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Development of Kansei Engineering-Based Method for Service Improvement in Hotel Operations

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Abstract

The purpose of this study is to develop or improve the Kansei engineering-based method for designing service improvement used in previous studies. Kansei engineering can be integrated with other relevant methods or techniques so that a better method can be produced. This study proposes the development of Kansei engineering-based method that is suitable for designing service improvements in hotel operations by integrating Kansei engineering, text mining, service blueprint, SERVQUAL, Kano model, and QFD. Text mining is used to collect Kansei words by utilizing online customer reviews. Service blueprint is used to determine the service attributes, and SERVQUAL to evaluate current service quality. Kano model is used to classify service attributes into Kano categories. QFD is used to determine customer needs and translate these customer needs into technical characteristics and specifications. The method developed in this study was applied in hotel services in Bali. The results of determining service improvement priorities obtained in this study indicate that service improvements should be focused on the hotel technical requirements which consist of hotel cleanliness standards, availability of housekeeping equipment, professional hotel interior and exterior designers, personnel management, general affair management, employee education and training, and customer relationship management. This method has been successfully applied in the hotel sector. In addition to the hotel sector, this method can also be applied in other service sectors.

Keywords: Kansei engineering, text mining, service blueprint, Kano, SERVQUAL, QFD

Abstrak

Penelitian ini dilakukan untuk mengembangkan atau memperbaiki metode perancangan atau perbaikan layanan berbasis Kansei engineering yang digunakan dalam penelitian-penelitian sebelumnya. Kansei engineering dapat diintegrasikan dengan metode atau teknik lain yang relevan agar dapat dihasilkan suatu metode yang lebih baik. Pada penelitian ini diusulkan pengembangan metode berbasis Kansei engineering yang sesuai untuk merancang perbaikan layanan hotel dengan mengintegrasikan Kansei engineering, text mining, service blueprint, SERVQUAL, model Kano, dan QFD. Text mining dengan memanfaatkan online customer review digunakan untuk mengumpulkan kata-kata Kansei. Service blueprint digunakan untuk menentukan atribut layanan yang diperlukan. SERVQUAL digunakan untuk melakukan evaluasi terhadap service quality saat ini. Model Kano digunakan untuk mengelompokkan atribut layanan ke dalam kategori Kano. QFD digunakan untuk menentukan prioritas keinginan dan kebutuhan pelanggan dan menerjemahkan kebutuhan pelanggan ini ke dalam karakteristik dan spesifikasi teknis. Metode yang dikembangkan dalam penelitian ini diterapkan dalam layanan hotel di Bali. Hasil penentuan prioritas perbaikan layanan yang diperoleh pada penelitian ini menunjukkan bahwa perbaikan layanan yang dilakukan sebaiknya difokuskan pada technical requirements hotel yang terdiri dari standar kebersihan hotel, ketersediaan peralatan housekeeping, desainer interior dan eksterior hotel yang profesional, manajemen personalia, general affair management, pendidikan dan pelatihan pegawai, serta customer relationship management. Metode ini berhasil diterapkan di sektor hotel. Selain untuk sektor hotel, metode ini juga dapat diterapkan di sektor jasa lainnya.

Kata kunci: *Kansei engineering, text mining, service blueprint, Kano, SERVQUAL, QFD*

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Introduction

Service quality is a critical success factor that enables a firm to differentiate itself from its competitors. Good service quality leads to customer satisfaction, positive word of mouth, the retention of existing customers, and the attraction of new customers (Ladhari, 2009b). Customer satisfaction can be ensured by providing high quality services (Getty & Getty, 2003). Thus, service quality is an antecedent of customer satisfaction (Deng *et al.*, 2013; Nunkoo *et al.*, 2019; Hong *et al.*, 2020). Service quality has a positive relationship with customer emotions (Jang & Namkung, 2009; Ladhari, 2009b). Customer emotions also have a positive relationship with customer satisfaction (Liljander & Strandvik, 1997). Customer satisfaction can affect customer loyalty (Meesala & Paul, 2018; Fitriani *et al., 2020*) and develop customer loyalty is one of the main operational strategies to face the increasing competition (Deng *et al.*, 2013). Customer loyalty is related to the possibility of a customer returning, providing positive word-of-mouth, and providing references and publicity (Bowen & Shoemaker, 1998). Barsky & Nash (2002) have shown that customer emotions can affect customer satisfaction and loyalty.

