

# **Ergonomics-based Kansei Engineering and Kano Model for Public Services Excellence**

**Markus Hartono**

Department of Industrial Engineering  
University of Surabaya  
Jalan Raya Kalirungkut, Tenggilis, Surabaya, Indonesia 60293  
[markus@staff.ubaya.ac.id](mailto:markus@staff.ubaya.ac.id)

**Amelia Santoso**

Department of Industrial Engineering  
University of Surabaya  
Jalan Raya Kalirungkut, Tenggilis, Surabaya, Indonesia 60293  
[Uamelia@staff.ubaya.ac.id](mailto:Uamelia@staff.ubaya.ac.id)

**Dina Natalia Prayogo**

Department of Industrial Engineering  
University of Surabaya  
Jalan Raya Kalirungkut, Tenggilis, Surabaya, Indonesia 60293  
[Udnprayogo@staff.ubaya.ac.id](mailto:Udnprayogo@staff.ubaya.ac.id)

## **Abstract**

Emotion is found to be stronger than cognition in human and system interaction. Kansei Engineering has been extensively used to capture customer emotions and translate them into product characteristics since 1980s. Ergonomics in Kansei Engineering is dealing with user and customer capability and limitation in terms of emotional aspects. Customer emotion and expression resulted from both products and services interaction. However, research of Kansei Engineering in services is still relatively less explored. Since service industries are growing significantly as one of the contributors for today's economy, it is a calling for ergonomics-based Kansei Engineering methodology in understanding, modeling and fulfilling what the emotional needs as a function of service attributes. In this study, Kano model has been proposed to Kansei Engineering methodology as a quality tool in screening which service attributes are sensitive to emotional satisfaction, so that more focused-improvements on services are highly expected. Public service sector has been chosen as an empirical study to verify the proposed model. An interview followed by face to face questionnaire which involved 100 subjects has been conducted to explore and investigate what the critical emotional needs related to service attributes in the public service sector. The findings were deemed to be important for local government in prioritizing which services need to be improved. More importantly, it is hoped that both parties (i.e., public and local government) will experience the public service offerings in more effective and efficient way.

## **Keywords**

Kansei Engineering, Kano model, Ergonomics, public services

## **1. Introduction**

The fulfilment of customer needs is of critical to any product and service designers. It starts and ends with users and customers. What is needed and expected by customer should be of prioritized. In a case of service quality, service designer should capture what is needed by the potential customer, and translate it into service characteristic. It may be started by the measurement of expected and perceived service quality, then followed by the analysis of service

gap (Parasuraman et al., 1988). Once there is at least 1 negative gap, which is explaining there is insufficient fulfilment of customer expectation, the service quality is considered not excellent. It is a great challenge for service designer and manager to investigate what the factors making the service offerings ineffective.

Service is of good quality when it has an ability to satisfy the expectations and needs of the targeted customer. It confirms the definition of quality, such as fitness for use and conformance to requirements. Related to product and service, according to Hollins and Shinkins (2006), it refers to product-based, user-based, and value-based. Product-based is defined by measurable characteristics, user-based defined by customer's fitness for use, and value-based refers to the balance between price and performance. In other words, the voice of customer (VOC) is the essence of service quality.

Once there is a negative gap (i.e., a condition when the perception is less than the expectation), there is a signal of dissatisfaction. When there is a dissatisfaction, it may impact the customer loyalty and the company image. Thus, a company should tackle this symptom of dissatisfaction as quickly as possible to avoid more serious risk. Inherently, satisfaction is a complex response due to the assessment of perceived and expected consumption and experience (Vinagre& Neves, 2010).

Basically, customer satisfaction consists of both affect and cognition (Hartono &Raharjo, 2015). Affect helps us making quick judgment or decision, while cognition deals with rationale, knowledge and mental processing (Khalid &Helander, 2006). Affect involves emotions and attitudes. Practically, products or services which offer distinguished features will win the market. Distinguished features are those fulfilling the customer emotional satisfaction and delight. Nagamachi (1995) demonstrates it as the function of product or service attributes and Kansei. In Japanese, the emotional satisfaction or affect is called as Kansei.

