

JOURNAL of the
**PHILIPPINE INSTITUTE OF
INDUSTRIAL
ENGINEERS
(JPIIE)**

**Volume 8 Number 1
June 2011**

Guest Editor
Eppie Clark

Editor-in-Chief
Anthony SF Chiu
Philippine Institute of Industrial Engineers

Managing Editor
Rosemary Seva
De La Salle University – Manila

Published by:

Philippine Institute of Industrial Engineers (PIIE)

PIIE is a partner of the **APIEMS Network**

APIEMS: Asia Pacific Industrial Engineering and Management Society

Copyright © **Philippine Institute of Industrial Engineers (PIIE)**

All rights reserved.

No part of this publication may be reproduced,
stored in a retrieval system, or transmitted,
in any form or by any means,
electronic, mechanical, photocopying,
recording, or otherwise, without permission
in writing from the publisher.

ISSN 1656-2798

Printing Press:

Central Books Supply Inc.

927 Phoenix Bldg. Quezon Avenue, Quezon City 1101

Tel. +63 2 3723550 local 34 / direct 3744064

Fax. 3724732

CONTENTS

- **Editorial.....iv**

- **Evaluating the Impact of the Lift-Move-Place Activity with 5-Gallon Water Bottles to Spinal Loading Parameters: A Dynamic Motion Analysis Approach**
Dennis T. Beng Hui
Efren Miguel T. de la Cruz
Paul Anthony S. Go
John Christopher A. Ko.....1

- **Risk Factors among Persons with Disabilities in the Mobility Toys Manufacturing Cooperative**
Maida A. Dela Cueva
John Bert Corpuz
Christopher Rondero
Venusmar Quevedo.....8

- **The Role of Kansei Engineering in Influencing Overall Satisfaction and Behavioral Intention in Service Encounters**
Markus Hartono
Tan Kay Chuan.....14

- **Affective Service for Elderly: A Case of Taiwan High Speed Rail Station**
Emil R. Kaburuan
E. Peranginangin
W. P. Pu
M. H. Chu
I. F. Hsieh
S. F. Chien.....24

- **Noticing Directional Signages: A Visual Attention Investigation on Wayfinding**
Joselisa Shiela Mary Tiong
David Angelo Bornilla
Danna Ariane Despues
Alma Maria Jennifer Gutierrez.....28

Editorial Note

*I*t is with pride and honor that we publish this issue of the Journal of the Philippine Institute of Industrial Engineering which contains selected papers from the First Southeast Asian Network of Ergonomics Societies Conference in 2010. SEANES2010 is a momentous event as it marks the first time that a regional conference in ergonomics was held in the Philippines. Dr. Rosemary Seva, the immediate past president of SEANES was instrumental in taking the conference to the Philippines. The success of the event was made possible by the help provided by the members of the Philippine Ergonomics Society and De La Salle University. Both organizations are long time partners of the Philippine Institute of Industrial Engineers.

This special issue contains the works of authors who have been passionately involved in the study of ergonomics, with the main intent of facilitating human interactions with products, equipment, environment and systems through the design of equipment and devices that fit the human body, its movements and cognitive abilities.

This special issue of the JPIIE is a collection of papers that dealt with interesting and relevant subjects in ergonomics such as aging, lifting, safety, and cognition. The diversity of topics gives an appreciation of the large application domain of ergonomics in several areas.

The population of most first world countries in the world is aging. As most facilities have been designed for young and middle-aged population this trend may necessitate changes in design. In Taiwan, a group of researchers studied how they can satisfy the needs of the elderly population who are using train services. The keen use of observation allowed them to make service improvements that significantly increased the satisfaction of elderly users.

Lifting 5-gallon water containers is a safety problem in most households as it can easily cause back problems. In the paper of BengHui et al, alternative designs for lifting the water container were presented and evaluated using motion analysis and electromyography. With the improved design, it is expected that the danger of lifting will be greatly minimized.

The work of Tiong et al presented visual interaction between the environment and users. The intent is to take control of the elements of directional signages in order to minimize possibility of the users from being lost.

The work of Hartono and Chuan investigated the relationships among constructs during a service encounter process in luxury hotels. The findings show that emotions play a significant role as a complement to cognitive process in influencing customer satisfaction.

The work of De La Cueva et al aimed to assist in maintaining the health and safety of Persons with Disabilities (PWDs) who are employed in manufacturing organizations. The study suggests that it is important to determine the capabilities and limitations of PWDs to design tasks that will maintain their well-being.

The elderly are the beneficiaries of the work of Kaburuan et al. They proposed a design which promotes affective service in public facilities for the elderly. It is based on the observation of elderly activities inside the waiting room in the train station.

This set of researches depict but a few of the noble works of authors addressing the needs of the human being in his various daily tasks. As Industrial Engineers, we perceive that work such as these are significant contribution to the promotion of the well-being of the worker. Therefore we find it our privilege to present this as just the first of two issues on ergonomics and design.

