem (see Figure 4). Design is highly connected to model/framework generation and strongly concerned with real-case subject.

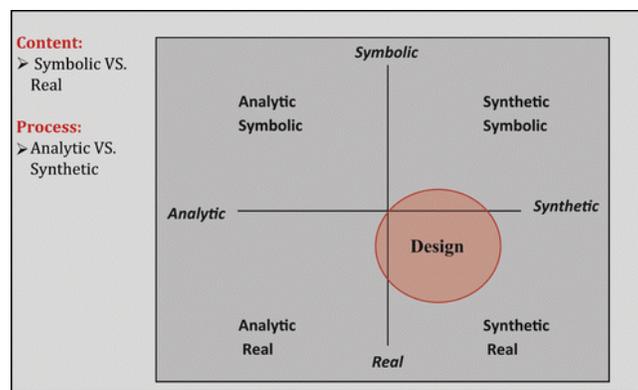


Figure 4. A conceptual representation of process and content in a design thinking (adopted from Owen, 2007)

KE methodology is product and service development and design framework indeed (see Figure 5 for the details of consolidation framework of KE-DT). At the initial stage, both KE and DT has the same step which is to understand the human-system interaction. It may be either a new environment or an experienced environment. Using both linear and non-linear type of DT methodology, after understanding the human-system interaction, through empathize step, a designer needs to choose service/product domain which is of interest, and to define the problem. It is an empathic recognition of the possible and potential problem(s) the designers or engineers are trying to solve. The potential problems may be recognized from customer complaint, customer review, and verbal or non-verbal customer communication.

Afterward, it moves to the define step. It is to analyze our observation and do synthesis them in order to formulize the core problems. The core problems should be related to complex human-centered perspective point of view. In other words, it is more on understanding what is required by customers – what the goal is. Here, Kansei words are identified, finalized, and measured. Concurrently, the product or service attributes are defined and measured. SERVQUAL model is usually used in dealing with services, whereas product dimension categorization is used in dealing with physical product. Kano categorization is utilized to filter which attributes are critical for improvement (see Hartono & Tan, 2011). Kansei is found to be a function of perceived product or service performance, thus, the Kansei response is linked to the perceived product or service performance. It is called as Kansei modeling. In order to validate the formed Kansei model, the confirmatory mechanism for “true meaning” of Kansei is used (Hartono, 2020). Once the linear or non-linear KE model is formed, it needs to check whether the model is valid and make-sense by confirming it with the real condition experienced by the actual customers.

The next step is that the ideate. Based on the confirmed significant relationship between Kansei and product/service attributes as done in the previous step, it is important to list the most critical product/service attributes need to be improved. Using the House of Quality (HoQ), for instance, those critical product/service attributes (known as

WHATs) will be linked to alternative solutions (usually known as HOWs). Some relevant tools are listed as alternatives, such as brainstorming, Quality Function Deployment (QFD), Theory of Inventive Problem Solving (TIPS/TRIZ) (Hartono, 2016). A recent issue on sustainability can be considered as well. In general, the ideation step is about to consolidate some possible solutions internally and externally. Once there are some possible solutions, due to limited resources, a prioritization step should be conducted. Pareto analysis is a common tool to be used.