Emotional satisfaction has been found to be a good predictor of loyalty (Wong, 2004), and a mediator of perceived quality and behavioral intention (Ladhari, 2009). A more recent research, taking a case study on hotel services, shows that both emotion/affect (known as Kansei) and cognition partially mediate the impact of perceived service quality on loyalty (Hartono &Raharjo, 2015). Through Kansei Engineering (KE), there are few studies on emotional satisfaction in service domains, such as home interior (Llinares& Page, 2011), hotel services (Hartono & Tan, 2011; Hartono et al., 2013; Hartono &Raharjo, 2015), and logistics services. In general, KE is found to be a strong backbone of emotional-based research framework.

Due to more complex problem in services, there is a need in investigating the role of emotions in services. This study takes a case study on public services. The use of KE integrated with Kano model is proposed, to provide the quantitative model of the relationship between emotional response (Kansei) and perceived service quality, considering the performance of service attributes (either it is attractive, one-dimensional, or must-be) (see Hartono & Tan, 2011).

## **2. Literature Review**

### **2.1 Kansei and Service Quality**

Basically, what impressed the customer is critical to any service provider. Impression is dealing with emotion. Khalid and Helander (2006) emphasized that emotion is more dominant than cognitive process in making judgment. In Japanese, the emotions generated by the perceived experience on services is called as Kansei. People with full of Kansei will show good emotion, knowledge and passion (Nagamachi and Lokman, 2011). With respect to market competition, the inclusion of Kansei into service experience will bring good perception to the customers and win the market.

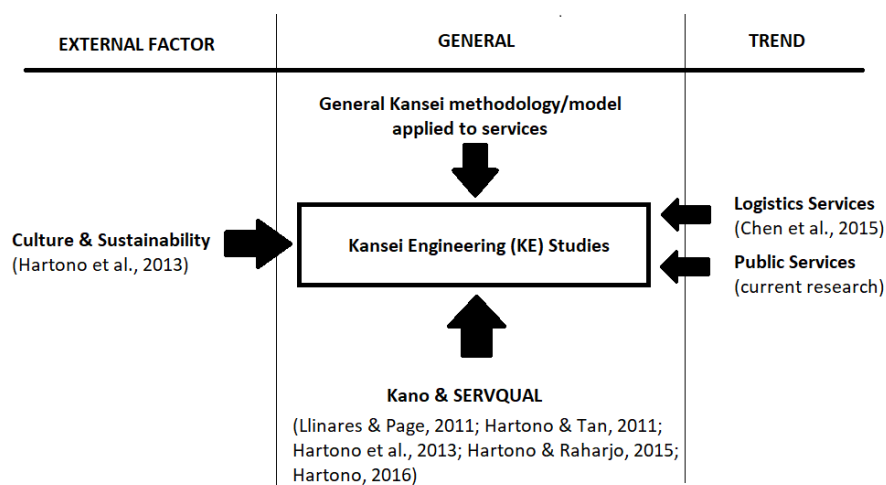
Perceived Kansei is a function of perceived service quality. According to Hartono & Tan (2011), Hartono &Raharjo (2015), and Hartono (2016), the perceived service quality through SERVQUAL dimensions and their attributes bring significant effects on emotional response (Kansei). Through the concept of total quality control (TQC), this

Kansei model is known as Kansei quality management (KQM) which focusing on maximizing total customer satisfaction (Nagamachi&Lokman, 2011).