Anthony SF Chiu, DBA PIE
Editor-in-chief
Rosemary Seva, PhD
Managing Editor
Eppie Clark, PhD
Guest Editor

The Role of Kansei Engineering in Influencing Overall Satisfaction and Behavioral Intention in Service Encounters

Markus Hartono,^{1,2} Tan Kay Chuan¹

¹Department of Industrial and Systems Engineering, National University of Singapore

²Department of Industrial Engineering, University of Surabaya

markushartono@nus.edu.sg

isetankc@nus.edu.sg

Abstract: Customers today concern themselves more on fulfilling their emotional needs rather than rationales and functionalities. In dealing with customer emotions in products/services, Kansei Engineering (KE) is applied. A comprehensive case study in luxury hotels was conducted. Eighty one Indonesian, 75 Singaporean, and 74 Japanese tourists participated in this survey. It aims to investigate the relationships among constructs during service encounter process. The finding shows that emotions (affective process) play a significant role as a complement to cognitive process in influencing customer satisfaction. Among 3 populations, Japanese was found to be more Kansei-oriented customer.

Keywords: *Kansei Engineering, emotional needs, customer satisfaction*

1. INTRODUCTION

Today's customers are very dynamic and 'unfaithful' to particular products and services. Compared to the first launching, the sales of products or services are not increasing as before. This condition influences companies to reformulate their product and development strategies (Shimizu *et al.*, 2004). As mentioned earlier by Schütte (2005), some efforts or methods were old fashioned, such as fast product/services changes, or even price reductions and discounts. Essentially, this condition reveals an effort to explore and capture the deepest voice of customer that is "unspoken emotional need" customers seek in product and service. This strategy is potential to create "customer emotional bond" in the future.

To deal with customer unspoken emotional needs, Kansei Engineering (KE) is proposed (Nagamachi, 1995; 2002a; 2002b). This method has been extensively applied to product design and development since 1970s (Nagamachi, 1995, 2002a, 2002b; Nagamachi and Imada, 1995; Schütte *et al.*, 2004; Schütte, 2005). The application framework of KE and its methodology has been discussed and extended into international-based services (Hartono and Tan, 2009).

Since service is the fastest growing sector in today's economies, it is potential to utilize KE on capturing and modeling customer emotions ("Kansei" in Japanese). The main part of the service processes is service encounter. It is when the server meets the customer, where the customer emotions involved, and where most people judge the quality of service. Mattila and Enz (2002) argued that consumer's evaluations of the service encounter correlate highly with their displayed emotions during the interaction process. Actually, many studies on service quality have been carried out which focusing on cognition (Liljander and Strandvik, 1997; Yu and Dean, 2001; Wong, 2004; Ladhari, 2009). Hence, this research focuses on service encounter that involves some service experience processes, such as affective (Kansei) process, perceived service

quality, cognitive process, overall satisfaction, and behavioral intention.

This paper is organized as follows. Following this introduction, the paper presents the purpose of study. Afterwards, a short review of KE in services is provided, followed by a short elaboration of physical products and services, and several service experience constructs. The main contribution of this paper, namely "proposed model of Kansei Engineering in the initial stage of service experiences" followed by a case study takes the next place. Then comes the discussion and conclusion sections.

2. THE PURPOSE OF THE STUDY

KE studies on service sector have been addressed by Nagamachi since 1980s (see Nagamachi and Lokman, 2011). It was then extended by Hartono and Tan (2009) by proposing an integrative framework of KE applied to services. This study highlights a crucial part taken from the whole application framework of KE in services, i.e., the relationships among variables of service quality, cognition, affection, satisfaction, and behavioral intention in services. Hence, this study examines the role of affective process (Kansei) as an impact of perceived service quality and cognitive process, and investigates how the affective process influences customer satisfaction and also behavioral intention.

3. LITERATURE REVIEW

3.1 Kansei Engineering (KE) in services

KE is defined as an ergonomic technology of customer-oriented product development which mainly focusing on the customer's feelings and needs (Nagamachi, 1995; Nagamachi and Imada, 1995). Besides dealing with attractive exterior appearances, KE has a strength to optimize properties which are not directly detectable or visible (i.e., interior qualities) but felt by human sense (i.e., emotions), such as the atmosphere of a concert hall, the concepts of good driver feeling or quality feeling by modifying the engineering properties of the products (Schütte *et al.*, 2008). Mazda Miata is one example of the KE's pinnacles of success.

KE is shown as a method to elevate customer satisfaction which is superior to other methods. KE is able to minimize the subjectivity of emotions measurement by building a mathematical relationship model between emotional responses/internal sensations through all human senses and their respective external stimuli (e.g., product traits and service attributes). In other words, this method can quantify the subjective feelings which are related to particular physical objects (in physical product) and both physical and non-physical stuffs (in service environment). In dealing with flexibility due to rapid changing innovations, KE can tunnel through the borders between the different scientific fields. Also, this method can identify suitable tools and reassemble them into a new method for modified KE in order to quantify the impact of product traits/service attributes have on the users' emotions (Schütte *et al.*, 2004).

Regarding the contribution of KE in service and hospitality sector, SERVQUAL model (Parasuraman *et al.*, 1988, 1991) is used as the representation of service attributes (see Ladhari, 2009). The customers' evaluation of service quality is reflected by the magnitude of perceived service and the difference (gap) between predicted and perceived service. It turns out to be a precursor of customers' emotion, satisfaction and behavioral intention.

3.2 Physical and non-physical elements of services

When customers evaluate a service, they are interested in physical appearance and external impression. It is known as servicescape (Bitner, 1992). Consumers are likely to use tangible aspects like appearances to make judgments and evaluations. Essentially, servicescape is the physical surroundings in services which might build the effects on the quality of social interaction between customer and employee. Regarding non-physical element of service, the interaction between customers and employees is applied. For example, the actual interactions such as how customers examine the way the service staffs behave, communicate and dress up are the determinants of customer's impression on services. This recalls the definition of services as the application of specialized competences (knowledge and skills) through processes,

activities, and interactions which rather than things (Vargo and Lusch, 2004; Lovelock, 1991).