The focus of most of service quality and satisfaction studies has been on the cognitive aspects, while seemingly important affective components (emotions) have been largely ignored (Wong, 2004). Affective components of customers should also be considered in service design or improvement. The service sector that is closely related to the customer must be supported by the design of services based on customer experience and emotional perception. Kansei engineering can be used as a method to translate consumers' impressions and emotions for a product or service into design elements (Nagamachi, 1995). Kansei Engineering was originally applied only in product design, but now Kansei Engineering has begun to be applied in the service design (e.g., Hartono & Chuan, 2011; Hartono *et al.*, 2013; Chen *et al.*, 2015a; Chen *et al.*, 2015b; Li & Yan, 2016; Hsiao *et al.*, 2017a; Hsiao *et al.*, 2017b; Hartono *et al.*, 2017; Yeh & Chen, 2018; Hartono, 2020).

Most of the previous studies that used Kansei engineering to design or improve services, adopted Kansei engineering methodology framework proposed by Schütte *et al.* (2004) which consists of domain selection, spanning semantic space, spanning the space of properties, synthesis, validity testing, and model building. These previous studies have some shortcomings that can still be improved. Previous studies have paid little attention to each stage in the methodological framework well. This study was conducted to develop or improve the Kansei engineering-based method for designing service improvement used in previous studies.

In Kansei engineering methodology framework proposed by Schütte *et al.* (2004) there is a stage called span the semantic space. At this stage, identification of Kansei words is carried out by gathering information through extracting words that describe the customer's emotions or impressions. Kansei words identification is usually carried out through interviews or surveys (e.g., Hartono & Chuan, 2011; Hartono *et al.*, 2013; Hartono *et al.*, 2017; Hartono, 2020). Identification of Kansei words through interviews will take a lot of time because interviews cannot only be done on one or two people. In addition, when the interview was conducted, customers may not be fully honest and open in describing their emotions. When identifying Kansei words, online customer reviews can be utilized and processed through text mining to get honest impressions and emotions from customers.

There are two things that have to be done at spanning the space of properties stage. The first is collecting service attributes and the second is assessment of service attributes. Most of the previous studies that used Kansei engineering-based methods to design or improve services only collected service attributes from literature study. Service attributes should not only be collected based on literature study, but also based on service experience or service processes experienced by customers. Service blueprint is a graphical representation of the service process (Radnor *et al.*, 2013). Service blueprints can be used to map service processes in a comprehensive and structured way. Bitner *et al.* (2008) defines five components of service blueprint that consists of customer action, onstage, backstage, support processes, and physical evidence. From the relationship between customer action, onstage, backstage, support processes, and physical evidence, the required service attributes can be identified.

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Most of the previous studies (e.g., Chen *et al.*, 2015a; Chen *et al.*, 2015b; Li & Yan, 2016; Hsiao *et al.*, 2017a; Hsiao *et al.*, 2017b; Yeh & Chen, 2018) did not assess the service attributes. Hartono & Chuan (2011), Hartono *et al.* (2013), Hartono *et al.* (2017), and Hartono (2020) use SERVQUAL and Kano model to assess the service attributes. SERVQUAL is used to evaluate current service quality so that service improvements can be done first for service attributes that have lower quality. Hartono & Chuan (2011), Hartono *et al.* (2013), and Hartono *et al.* (2017) use SERVQUAL questionnaire to assess customer perceptions and expectations of each service attribute separately, service quality evaluation is then done by calculating the gap score. Assessment of perceptions and expectations which is conducted separately causes the number of statement items that must be filled by customers to be quite a lot because the number doubled. Moreover, Ladhari (2009a) states that the feasibility of using a gap score to represent the quality of service has been questioned, both conceptually and empirically. For that reason, it is better not to evaluate service quality by calculating a gap score. The Kano model is used to classify service attributes based on how well these service attributes can satisfy customer needs. By grouping service attributes based on Kano category, service attributes that have the greatest effect on customer satisfaction can be identified. Hartono & Chuan (2011), Hartono *et al.* (2013), and Hartono *et al.* (2017) group each service attribute into the Kano category based on the frequency of each Kano category. However, grouping service attributes into Kano categories based on frequency is less accurate (Madzík, 2016). Therefore, grouping service attributes into the Kano category should not be done based on frequency.

The model building phase is carried out to determine the relationship between service attributes and Kansei words. Most of the previous studies determined the solution of service design or improvement based solely on the results of the model built, which is based on service attributes that can positively influence the Kansei words. At the solution analysis stage, QFD can be used to determine the priority of service attributes (customer requirements) and translate these service attributes into characteristics and technical specifications (technical requirements).

The developed Kansei engineering-based method for designing service improvement proposed in this study is expected to be suitable for use in designing service improvements in hotel operations. To find out whether the method proposed in this study is appropriate and can be applied in designing service improvements in hotel operations, the method proposed in this study is then applied for hotel service improvement in Bali.