## 2.2 Kansei Engineering and Kano model

Kansei Engineering model starts with the identification of basic concept of product/service design taking into account emotional needs (Kansei), and ends with the service/product concept characteristics (Nagamachi, 1995). The idea of engaging Kano model with Kansei Engineering (KE) methodology is to enhance the effectiveness of KE application, incorporating the performance of Kano category, whether it is attractive (A), must-be (M) or one-dimensional (O) one (Hartono & Tan, 2011). The service attributes which are categorized as A or O category are deemed to be Kansei-booster (Hartono & Raharjo, 2015; Hartono & Tan, 2011). Those are linearly or unexpectedly beyond satisfaction influence the satisfaction, some are known as delighter (Kano et al., 1984).

Through mapping of the previous KE research on services, it is found that there are three general categories, namely, i. External factor, ii. General, and iii. Trend, as shown in the Figure 1 below.



**Figure 1. General mapping of KE research on services**

## 3. Research Methodology and Model Development

### 3.1 Method

In-depth interview and questionnaire were used for data collection. This study selected a public service called XYZ as the object, located at Surabaya (East Java, Indonesia). It is well known as the public green park at the city center, equipped with children playground, free internet access, and food stalls. Those who have visited this public place and enjoyed its services at the last 6 months were deemed as the potential participants. According to Hartono and Raharjo (2015), this study applied non-probability convenience sampling involving 100 participants. All domestic respondents were recorded.

### 3.2 Proposed Model

By referring to previous studies on KE in services (see Hartono & Tan, 2011 ; Hartono & Raharjo, 2015 ; Hartono, 2016) as provided in Figure 1, the utilized applied integrative model of SERVQUAL, KE and Kano in public services is proposed, as seen in Figure 2. It starts with the identification and measurement of Kansei and public service attributes. The general model of service attributes were adopted from Parasuraman et al. (1988) and modified according to the context of public services. Kano categorization with focus on A and O performance, followed by the linear modeling and priority for improvement were then formulized (see Hartono & Tan (2011) for the details).

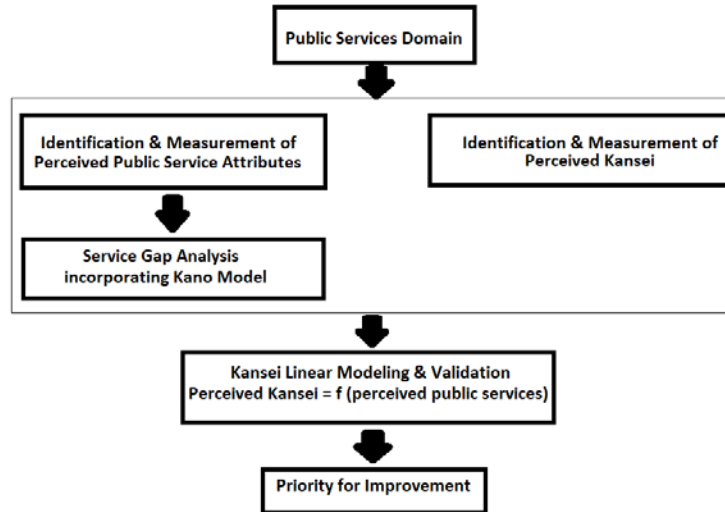


Figure 2. Applicative model of KE & Kano for public services

#### 4. Result and Discussion

The study finalized 15 public service attributes which were mainly adopted and modified from Parasuraman's 22 SERVQUAL items, and they were deemed reliable, through the reliability test's Cronbach's alpha (with a value of 0.845, and cutoff value of 0.7). It implies that there is no problem with the internal consistency. The content and convergent validity were also deemed acceptable (with a value of AVE was higher than 0.5, and Parasuraman's SERVQUAL items were significantly tested through many different service contexts).

The descriptive statistics of public service attributes engaged with Kano categorization is shown in Table 1. There were 8 Kansei words as the representative customer emotional needs finalized, such as comfortable, homey, satisfied, clean, interesting, safe, crowded, and well-organized. All the Kansei words were then set as the dependent variables, and each of them was modeled with service attributes, as shown in Figure 2.