3.3 SERVQUAL model as the main representation of services

Perceived service quality is found positively related to the emotional satisfaction in many researches (Wong, 2004). This is the main core of stimulus for customers during service encounter. Similar to product elements, it is called service attributes when applying KE in services.

In measuring and exploring customer experience on service, SERVQUAL model (Parasuraman *et al.*, 1988, 1991) is used. It comprises 5 dimensions, such as: i) tangibles, including physical facilities and environment, equipment, and appearance of personnel; ii) reliability, or an organization's ability to perform the promised service accurately; iii) responsiveness, or an organization's willingness to help customer and provide prompt services; iv) assurance, which is the knowledge and courtesy of employees and their ability to convey trust; and v) empathy, or the caring and individualized attention which an organization provides. In essence, these dimensions are the manifestation of the physical and non-physical aspects of services.

3.4 Dimensions of service experience and satisfaction

Service experience and satisfaction consist of both cognitive and affective dimensions (Oliver, 1993). Emotion is regarded as a mediator between cognitive evaluation and service satisfaction (Oliver & Westbrook, 1993). Helander and Khalid (2006) highlight the difference between affect and cognition. The affective system makes judgments and quickly helps us determine which things in the environment are dangerous or safe, good or bad. It is called visceral level of human brain processing (Norman, 2004). Due to service experience, it may consist of such emotions as anger, contentment, pleasure, happiness, etc (Ladhari, 2009). On the other hand, cognition forms beliefs and knowledge. It covers customer's evaluation of a series of service attributes performance. It implies that products or services (system) that make us feel good, happy and impressive are easier to deal with and produce more harmonious results.

3.5 Behavioral intention

Behavioral intention is also called customer loyalty. It refers to the likelihood of a customer returning, making business referrals, providing strong word-of-mouth, as well as providing references and publicity to others (Bowen and Shoemaker, 1998). In this study, behavioral intention refers to 'loyalty', 'willingness to pay more', and 'recommendation' as adopted from Ladhari (2009). A positive emotion which is triggered by the provision of high level of service quality may lead to higher levels of customer satisfaction, increase hedonic service value, and increase repurchase intentions (Oliver *et al.*, 1997;

Liljander and Strandvik, 1997; Babin and Attaway, 2000; Barsky and Nash, 2002; Wong, 2004).

4. PROPOSED RESEARCH MODEL

In service research, perceived service performance and expectation will influence customer emotion. Even though the debate regarding whether cognition precedes affection or affective experience precedes cognition still remains unresolved (Lin, 2004), this study is proposed in line with what KE concerns. Cognitive state is deemed to precede emotional state as argued by some researchers (Lazarus, 1999). It has been shown by the relationship between Kansei and external stimuli (product elements/properties) where Kansei is a function of external stimuli (Nagamachi, 1995, 2002a, 2002b; Schütte *et al.*, 2004, 2008; Schütte, 2005). Basically, cognitive process relates to form pre consumption expectancies, observe product performance, compare performance with expectations, form disconfirmation perceptions, combine these perceptions with expectation levels, and form satisfaction judgments (Oliver 1980, 1993; Tse & Wilton, 1988). By referring to the concept of Gestalt psychology, Lin (2004) argues that when customers evaluate servicescapes, their individual perception serves a cognitive experience which stimulates their emotional responses (e.g., pleasure, arousal, and dominance). According to Russell (1980), cognition as a comparison of perceived quality and service expectations is likely to be a driver of emotion/affect. On the other hand, affective process is the emotions felt by customers after

experiencing certain services (during service encounter stage). Affective process is regarded as the core of this study and applied in the midst of the whole service processes.

This study proposes a model of KE in the initial stage of service experience (see Figure 1). The model is modified from Oliver (1980) and Ladhari (2009). It aims to investigate the modified relationships between perceived service performance, cognition, emotion, overall satisfaction and behavioral intention in order to address the application of KE in services. This is an integrated model of Kansei and service attributes taken into account the relevant service experience constructs. In general, this model consists of 2 main parts of service experience, i.e., i) internal interaction and ii) external interaction. The former discusses about the availability of service quality (environmental dimensions) and customer internal responses. What constitutes the relationship between cognitive process, affective process, and satisfaction refers to customer internal responses. In shorts, it explains how service quality affects customer internal responses. Whilst the latter highlights behavioral intention as the customer external response (external interaction). It includes how customers behave after experiencing services for a certain period of time.