The rest of this paper is constructed as follows. The methodology proposed in this study is shown in Section 2. To provide practical insight into the proposed methodology, an empirical study was carried out on hotel services. The results and analysis for hotel service improvement illustrated in Section 3. In section 4, conclusions about this study are made. The limitations of this study and suggestions for further study are also discussed in Section 4.

Methodology

The Kansei engineering methodology framework used as a reference in this study is the Kansei engineering methodology framework proposed by Schütte *et al.* (2004). This methodology has been widely used in previous studies on Kansei engineering in services.

Kansei engineering can be integrated with other relevant methods or techniques. The integration of Kansei engineering with other methods proposed in this study is shown in Figure 1.

The “span the semantic space” stage consists of three activities (Hartono & Chuan, 2011), i.e. Kansei words collection, Kansei words selection, and measurement of Kansei words response and importance. Kansei words can be collected through text mining by utilizing online customer reviews. The “span the space of properties” stage consists of three activities (Hartono & Chuan, 2011), i.e. service attributes collection, evaluation of the current service quality, and service attributes classification into Kano categories. Service attributes can be collected using service blueprint and literature study. Service blueprint can be used to map the hotel service process and determine the service attributes needed. Most of the previous studies that used Kansei engineering to design or

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improve services, did not utilize the service blueprint to identify service attributes. SERVQUAL can be used to evaluate current service quality. Kano model can be used to categorize service attributes based on how well these service attributes can satisfy customer needs. Solution analysis in this study can be carried out by using QFD. QFD can be used to determine customer requirements/needs and translate these customer requirements into technical characteristics and specifications.

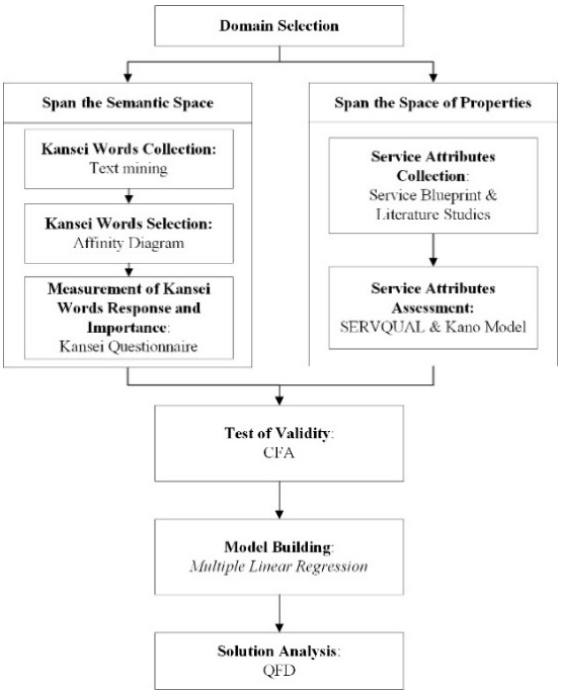

Figure 1. The proposed integration of Kansei engineering with other methods

Results and Discussion

Domain Selection

Good tourism facilities or services must be provided to continue to attract tourists and increase tourists' satisfaction and loyalty. One of the most important tourism facilities or services is the hotel. The improvement of hotel services in Bali needs to be done so that the quality of hotel services in Bali along with tourists' satisfaction and loyalty can be improved. In this study, the selected domains are 3, 4 and 5-star hotels in southern Bali.

Kansei Words Collection

Many of the previous studies that used Kansei engineering to design or improve services collected the Kansei words through interviews. Identifying and gathering the Kansei word through interviews will take a lot of time because the interview can not only be done on one or two people. Moreover, through interviews, customers may not be completely honest and open in depicting their emotions. The internet has brought a big transformation in tourists' behavior, tourists or travelers not only reserve hotels and tickets online, they also exchange information about their travel and describe their travel experience over online review sites (Kim *et al.*, 2017). At the identification and collection stage of the Kansei words, online customer review can be utilized to obtain an honest impressions and emotions from the customers. Online customer reviews reflect how customers describe, reconstruct, and share their experiences.

In this study, customer reviews were collected from TripAdvisor using WebHarvy. There were 53,088 customer reviews of 100 hotels in southern Bali collected in this study. Customer reviews that had been collected were then processed using RapidMiner. The data preprocessing and data processing steps undertaken in this study were converting all the letters into lowercase, tokenization, stop word removal, and data filtering with part-of-speech tagging (POS Tagging). Of the 53,088 reviews collected, 334 adjectives were obtained which must be sorted to obtain appropriate words to describe customer's impressions and emotions. After sorting, the remaining 153 words still must be reduced. Reduction of Kansei words was done by grouping words that have the same meaning using affinity diagram. This process was done with the help of two linguists. After this process was done, 15 Kansei words were obtained (i.e., pleasing, friendly, confident, comfortable, considerate, spacious, spirited, beautiful, amazed, excellent, extraordinary, worthy, polite, private, tranquil).