Table 1. Satisfaction score and Kano category of public service attributes

Dimension	Public Service Attributes	Satisfaction Score*	Kano Category
Tangible	The design of public park is interesting	-0,31	M
	The parking lot is spacious	-2,13	M
	The facility in the public park (children playground, seating, and toilet) is well maintained and safe	-0,37	M
	The food stall area is clean	-2,40	O
	The ornament in the public park is well managed	-2,25	A
Reliability	The supporting facility in the public park (free internet access, jogging track, and drinking water tap) is complete	-0,31	O
	The ability of employees cleaning the public park is adequate	0	M
	The employee can maintain and fix the facility and plant correctly and precisely	-0,09	M
Responsiveness	All facilities can be utilized without any constraints of time and damage	-0,42	M
	The employee is responsive to clean the public park	-3,47	M
Assurance	The employee is responsive to manage any damaged facility	-2,26	M
	The parking lot and entire public park is secure	-0,26	M
Empathy	The facility in the public park is safe to use	-0,18	M
	All complaints can be directly delivered to the employee	-3,34	M
	The information about the public is publicly available	-5,44	M

\*satisfaction score = (perception – expectation) x importance level

**Table 2. Kansei modeling and critical public service attributes**

Kansei Words	p-value	Kansei Linear Model	Critical Service Attributes
Comfortable	0.000	Comfortable = 0.147 + 0.577T <sub>6</sub>	T <sub>6</sub> : The supporting facility in the public park (free internet access, jogging track, and drinking water tap) is complete
Homey	-	-	-
Satisfied	0.02	Satisfied = 3.509 + 0.223 T <sub>4</sub>	T <sub>4</sub> : The food stall area is clean
Clean	-	-	-
Interesting	0.000	Interesting = 1.231 + 0.25 T <sub>4</sub>	T <sub>4</sub> : The food stall area is clean
Safe	-	-	-
Crowded	-	-	-
Well-organized	0.001	Well-organized = 3.244 + 0.266 T <sub>5</sub>	T <sub>5</sub> : The ornament in the public park is well managed

Incorporating the satisfaction score, Kano score and Kansei score, the total integrative weight of each significant service attribute is calculated (shown in Table 3). It is used to identify the most critical service attribute to improve. It was found that the most critical service attribute in the public park service was the food stall area is clean.

**Table 3. Total weight of service attribute for prioritized improvement**

No	Service Attribute	Satisfaction Score	Kano Category (Scores)	Kansei Words (Scores)	Total Weight**
1	T <sub>4</sub> : The food stall area is clean	2.4	O (2)	Satisfied; Interesting (4.37; 4.29)	41.57
2	T <sub>5</sub> : The ornament in the public park is well managed	2.25	A (4)	Well-organized (4.31)	38.79
3	T <sub>6</sub> : The supporting facility in the public park (free internet access, jogging track, and drinking water tap) is complete	0.31	O (2)	Comfortable; Interesting (4.30; 4.29)	5.33

\*\*total weight = |satisfaction score| x Kano score x  $\sum$  Kansei scores

## 5. Conclusion and Further Research

This study provides both theoretical and practical contributions. This study complements the applied integrated approach of Kansei Engineering and Kano to services, taking into account public services. The finding demonstrates how emotions were influenced by the usefulness and fulfillment of public service attributes. Apart from commercial-oriented services, this study was able to show that emotions are also important in bringing customer satisfaction regardless the type of business model. In addition, in-line with the previous studies on commercial services, this study provides a practical guideline for the local government or its representative in prioritizing which service attributes need to be improved given a limited budget and resource.

## 6. Acknowledgement

This study was supported by the Department of Industrial Engineering University of Surabaya (Ubaya) and the Directorate of Research, Technology, and Higher Education (Ristekdikti). The author would like to thank the anonymous reviewer.

## References

Chen, M-C., Hsu, C-L., Chang, K-C. and Chou, M-C., Applying Kansei Engineering to design logistics services: a case of home delivery service. *International Journal of Industrial Ergonomics*, Vol. 48, pp. 46-59, 2015.