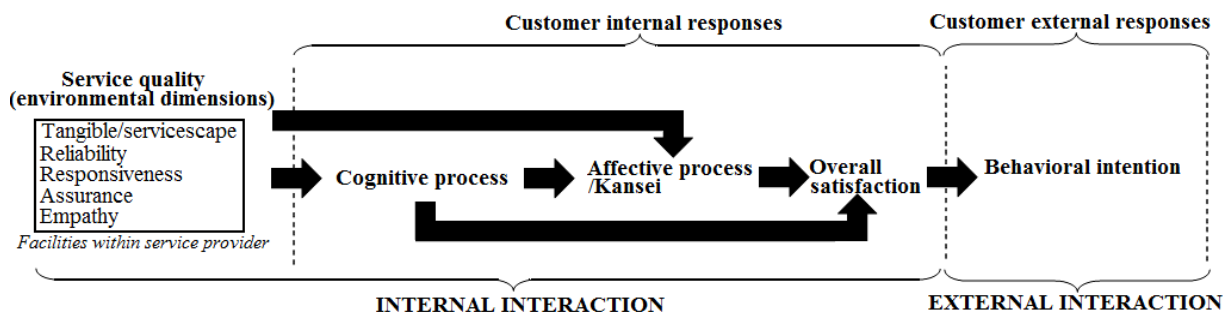


Figure 1: Proposed model of Kansei Engineering in the initial stage of service experiences

5. EMPIRICAL STUDY

Case study has been conducted in luxury hotel services during November 2009-December 2010. Luxury hotels were chosen since they have potential impact on customer emotions (Barsky and Nash, 2002). Luxury hotel is deemed to be a complex service with integrated customer involvement. It seems that people can do all their activities and needs in hotel in a whole day. Tourists who stayed in any luxury hotel at least for 2 days were the target of the survey. It was assumed that customers should have known well the services provided by the hotel. This approach is in line with what KE concerns. According to Schütte *et al.*

(2008), it is more useful to evaluate products/services after long-term usage. A face to face questionnaire was utilized as the primary means of data collection. Face validity was enhanced since the interviewer tried to explain the study objective and to respond any relevant queries from the participants. Respondents were then asked to state their response of the hotel services with respect to each construct provided using a five-point Likert scale. It took around 20 minutes per subject. Data collected from 81 Indonesian, 75 Singaporean, and 74 Japanese tourists were reported. The profile of respondents is summarized in Table 1.

TABLE 1
Profile of respondents

Variable	Indonesian		Singaporean		Japanese	
	Freq.	% of total	Freq.	% of total	Freq.	% of total
Hotel category						
4-star hotel	36	44.4	26	34.7	29	39.2
5-star hotel	45	55.6	49	65.3	45	60.8
Gender						
Male	41	50.6	36	48	36	48.6
Female	40	49.4	39	52	38	51.4
Age						
<=20	10	12.3	7	9.3	0	0
21-30	16	19.8	17	22.7	0	0
31-40	21	25.9	19	25.3	19	25.7
41-50	21	25.9	17	22.7	22	29.7
>50	13	16	15	20	33	44.6
Frequency of travel						
Once a year or less	14	17.3	15	20	14	18.9
Every 6 month	25	30.9	20	26.7	26	35.1
Every 3 month	22	27.2	23	30.7	18	24.3
Every month	12	14.8	11	14.7	16	21.6
>= once a month	8	9.9	6	8	0	0
Purpose						
Vacation	43	53.1	23	30.7	16	21.6
Business trip	20	24.7	25	33.3	29	39.2
Conference	10	12.3	12	16	14	18.9
Social visit	7	8.6	14	18.7	14	18.9
Medication	1	1.2	-	-	-	-
Amount of time spent						
<=3	29	35.8	18	24	39	52.7
4-7	30	37	27	36	20	27
8-11	22	27.2	30	40	15	20.3
>11	0	0	0	0	0	0
Monthly income						
<=US\$2000	18	22.2	3	4	0	0
US\$2001-3000	33	40.7	21	28	18	25
US\$3001-4000	16	19.8	17	22.7	20	27.8
>US\$4000	14	17.3	34	45.3	34	47.2
Frequency of stay						
Less than once a year	11	13.6	4	5.3	0	0
Once a year	16	19.8	21	28	20	27
Twice a year	18	22.2	25	33.3	12	16.2
Three times a year	19	23.5	17	22.7	10	13.5
Four times a year	13	16	5	6.7	20	27
Five times or more a year	4	4.9	3	4	12	16.2
Highest education						
Junior high or equivalent	11	13.6	0	0	0	0
High school or equivalent	34	42	24	32	21	28.4
College or university degree	30	37	36	48	22	29.7
Post graduate	6	7.4	15	20	30	40.5
Occupation						
Clerical/office	5	6.2	12	16	0	0
Engineering	11	13.6	9	12	0	0
Entrepreneur/self-employed	16	19.8	13	17.3	13	17.6
Management	8	9.9	10	13.3	9	12.2
Education	11	13.6	12	16	20	27
Finance	12	14.8	10	13.3	12	16.2
Marketing	11	13.6	9	12	9	12.2
Student	6	7.4	0	0	0	0

As seen in Table 1, this study captured a balanced percentage of male and female respondents for each population group. The gender split was 50.6% male and 49.4% female (Indonesia), 48% male and 52% female (Singapore), and 48.6% male and 51.4% female (Japan). Tourists of age between 31 and 40 was the largest group (in Indonesia and Singapore), whilst the Japanese group had the biggest portion at the age above 50. The majority traveled once every 6 months. In terms of the purpose of stay, more than half of the Indonesian tourists indicated that they were on vacation (53.1%), whilst the Singaporean and Japanese people were on business trips (33.3% and 39.2%, respectively). The longest amount of time spent was 8 to 11 days (40% in Singaporean), whilst most Indonesian and Japanese tourists spent less than 3 days (35.8% and 52.7%, respectively). In the majority, the subjects' monthly incomes ranged between US\$2001 and US\$3000 (40.7% in Indonesian), and over US\$4000 (45.3% and 47.2% in Singaporean and Japanese, respectively). In terms of education level, both Singaporean and Indonesian tourists were mostly bachelor degree holder (37% and 48%, respectively), whilst Japanese tourists were postgraduates (40.5%). Most of the Indonesian and Singaporean subjects were entrepreneurs/self-employed (19.8% and 17.3%, consecutively), while the Japanese tourists were working in the education sector (27%).