Data Collection

Respondents participated in this study were domestic and foreign tourists who were staying in hotels located in the southern Bali. The survey period was from the beginning of May 2018 until the end of June 2018 (two months). A total of 663 questionnaires were collected, after the removal of duplicate and incomplete responses, 593 usable responses were included in the sample for analysis.

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Measurement of Kansei Response and Importance

Kansei responses and importance were collected using questionnaires with 6-point semantic differential scale (see Table 1 and Table 2).

Table 1. Kansei response questionnaire used in this study

Kansei Response							
Negative Kansei	Kansei Score						Positive Kansei
Displeasing	1	2	3	4	5	6	Pleasing
Unfriendly	1	2	3	4	5	6	Friendly
Unconfident	1	2	3	4	5	6	Confident
Uncomfortable	1	2	3	4	5	6	Comfortable
Inconsiderate	1	2	3	4	5	6	Considerate
Small	1	2	3	4	5	6	Spacious
Listless	1	2	3	4	5	6	Spirited
Bad-looking	1	2	3	4	5	6	Beautiful
Unsurprised	1	2	3	4	5	6	Amazed
Inferior	1	2	3	4	5	6	Excellent
Ordinary	1	2	3	4	5	6	Extraordinary
Unworthy	1	2	3	4	5	6	Worthy
Rude	1	2	3	4	5	6	Polite
Not Private	1	2	3	4	5	6	Private
Disturbed	1	2	3	4	5	6	Tranquil

Table 2. Kansei importance questionnaire used in this study

Kansei Importance						
Emotional Needs	Importance Score					
I want to stay in a **PLEASING** hotel environment	1	2	3	4	5	6
I want a **FRIENDLY** hotel service	1	2	3	4	5	6
I want to feel **CONFIDENT** staying at this hotel	1	2	3	4	5	6
I want to feel **COMFORTABLE** staying at this hotel	1	2	3	4	5	6
I want a **CONSIDERATE** hotel service	1	2	3	4	5	6
I want to stay in a **SPACIOUS** hotel	1	2	3	4	5	6
I want a **SPIRITED** hotel service	1	2	3	4	5	6
I want to stay in a **BEAUTIFUL** hotel environment	1	2	3	4	5	6
I want to be **AMAZED** by the hotel service	1	2	3	4	5	6
I want to stay in an **EXCELLENT** hotel	1	2	3	4	5	6
I want to stay in an **EXTRAORDINARY** hotel	1	2	3	4	5	6
I want a **WORTHY** hotel service	1	2	3	4	5	6
I want a **POLITE** hotel service	1	2	3	4	5	6
I want a hotel with **PRIVATE** feel	1	2	3	4	5	6
I want to stay in a **TRANQUIL** hotel environment	1	2	3	4	5	6

Collection and Assessment of Service Attributes

In this study, service attributes were collected using service blueprint and literature study. Service blueprint is a method that can be used to map the service process in a comprehensive and structured way. By utilizing the service blueprint, the required service attributes can be known. Service blueprint created for hotel services in this study can be seen in Figure 2. It was an adaptation of the service blueprint created in Bitner *et al.* (2008). After service attributes were collected, these attributes then grouped into five dimensions of SERVQUAL (tangible, reliability, responsiveness, assurance, and empathy). In total, there were 40 service attributes collected from the service blueprint and literature study.

Subsequently, a SERVQUAL questionnaire and Kano questionnaire were developed which then will be filled out by the same respondents as the Kansei questionnaire. In this study, the SERVQUAL questionnaire was used to assess the actual performance and customer expectations of each service attribute in a combined format to reduce the number of items that must be filled out by the customer (see Table 3). This questionnaire was adapted from a questionnaire for the service quality assessment proposed by Brown *et al.* (1993) & Mei *et al.* (1999). Brown *et al.* (1993) empirically compare the gap score approach with the direct comparison operationalization (combined