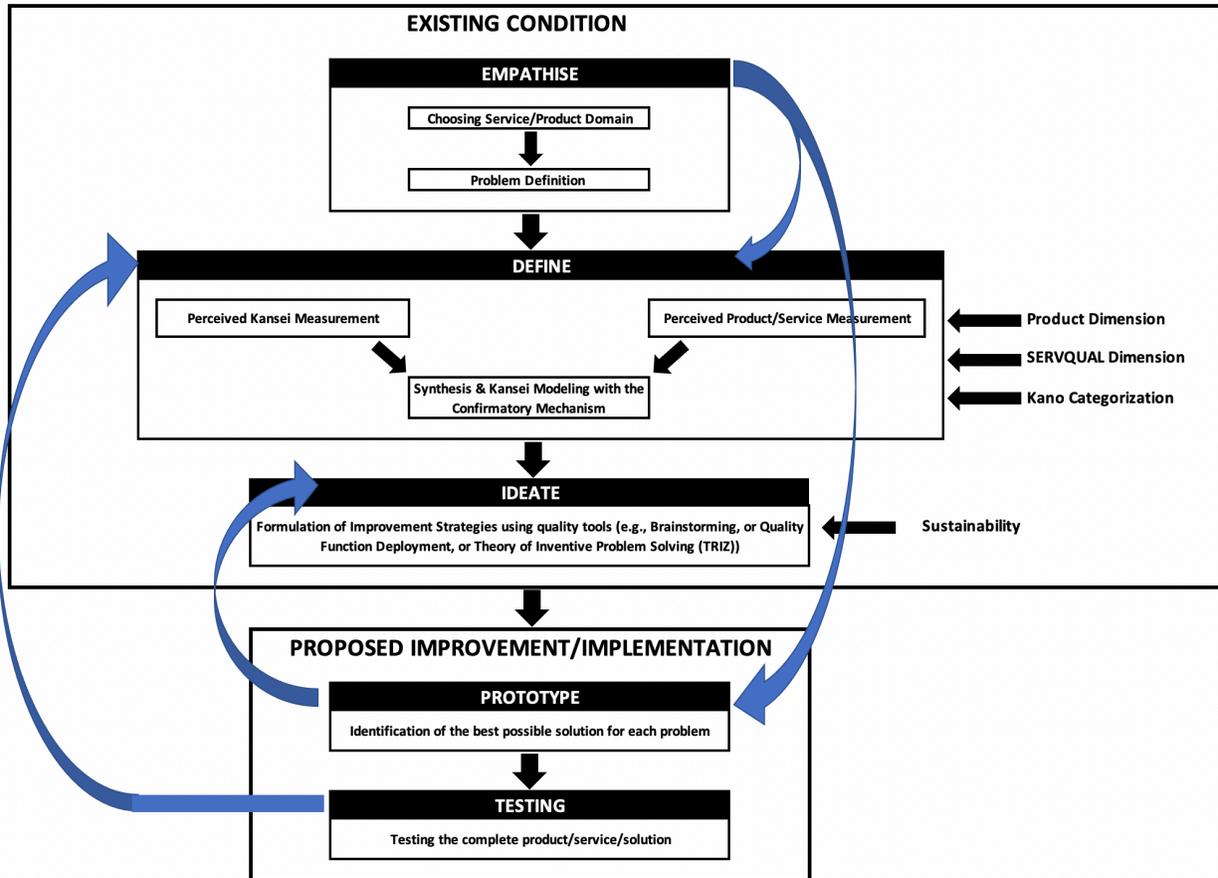


Figure 5. A proposed KE-DT methodology for product/service design and development

Once all the previous steps settled (categorized as the existing condition), a group of proposed improvement/implementation step will follow. It consists of prototyping and testing. Prototyping is a way of experimental stage. It is to create a physical model or real improvement strategy. Afterward, a testing will be conducted. It is a final and complete physical product or service solution to be tested in a real environment with actual or potential user/customer.

With regard to non-linear KE-DT methodology, after empathize stage, it can move to either define or directly to prototyping step. Also, from prototyping it can return to ideation step. It means that there is something to refine based on the prototyping result. After testing, it also can give feedback to the define step. It means that there is another potential problem identified. In general, this combined KE-DT methodology accommodates the concurrent processes in the product or service design and development incorporating customer emotional needs (Kansei).

3. Discussion

Design Thinking (DT) has become a dominant and integral part of the engineering design and business field. It promotes across disciplines since it has a methodology for product, service, and even system design incorporating creative thinking in exploring and generating some possible solutions to any social and engineering problems. Due to

a more complex problem and customer dynamics, a more mature approach in design is needed. According to Gloppen (2009), a design attitude differentiates an approach for solving problem with regard to continuous invention and striving a better place to live for human beings.

Due to more complex problems, Kansei Engineering (KE) should be adjusted to be more relevant in handling various cases. DT is chosen to be a relevant model to be combined with. DT is believed to accommodate wider perspective in human-system interaction. It starts with empathize, which is to observe, interview, and understand deeper what is required by the subject or user or customer. Surely, it is relevant to KE. KE stresses on the importance of user/customer emotions. Through empathy, customer emotions can be revealed and explored. This proposed integrated KE-DT methodology complements the existing KE framework/methodology by engaging the improvement/implementation stage (which is comprised 2 parts, i.e., prototyping and testing). It is wrapped in the design thinking framework.

The superiority of this proposed KE-DT framework is that its ability to dealing with various physical products or non-physical services, and its flexibility to engage with many quality tools. It has the common objective of how to achieve more efficient and effective solution regard to any social-engineering problems.

In dealing with real case studies, there are some conditions to be considered. These are referred to design-thinker characteristics, as follow (Razzouk & Shute, 2012). First, it is human and environment-centered concern. The proposed designs (either product or service) should focus on human needs and sustainable environment concurrently. Second, it should be visualized. Third, it promotes multifunctionality; it means that more diverse or multiple solutions are expected. It is also referred to system thinking. The solutions are not meant to be engaged with 1 problem, instead, they can accommodate more and various problems. Fourth, it puts forward multidisciplinary approach.

Some domains of empirical study examples to be considered such as mechanical engineering, industrial design, software design, industrial services, and IOT-based design.

4. Conclusion

This study proposes a joint framework of Kansei Engineering (KE) and Design Thinking (DT), named as KE-DT methodology. KE methodology has been extensively used for product and service design, and it has extended as well in terms of its ability to engage with quality tools. With rapid growth of customer needs and complex socio-technical problems, more relevant and updated KE approach is needed. Hence, this study proposes an integrated KE-DT framework which can be applied to both physical products and non-physical services. Human and environment-centered and multidisciplinary approach are the main characteristic of this framework. An empirical study is needed for future research.

This study is considered a preliminary research proposing a conceptual framework of KE-DT. As this is also a limitation of the study, hence in the future it is recommended to validate the proposed KE-DT methodology considering a complex service setting. It is specially to prove that KE has a close relationship with DT.

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Biography

Markus Hartono is an Associate Professor in Industrial Engineering at the University of Surabaya, Indonesia, and the Dean of Faculty of Creative Industries at the University of Surabaya, Indonesia. He earned M.Sc. and Ph.D. with full scholarships in Industrial and Systems Engineering from National University of Singapore, Singapore. He has published journal and conference papers in the areas of Ergonomics/Human Factors Engineering, Industrial and Systems Engineering, Kansei Engineering, and Product Design. He is also a Certified Human Factors Professional (CHFP) by Board of Certification in Professional Ergonomics (BCPE), a Professional Engineer of Indonesian Engineers Association (PII), ASEAN Engineer, and Indonesian Accreditation Board for Engineering Education (IABEE) Evaluator.