5.1 Construct validity

It is used to ascertain the quality of a survey. The adequacy of relationship model between constructs and their measurement items was evaluated by reliability and validity tests of the research instruments. Confirmatory factor analysis (CFA) is utilized. This is to verify the factor structure of a set of observed measures. SmartPLS 2.0 M3 (Ringle *et al.*, 2005) was used. PLS deals with small sample sizes and makes few demands on any distributional form of the measured variables (Chin, 1998). The convergent validity, discriminant validity, and reliability of all constructs, were examined and reported (see Table 2). Since the items under "Cognitive process" construct were derived from "Service quality" construct (i.e., the gap between perceived and expected service quality), it was skipped for instrument validation. According to Bagozzi (1994), it is argued that construct validity (convergent and discriminant validity) will not be meaningful if the indexes formed as linear sums of measurement. In addition, "Overall satisfaction" construct was skipped for validity test since it has only 1 observed measure. The data were then standardized using SPSS[®] 13 for building path model using PLS-Graph 2.0.

1) *Affective process (Kansei) construct*

The collection of Kansei words is known as the affective process. These words were collected from interviews with seven tourists who stayed in luxury hotels. For common studies, according to Steinar (2007), the number of interviews is usually around 15±10. By adopting the concept of "contextual inquiry", on-site interviews were carried out. Forty relevant Kansei words were chosen based on findings from interviews and a literature review. They

were then structured and finalized to be a group of 16 words such as convenient, attractive, clean, etc.

In terms of convergent validity, the following three criteria are recommended by Fornell and Larcker (1981): i) all item factor loadings should be significant and exceed 0.7 (Nunnally, 1978), ii) construct reliabilities should exceed 0.7, and iii) average variance extracted (AVE) by each construct should exceed 0.5. This study adopted a loading threshold of 0.5 as argued by Hulland (1999) and Chin (1998). In the Indonesian sample, all items satisfied the threshold value except for "Passion" (0.226). However, in the Japanese sample, items "Convenience" and "Relaxedness" had loadings below 0.5, while the remaining items were satisfied. In the Singaporean sample, all items were satisfied. As a consequence, those items with loadings below 0.5 were deleted. Furthermore, this construct had acceptable composite reliability and AVE for all three groups. In terms of discriminant validity, the following two options are recommended (Gefen and Straub, 2005): i) the square root of AVE for a particular construct must be greater than its corresponding inter-construct correlation coefficients and ii) the loadings for the within-construct must exceed the inter-construct cross loadings by at least 0.1. For all three sample groups, this requirement was satisfied. Regarding reliability, this is used to evaluate the internal consistency of a construct. Cronbach's alpha and composite reliability were used (Gorla *et al.*, 2010). Nunnally (1978) suggests 0.7 as a benchmark for 'modest' reliability. For all three sample groups, this requirement was also satisfied. Hence, this construct was found to be valid and reliable.

2) *Service quality construct*

The service attributes were designed based on relevant theories and significant research findings proposed by previous scholars. They consider the SERVQUAL 22-item scale by Parasuraman *et al.* (1988) and the 26-item scale of hotel service quality by Ladhari (2009). These were previously empirically tested by scientific research techniques and have shown tolerable validity. In total, there were 39 items, such as "The receptionist and information desk is visually appealing", "The employees' uniforms are clean, nice, and neat" ... "The hotel has operating hours convenient to you". Based on the PLS output, related to convergent validity, all items of the "perceived service quality" construct had loadings above 0.5, except for three items in the Japanese group. These items were removed. As a result, for all three sample groups, this construct also demonstrated tolerable validity and reliability.

3) *Behavioral intention construct*

The following three different items were used to describe this construct (Ladhari, 2009): i) "I will certainly recommend hotel XYZ to my friends, relatives, and acquaintances", ii) "I would pay a higher price than the competitors charge for the benefits that I received from hotel XYZ", and iii) "Hotel XYZ is always my first choice". Based on the PLS output, this construct also showed acceptable validity and reliability in all groups.

Table 2
Measurement of constructs

Construct	Indonesia			Singapore			Japanese		
	AVE*	Composite reliability	Cronbach's alpha	AVE	Composite reliability	Cronbach's alpha	AVE	Composite reliability	Cronbach's alpha
Affective process (Kansei)	0.498	0.937	0.928	0.492	0.911	0.897	0.491	0.862	0.827
Perceived service quality	0.51	0.971	0.97	0.494	0.946	0.941	0.48	0.919	0.908
Behavioral intention	0.713	0.882	0.801	0.588	0.809	0.655	0.654	0.849	0.741

*average variance extracted

5.2 Path analysis

When performing this study, it was highly assumed and considered all participants have experienced all aspects of the hotel services. Participants should have had good prior experience, high interest, and a high degree of interaction, so that they will deliver more relevant and reliable results. All bad and irrelevant responses of

customer were neglected. Thereafter, it was to assess the structural model by looking at the explanatory power of the structural model and the path coefficients using SmartPLS 2.0 M3 (Ringle et al., 2005) (see Figure 2). Hypotheses testing were performed by examining the size, the sign, and the significance of the path coefficients, and all statistical tests were assessed using *one-tailed t-test* since the hypotheses were unidirectional in nature (see Table 3).