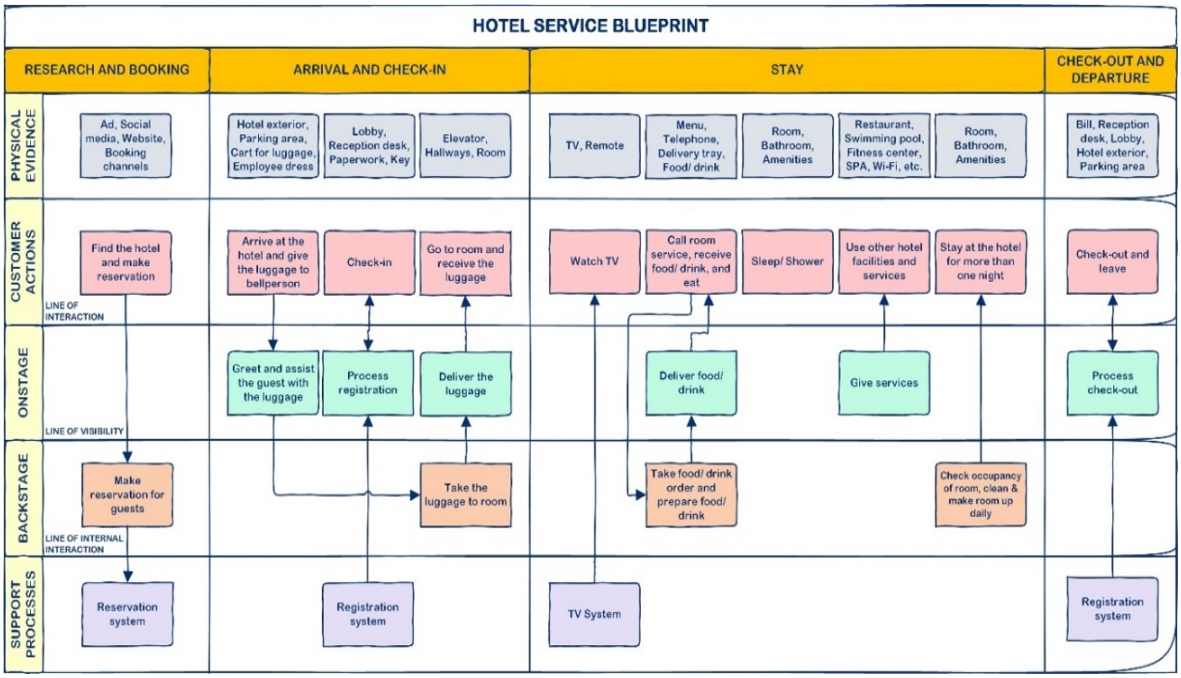

Figure 2. Service blueprint created for hotel services in this study

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format) of the same construct, the results obtained show that the direct comparison approach was less strenuous for respondents, had better psychometric properties, and produced favorable empirical results. Mei et al. (1999) state that the one-column format questionnaire can be a robust and reliable instrument, particularly for the hospitality industry.

Table 3. An example of SERVQUAL questionnaire used in this study

1 = Very much poorer than expected
2 = Poorer than expected
3 = Slightly poorer than expected
4 = Slightly better than expected
5 = Better than expected
6 = Very much better than expected

Tangible	Service Quality Score					
There are convenient parking spaces available	1	2	3	4	5	6
The outdoor surroundings are visually attractive and clean	1	2	3	4	5	6
The hotel's interior and exterior are well managed and maintained	1	2	3	4	5	6
The employees have clean and neat uniforms	1	2	3	4	5	6
The lobby and front desk are visually appealing	1	2	3	4	5	6
There are enough elevators for customers to use	1	2	3	4	5	6
The furnishings in the room are appealing	1	2	3	4	5	6
The room and bathroom are clean	1	2	3	4	5	6
The hotel's room service provides a variety of items on the menu	1	2	3	4	5	6
The bed/mattress/pillow is comfortable	1	2	3	4	5	6
There are enough towels, soap, etc. in my room	1	2	3	4	5	6
The facilities (health club, pool, meeting rooms, banquet halls, etc.) are well maintained, clean, and convenient	1	2	3	4	5	6
The hotel is clean	1	2	3	4	5	6
The hotel has up-to-date equipment	1	2	3	4	5	6
The retail stores and dining-out facilities are conveniently located	1	2	3	4	5	6

Kano model was used to classify the service attributes based on customers' opinion. Kano Model aims to classify the service attributes based on how well these service attributes can satisfy customers' needs, so that the service provider will be able to prioritize the critical characteristics of service attributes based on the assessment of the customer. In Kano questionnaire, customers were asked to evaluate a pair of statements about the service attributes (functional and dysfunctional statements of each service attribute) with five different answer options (see Table 4).