- Hartono, M. and Tan, K.C., How the Kano Model Contributes to Kansei Engineering in Services, *Ergonomics*, Vol. 54, No. 11, pp. 987–1004, 2011.
- Hartono, M., Tan, K.C., and Peacock, J.B., Applying Kansei Engineering, the Kano Model and QFD to Services, *International Journal of Services, Economics and Management*, Vol. 5, No. 3, pp. 256–274, 2013.
- Hartono, M. and Raharjo, H., Exploring the mediating role of affective and cognitive satisfaction on the effect of service quality on loyalty, *Total Quality Management & Business Excellence*, Vol. 26, No. 9-10, pp. 971-985, 2015.
- Hartono (2016), The extended integrated model of Kansei Engineering, Kano and TRIZ incorporating cultural differences into services, *International Journal of Technology*, No. 1, pp. 95 – 103, 2016.
- Hollins, B. and Shinkins, S., *Managing Service Operations: Design and Implementation*, London: SAGE Publications Ltd., 2006.
- Kano, N., Seraku, N., and Takahashi, F., Attractive Quality and Must-be Quality, *The Journal of the Japanese Society for Quality Control*, Vol. 14, No. 2, pp. 39–44, 1984.
- Khalid, H. M. and Helander, M. G., Customer Emotional Needs in Product Design, *Concurrent Engineering: Research and Applications*, Vol. 14, No. 3, pp. 197-206, 2006.
- Ladhari, R., Service quality, emotional satisfaction, and behavioral intentions: A study in the hotel industry, *Managing Service Quality*, Vol. 19, No. 3, pp. 308-331, 2009.
- Llinares, C. and Page, A.F., Kano's model in Kansei Engineering to evaluate subjective real estate consumer preferences, *International Journal of Industrial Ergonomics*, Vol. 41, No. 233-246, 2011.
- Nagamachi, M., Kansei Engineering: A New Ergonomic Consumer-oriented Technology for Product Development, *International Journal of Industrial Ergonomics*, Vol. 15, No. 1, pp. 3–11, 1995.
- Nagamachi, M. and Lokman, A.M., *Innovations of Kansei Engineering*, CRC Press, Boca Raton, Florida, USA, 2011.
- Parasuraman, A., Berry, L.L., and Zeithaml, V.A., SERVQUAL: A Multiple-item Scale for Measuring Consumer Perceptions of Service Quality, *Journal of Retailing*, Vol. 64, No. 1, pp. 12–40, 1988.
- Vinagre, H. and Neves, J., Emotional predictors of consumer's satisfaction with healthcare public services, *International Journal of Health Care Quality Assurance*, Vol. 23, No.2, pp.209-227, 2010.
- Wong, A., The role of emotional satisfaction in service encounters, *Managing Service Quality*, Vol. 14, No. 5, pp. 365-376, 2004.

## **Biography**

**Markus Hartono** is an Associate Professor at the Department of Industrial Engineering, University of Surabaya, Indonesia. He received his Bachelor of Engineering (B.Eng.) in Industrial Engineering from University of Surabaya (Ubaya), Indonesia, in 2000 with predicate of Cum Laude. In 2004, he received the ASEAN Graduate Scholarships (AGS) award for pursuing his master's degree in Industrial and Systems Engineering from National University of Singapore (NUS), and he obtained his Master of Science (M.Sc.) in 2005. In 2008, he received a prestigious award of NUS Graduate Research Scholarships for 4 years for pursuing his PhD, and obtained his PhD degree in 2012. He received Best Paper Award of the 14<sup>th</sup> and 15<sup>th</sup> Quality in Research (QiR) in 2015 and 2017, respectively. His teaching and research interest is in ergonomics, Kansei Engineering, product design and management, and service quality management. He is Vice President of Indonesian Ergonomics Society (IES) and a member of Affective Design Technical Committee for International Ergonomics Association (IEA).