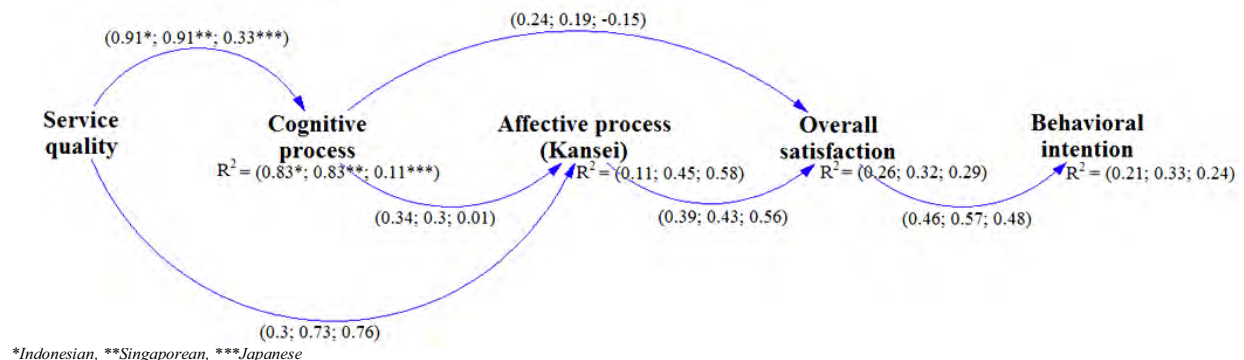


Fig. 2 Structural model with path coefficients

Table 3
Results of structural model

Path	Indonesian		Singaporean		Japanese	
	t-val.	Inference*	t-val.	Inference	t-val.	Inference
Service quality → Cognitive process	62.86	Supported	51.66	Supported	3.04	Supported
Service quality → Affective process	2.11	Supported	3.11	Supported	12.41	Supported
Cognitive process → Affective process	2.14	Supported	2.27	Supported	0.14	Not supported
Cognitive process → Overall satisfaction	2.26	Supported	1.68	Supported	1.86	Supported
Affective process → Overall satisfaction	4.73	Supported	4.81	Supported	8.42	Supported
Overall satisfaction → Behavioral intention	5.61	Supported	8.93	Supported	5.67	Supported

*it was checked with 20.05 = 1.645

The path analysis among the five major constructs (including their hypotheses) is shown in Table 4.

Table 4
Path and hypothesis analysis

Path	Hypothesis	Analysis
Service quality → Cognitive process	Perceived service quality is positively related to cognitive process	The paths for all 3 groups were significant, which supported this hypothesis. Both Indonesian and Singaporean rated larger effect of perceived service quality on cognitive process than Japanese.
Service quality → Affective process	Perceived service quality is positively related to affective process	Affective process refers to the response of customer emotions/Kansei. All paths in 3 groups were supported. The largest effect of perceived service quality on affective process was shown by Japanese.
Cognitive process → Affective process	Cognitive process is positively related to affective process	This hypothesis was not supported only by Japanese group. It might be due to relatively high average scores on expectation with low average scores on perception. Thus, its service gap scores were not significantly positively correlated with perceived Kansei (affective process) scores. Singaporean and Indonesian had relatively the same pattern of average expectation and perception scores.
Cognitive process → Overall satisfaction	Cognitive process is positively related to overall satisfaction	This hypothesis was supported at Indonesian and Singaporean samples. However, it had a reverse at Japanese group, i.e., cognitive process had a negative correlation with overall satisfaction. It meant that, in Japanese people, their overall satisfaction was not positively influenced by their evaluation on service experience.
Affective process → Overall satisfaction	Affective process is positively related to overall satisfaction	The paths for all 3 groups were significant, which supported this hypothesis. This is the main hypothesis of KE study in service applications. As shown in Figure 2, Japanese group had the highest effect of affective process on overall satisfaction, whilst Indonesian and Singaporean rated relatively the same. It confirms that Japanese people tend to rely their overall satisfaction on affect/emotion/Kansei rather than cognition. The more their emotions influenced, the more satisfied they are.
Overall satisfaction → Behavioral intention	Overall satisfaction is positively related to behavioral intention	All paths in 3 groups were supported. All groups showed relatively the same effect of overall satisfaction on behavioral intention.

6. ANALYSIS AND DISCUSSION

The research findings support and justify some findings from the previous studies. Regarding the relationship between perceived service quality and cognitive process, a very high coefficient of correlation of 0.91 (in Indonesian and Japanese) explains what service quality perceived by customers determines their cognitive evaluation judgment by looking at the gap between perceived and expected services. What the customers perceived will determine and justify what they will decide by recalling their expectation of certain services. This relationship may refer to the evaluation process on service experience/encounter. The result of this study also provides a direct impact of perceived service quality on affective process (Kansei). This is in accordance with what proposed by KE which is taking Kansei as a function of service attributes/product elements (Nagamachi, 1995; Schutte, 2005).