Table 4. An example of Kano questionnaire used in this study

1 = I Like It That Way
2 = It Must Be That Way
3 = I Am Neutral
4 = I Can Live with It That Way
5 = I Dislike It That Way

Empathy	Score				
The employees **are** helpful, friendly, and respectful	1	2	3	4	5
The employees **are not** helpful, friendly, and respectful	1	2	3	4	5
The hotel employees **give** me individual attention	1	2	3	4	5
The hotel employees **do not give** me individual attention	1	2	3	4	5
The services of the hotel **have** convenient business hours	1	2	3	4	5
The services of the hotel **do not have** convenient business hours	1	2	3	4	5
The employees **show** a sincere interest in solving my problem	1	2	3	4	5
The employees **do not show** a sincere interest in solving my problem	1	2	3	4	5
Employees in the hotel **are** consistently courteous to me	1	2	3	4	5
Employees in the hotel **are not** consistently courteous to me	1	2	3	4	5

The grouping and determination of Kano weights for each service attribute in this study used the technique proposed by Madzík (2016) as shown in Figure 3. In the method proposed by Madzík (2016), the number of responses for each category (A, O, M, I, R, Q) was multiplied by a parameter that corresponds to each category. To determine the Kano category and weight from each service attribute, the sum of the results of the multiplication was then divided by the number of responses. The parameters used in this study were A=4, O=2, M=1, I=0, R=-2. Service attributes that belong to the questionable (Q) category were excluded from the analysis (Madzík, 2016). The method proposed by Madzík (2016) can be used to determine Kano category and weight of each service attribute more accurately.

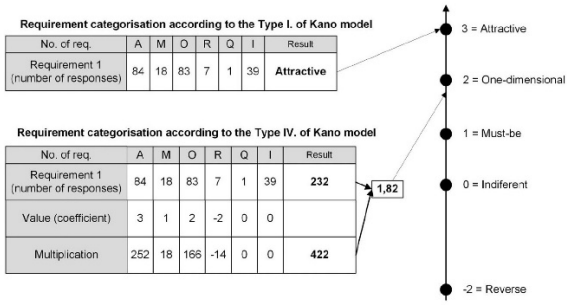

Figure 3. Kano categorization (Madzík, 2016)

The descriptive statistics of SERVQUAL questionnaire incorporated with Kano category are reported in Table 5. Table 5 shows that overall respondents' assessment of all service dimensions, i.e. tangible, reliability, responsiveness, assurance, empathy, had mean score above four. This result shows that perceptual valuation is higher than expectations, although the mean score that has a number below five indicated that perception judgments were only slightly better than expectations. Because perception assessments (actual performance) were better than expectations, the action for service improvements was then directed for continuous improvement. The Kano classification results for each service attribute can also be seen in Table 5. Based on the Kano classification results, there were 9 service attributes that belong to the attractive (A) category, 8 service attributes that belong to the one-dimensional (O) category, 21 service attributes that belong to the must-be (M) category, and 2 service attributes that belong to the indifferent (I) category.

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Table 5. Descriptive statistics of SERVQUAL questionnaire incorporated with Kano category

Variables		Min	Max	Mean	Std. Dev.	Kano Weight	Kano Category
Tangible	T1	1	6	4.43	1.165	0,492	I
	T2	1	6	4.65	0.982	2,067	O
	T3	1	6	4.76	0.952	1,329	M
	T4	1	6	4.84	0.933	1,182	M
	T5	1	6	4.75	0.990	3,078	A
	T6	1	6	4.45	1.172	1,268	M
	T7	1	6	4.63	0.963	3,020	A
	T8	1	6	4.77	1.028	1,470	M
	T9	1	6	4.70	1.045	3,015	A
	T10	1	6	4.88	0.989	1,371	M
	T11	1	6	4.77	0.973	1,437	M
	T12	1	6	4.66	1.043	2,101	O
	T13	1	6	4.83	1.019	1,472	M
	T14	1	6	4.69	1.071	3,035	A
	T15	1	6	4.81	1.017	3,022	A
Reliability	RB1	1	6	4.84	0.903	1,388	M
	RB2	1	6	4.92	0.795	1,283	M
	RB3	1	6	4.91	0.913	1,354	M
	RB4	2	6	4.83	0.780	1,460	M
	RB5	2	6	4.77	0.816	2,300	O
	RB6	2	6	4.86	0.815	1,162	M
	RB7	1	6	4.84	0.913	1,273	M
	RB8	1	6	4.91	0.905	1,361	M
	RB9	2	6	4.84	0.902	2,273	O
	RB10	3	6	5.12	0.787	1,452	M
Responsiveness	RP1	2	6	4.89	0.842	1,349	M
	RP2	2	6	4.79	0.871	3,003	A
	RP3	1	6	4.88	0.908	2,246	O
	RP4	2	6	4.93	0.890	2,337	O
	RP5	2	6	4.90	0.857	2,027	O
Assurance	A1	2	6	4.91	0.815	3,044	A
	A2	3	6	4.88	0.781	3,086	A
	A3	2	6	5.03	0.793	1,422	M
	A4	3	6	5.08	0.766	1,445	M
	A5	2	6	5.00	0.807	1,438	M
Empathy	E1	2	6	5.08	0.837	1,395	M
	E2	2	6	5.04	0.779	3,025	A
	E3	3	6	4.95	0.784	0,484	I
	E4	2	6	4.95	0.815	2,008	O
	E5	3	6	5.15	0.789	1,371	M