The result also supports a positive relationship between cognitive process and affective process (Kansei) except for Japanese group. It is in line with findings by

Bagozzi *et al.* (2002) that cognition precedes affection, and it may give a preliminary finding to support that hypothesis. Other interesting results are that cognitive and affective processes have a significant relationship on customer's overall satisfaction. It implies that overall satisfaction is impacted by customer's evaluation process and emotional needs/impression. Thus, it is suggested to put stress on the importance of affective process (Kansei) as a complement of cognitive process in investigating the value of customer's overall satisfaction. In other words, this study presents empirical evidence that affective process/Kansei played an important role in service experiences. Though affective and cognitive processes were independent, the direct impact of affective process on overall satisfaction in the present study was more significant than the direct effect of cognitive process on overall satisfaction among all 3 population groups (see path coefficients of affective process [0.39; 0.43; 0.56] which were greater than coefficients of cognitive process [0.24; 0.19; -0.15]).

In the present study, overall satisfaction resulting directly from cognitive and affective processes exhibits a

significant impact on behavioral intention. Hence, this study brings an insight of how the importance of KE methodology (i.e., a method which focuses on emotional aspects of customer) applied in service experiences and provides an empirical evidence that cognitive and affective (Kansei) processes play an important role in service experiences which influence customer overall satisfaction and behavioral intention.

Regarding cultural differences, compared to Indonesian and Singaporean counterparts, Japanese people were more affect-oriented/Kansei minded. It is easily recognized by looking at its path coefficient and *t*-value (“Affective process” → “Overall satisfaction”) which were larger than the other two population groups.

7. CONCLUSION AND FURTHER RESEARCH

Again, the success of KE in product designs and development may bring a significant influence and inspiration on the contribution of KE on service quality management. As for theoretical contribution, this study introduces a model of how the emotional aspects of customer during service encounters was taken into account by adopting KE methodology and shown its significance towards other related service experiences’ constructs. As for practical insights, this research gives the importance of affect/emotional needs/Kansei of customer to be taken into account by service managers in satisfying their customers well. Moreover, different cultural background may have effects on the perception of Kansei during service encounters.

Role of affective process (Kansei) as highlighted and stressed by KE in hospitality sectors (Nagamachi, 2002a, 2002b; Hartono and Tan, 2009; Nagamachi and Lokman, 2011;) should be of highly interesting and hot topic to service providers/managers. Future studies may focus on the modeling of the effect of cultural dimensions on Kansei and also how KE can be incorporated with current service and quality tools/methods.

8. REFERENCES

- Bagozzi, R. (1994). Structural equation models in marketing research: basic principles. *Principles of Marketing Research*, 3, 1-7.
- Bagozzi, R.P., Gurhan-Canli, Z., & Priester, J.R. (2002). *The Social Psychology of Consumer Behaviour*. Philadelphia: Open University Press.
- Babin, B.J., & Attaway, J.S. (2000). Atmospheric affect as a tool for creating value and gaining share of customer. *Journal of Business Research*, 49, 91-99.
- Barsky, J. & Nash, L. (2002). Evoking emotion: affective keys to hotel loyalty. *Cornell Hotel and Restaurant Administration Quarterly*, 43(1), 39-46.
- Bitner, M.J. (1992). Servicescapes: The Impact of Physical Surroundings on Customers and Employees. *Journal of Marketing*, 56, 57-71.
- Bowen, J.T. & Shoemaker, S. (1998). Loyalty: a strategic commitment. *Cornell and Hotel Restaurant Administration Quarterly*, 39(1), 12-25.
- Chin, W.W. (1998). The partial least squares approach to structural equation modeling. In G.A. Marcoulides (Ed.), *Modern methods for business research*, (pp. 295-336). Mahwah, NJ: Erlbaum.
- Fornell, C. & Larcker, D.F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50.
- Gefen, D. & Straub, D. (2005). A practical guide to factorial validity using PLS-graph: tutorial and annotated example. *Communications of the AIS*, 16, 91-109.
- Gorla, N., Somers, T.M., & Wong, B. (2010). Organizational impact of system quality, information quality, and service quality. *Journal of Strategic Information Systems*, 19, 207-228.
- Hartono, M., & Tan, K.C. (2009). A proposed framework of Kansei Engineering application in dealing with customer emotional needs in services. *Proceedings of 17th World Congress on Ergonomics IEA 2009, August 9-14, Beijing, China*.
- Helander, M. G. & Khalid, H. M. (2006). Affective and Pleasurable Design. In G. Salvendy (Ed.), *Handbook of Human Factors and Ergonomics* (pp. 543-572). New York: Wiley Interscience.
- Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: a review of four recent studies. *Strategic Management Journal*, 20, 195-204.
- Ladhari, R. (2009). Service quality, emotional satisfaction, and behavioral intentions: A study in the hotel industry. *Managing Service Quality*, 19(3), 308-331.
- Lazarus, R.S. (1999). *Emotions and Adaptation*. New York: Oxford University Press.
- Liljander, V. & Strandvik, T. (1997). Emotions in service satisfaction. *International Journal of Service Industry Management*, 8(2), 148-169.
- Lin, I.Y. (2004). Evaluating a servicescape: the effect of cognition and emotion. *Hospitality Management*, 23, 163-178.
- Lovelock, C. (1991). *Services Marketing*. Englewood Cliffs: Prentice-Hall.
- Lovelock, C. & Wirtz, J. (2007). *Services marketing: people, technology, strategy* (6th ed.). Upper Saddle River: Pearson/Prentice Hall.