Multiple Linear Regression

Service attributes (which belong to A, O, M Kano category) and Kansei responses that passed the validity test, were linked and analyzed by using multiple linear regression (stepwise linear regression). This process was carried out with the aim of knowing the correlation between Kansei words and service attributes. In this process, Kansei words were used as dependent variables and service attributes were used as independent variables. This process was carried out by using IBM SPSS Statistics 24. The significant linear regression models are shown in Table 6.

Table 6. Significant linear regression model for each Kansei word

Kansei Words		Significant Linear Regression Model	R^2	*p-value*
K_6	*Spacious*	0,197 T_7 + 0,160 A_1 + 0,115 E_2	0,106	0,000
K_8	*Beautiful*	0,216 A_4 + 0,163 E_2 + 0,108 T_{14} + 0,127 T_7 + 0,120 A_1 – 0,109 A_5 + 0,098 T_8 + 0,088 RP_3	0,190	0,000
K_9	*Amazed*	0,257 E_2 + 0,190 T_{14} + 0,157 RP_3 + 0,133 T_{12} – 0,106 T_4	0,201	0,000
K_{10}	*Excellent*	0,192 E_2 + 0,179 RP_3 + 0,118 T_7 + 0,093 T_2	0,142	0,000
K_{11}	*Extra-ordinary*	0,126 RP_2 + 0,207 T_7 + 0,166 RP_3 + 0,147 A_1 – 0,153 T_4 + 0,105 T_{13}	0,186	0,000
K_{12}	*Worthy*	0,133 A_1 + 0,217 T_8 + 0,128 A_2 + 0,124 E_2 + 0,175 T_5 + 0,082 RB_2 + 0,124 T_{10} – 0,101 T_{11}	0,201	0,000

Based on Table 6, there were six significant linear regression models obtained in this study. Of the 32 service attributes processed using multiple linear regression as independent variables, only 16 service attributes were correlated with the Kansei word. Regression models in this study had R^2 values ranged from 0.106 to 0.201. This shows that the independent variables in the regression model only explained 10% to 20% of the variance in the dependent variable. R^2 which ranged from 0.106 to 0.201 as found in this study is still acceptable, Falk & Miller (1992) suggested that the R^2 value should be more than 0.1 and the R^2 value in this study was already more than 0.1.

Solution Analysis

In this study, QFD was used to design service improvements. The priority of hotel service improvement in this study was determined using the HoQ matrix which is the most important matrix in the QFD method (Pawitra & Tan, 2003). Making a HoQ matrix began with the determination of customer requirements. Customer requirements were determined by referring to the results of data processing using multiple linear regression. Of the 32 service attributes that were processed, only 16 service attributes were related to the Kansei word. Service attributes that related to the Kansei word were used as customer requirements in the HoQ matrix. Subsequently, the priority or importance level of each service

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attribute (customer requirements) was determined by the multiplication of the service quality score, Kano weight, and Kansei word score. Service quality score was obtained from the division of one with the mean value of the results of the service quality assessment obtained from the SERVQUAL questionnaire. The division was done so that service attributes with a lower mean service quality value got higher importance. Kano weight was obtained from the calculation of the Kano weights that had been done before. Kansei word score was the mean value of the importance of the Kansei words that are influenced by service attributes.

After the customer requirements and the importance of each customer requirements were determined, the next step was to identify the technical requirements. Then, the relationship between customer requirements and technical requirements were determined in a relationship matrix. At this stage, the strength of the relationship between customer requirements and the technical requirements will be identified. Strong relationships were given a value of 9 and marked with (●), moderate relationships were given a value of 3 and marked with (○), and weak relationships were given a value of 1 and marked with (△). The importance level of each technical requirements was then calculated together with the making of relationship matrix. From the calculation results of the technical requirements importance weight, the average value of the importance weight of the technical requirements obtained was 54.88198 (6.67%). Therefore, service improvements will be focused on technical requirements that had importance weight value above 54.88198, i.e. hotel cleanliness standards (10.64%), availability of housekeeping equipment (9.28%), professional hotel interior and exterior designers (13.25%), personnel management (7.43%), general affair management (9.64%), employee education and training (22.27%), and customers relationship management (6.80%). The HoQ matrix created in this study is shown in Figure 4.