- Mattila, A.S. & Enz, C.A. (2002). The role of emotions in service encounters. *Journal of Service Research*, 4(4), 268-277.
- Nagamachi, M. (1995). Kansei Engineering: a new ergonomic consumer-oriented technology for product development. *International Journal of Industrial Ergonomics*, 15, 3-11.
- Nagamachi, M. & Imada, A.S. (1995). Kansei Engineering: An ergonomic technology for product development. *International Journal of Industrial Ergonomics*, 15, 1-1.
- Nagamachi, M. (2002a). Kansei engineering in consumer product design. *Ergonomics in Design - The Quarterly of Human Factors Applications*, 10(2), 5-9.
- Nagamachi, M. (2002b). Kansei Engineering as a powerful consumer-oriented technology for product development. *Applied Ergonomics*, 33, 289-294.
- Nagamachi, M. & Lokman, A.M. (2011). *Innovations of Kansei Engineering*. Boca Raton: CRC Press.
- Norman, D. A. (2004). *Emotional Design: Why Do We Love (or Hate) Everyday Things*. New York: Basic Books.
- Nunnally, J.C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.
- Oliver, R.L. (1980). A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research*, 17, 460-469.
- Oliver, R.L. (1993). Cognitive, affective, and attribute bases of the satisfaction response. *Journal of Consumer Research*, 20, 418-430.
- Oliver, R.L. & Westbrook, R.A. (1993). Profiles of consumer emotions and satisfaction in ownership and usage. *Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior*, 6, 12-27.
- Oliver, R.L., Rust, R.T. & Varki, S. (1997). Customer delight: foundations, findings, and managerial insight. *Journal of Retailing*, 73(3), 311-336.
- Parasuraman, A., Berry, L.L., & Zeithaml, V.A. (1988). SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. *Journal of Retailing*, 64(1), 12-40.
- Parasuraman, A., Berry, L.L., & Zeithaml, V.A. (1991). Refinement and reassessment of the SERVQUAL scale. *Journal of Retailing*, 67(4), 420-450.
- Ringle, C.M., Wende, S. & Will, A. (2005). *Smart PLS*. Hamburg: University of Hamburg.
- Russell, J.A. (1980). A Circumflex Model of Affect. *Journal of Personality and Social Psychology*, 39(6), 1161-1178.
- Schütte, S., Eklund, J., Axelsson, J. R. C., & Nagamachi, M. (2004). Concepts, methods and tools in Kansei Engineering. *Theoretical Issues in Ergonomics Science*, 5, 214-232.
- Schütte, S. (2005). *Engineering emotional values in product design. Kansei Engineering in development*. PhD thesis (unpublished). Linköping University, Linköping, Sweden.
- Schütte, S., Eklund, J., Ishihara, S., & Nagamachi, M. (2008). Affective Meaning: The Kansei Engineering Approach. In H.N.J.
- Schifferstein, P. Hekkert (Eds.), *Product Experience* (pp. 477-496). Oxford: Elsevier Ltd.
- Shimizu, Y., Sadoyama, T., Kamijo, M., Hosoya, S., Hashimoto, M., Otani, T., Yokoi, K., Horiba, Y., Takatera, M., Honywood, M., & Inui, S. (2004). On-demand production system of apparel on basis of Kansei Engineering. *International Journal of Clothing Science and Technology*, 16, 32-42.
- Steinar, K. (2007). *Doing interviews*. London: SAGE Publications
- Tse, D.K. & Wilton, P.C. (1988). Models of customer satisfaction formation: An extension. *Journal of Marketing Research*, 25, 204-212.
- Vargo, S.L. & Lusch, R.F. (2004). The four service marketing myths-remnants of goods-based, manufacturing model. *Journal of Service Research*, 6(4), 324-335.
- Wong, A. (2004). The role of emotional satisfaction in service encounters. *Managing Service Quality*, 14(5), 365-376.
- Yu, Y.-T. & Dean, A. (2001). The contribution of emotional satisfaction to consumer loyalty. *International Journal of Service Industry Management*, 12, 234-250.

ABOUT THE AUTHORS

Tan Kay Chuan received his PhD in Industrial Engineering and Operations Research (concentration in Human Factors Engineering) from the Virginia Polytechnic Institute and State University, USA, in 1990. He has been with the Department of Industrial and Systems Engineering, NUS, since then. Kay Chuan is currently an associate professor and a certified human factors professional (CHFP) issued by Board of Certification in Professional Ergonomics (BCPE). His teaching expertise is in human factors engineering, engineering statistics, engineering economy, quality planning and management, and more recently service innovation and management, and six sigma. His research interests are in quality function deployment, quality award systems, and innovation in service design. Email: isetankc@nus.edu.sg

Markus Hartono is an assistant professor in Engineering Management research group at the Department of Industrial Engineering, Faculty of Engineering, University of Surabaya, Indonesia. He received a Bachelor degree (B.Eng) in Industrial Engineering from University of Surabaya, Indonesia, and a Master degree (M.Sc) from National University of Singapore (NUS), Singapore. Currently he is a full time PhD student at the Department of Industrial &

Systems Engineering, NUS. In year 2011, he received two prestigious awards (“Best Paper Award” and “Young Service Researcher Award”) at The 2nd International Research Symposium on Service Management (IRSSM-2) in Yogyakarta, Indonesia. He is also a certified human factors professional (CHFP) issued by BCPE, and a member of Indonesian Ergonomics Society (PEI). Email: markushartono@nus.edu.sg