Conclusions

Kansei engineering can be integrated with other relevant methods or techniques so that a better method can be produced. This study proposed the development of Kansei engineering-based method that is suitable for designing service improvements by integrating Kansei engineering, text mining, service blueprint, SERVQUAL, Kano models, and QFD. Text mining is used to collect Kansei words. In this study, text mining was done by utilizing

			Technical Requirements															Importance Weight of Customer Requirements	Percentage
			Hotel cleanliness standards	Availability of housekeeping equipment	Availability of hotel room equipment	Professional hotel interior and exterior designers	Personnel management	General affair management	Employee education and training	Problem solving skills	Teamwork	Food & beverages management system	Customer relationship management	Information services	CCTV	Safe deposit box	First aid and emergency equipment		
Customer Requirements	T2	The outdoor surroundings are visually attractive and clean	●	●		●		○	○									2,1959	5,93%
	T4	The employees have clean and neat uniforms	●				○		●									1,2382	3,34%
	T5	The lobby and front desk are visually appealing	○	○		●		○										3,2854	8,87%
	T7	The furnishings in the room are appealing			○	●		○										3,2124	8,68%
	T8	The room and bathroom are clean	●	●					●		○							1,5517	4,19%
	T10	The bed/mattress/pillow is comfortable			○	△	△	○			△							1,4244	3,85%
	T12	The facilities (health club, pool, meeting rooms, banquet halls, etc.) are well maintained, clean, and convenient	●	●				○	●									2,1776	5,88%
	T13	The hotel is clean	●	●				○	●									1,4720	3,98%
	T14	The hotel has up-to-date equipment			○	●		●										3,1806	8,59%
	RB2	The check-in and out of the hotel are efficient					○		●		○							1,3221	3,57%
	RP2	Informative literature about the hotel facilities is provided											○	●				3,0281	8,18%
	RP3	Room service is prompt							●	○	●	●		△				2,2552	6,09%
	A1	Employees of the hotel have the knowledge to answer my questions					○		●	○			○					3,0734	8,30%
	A2	The employees know about local places of interest					○		●				○	○				3,2062	8,66%
	A4	The hotel ensures the security of the guests					●	○							●	●		1,4222	3,84%
	E2	The hotel employees give me individual attention					○		●				●					2,9734	8,03%
Importance Weight of Technical Requirements			87,575	76,431	23,452	109,046	61,178	79,324	183,301	17,308	41,022	20,297	56,006	41,267	12,800	12,800	1,422		
Percentage			10,64%	9,28%	2,85%	13,25%	7,43%	9,64%	22,27%	2,10%	4,98%	2,47%	6,80%	5,01%	1,55%	1,55%	0,17%		
Priority			3	5	10	2	6	4	1	12	9	11	7	8	13	13	14		

Figure 4. House of quality (HoQ) matrix

online customer reviews. Service blueprints can be used to map service processes in a comprehensive and structured way. The required service attributes can be determined using the service blueprint. SERVQUAL is used to evaluate current service quality. SERVQUAL is an instrument that can be used to assess service quality with good reliability and validity. In this study, the SERVQUAL questionnaire was used to assess the actual performance and customer expectations of each service attribute in a combined format so that the number of items that must be filled out by the customer can be reduced. Kano model is used to classify service attributes based on how well these service attributes can satisfy customer needs. Kano model provides a better understanding of customer requirements and can be used as a tool to determine priorities if a trade-off needs to be made. QFD is used to determine and prioritize customer needs, translate these customer needs into technical requirements, and deliver services focusing on customer satisfaction. Determining the priority of hotel service improvement in this study was carried out using the HoQ matrix contained in the QFD method. The use of HoQ provides useful information about improvements priority.

This study is subject to limitations, some limitations still need to be addressed in future work. The method developed in this study has been successfully applied in hotel sector. In further study, this method can be tried to be applied to other service sectors. The complete QFD method actually consists of several phases (matrices) to express linkages between inputs and outputs. The most widely used QFD methodology is the conventional QFD which is commonly used in manufacturing. Conventional QFD is deployed through a four-phase sequence, i.e. product planning (HoQ), design/ part deployment, manufacturing/process planning, and production planning. In this study, only the first phase of QFD was conducted, i.e. service planning (making HoQ matrix). In further study, the QFD method which consists of several phases (e.g., starting from the phase of creating the HoQ matrix to the phase of creating the action plan matrix) can be developed which then can be applied to the service sector.

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