



Integration of Latent Dirichlet Allocation and quality function deployment to analyze hotel service quality based on TripAdvisor

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Abstract: The main goals of this research are to determine the customers' requirements from hotels based on TripAdvisor and the technical capabilities to fulfill the customers' requirements. Latent Dirichlet Allocation (LDA), used in this research, is the method to determine customer's requirements based on reviews from TripAdvisor. An output from the LDA method is used as input to Voice of Customer (VOC) in the quality function deployment (QFD). A hotel is selected to be a case study for implementing the integration of LDA and QFD. Questionnaires are distributed to the respondents for the purposes of filling the QFD. The absolute weight, relative weight, absolute importance and relative importance from the QFD with the highest scores are determined as the major capabilities to fulfill customers' requirements. Suggestions are given to the hotel based on the output from the QFD. The suggestions for the hotel in this research were unannounced inspections and notes for the list of problems to be solved immediately by the hotel.

Keywords: hotel, service quality, Latent Dirichlet Allocation (LDA), Quality Function Deployment (QFD)

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1. Introduction

In today's highly competitive business environment, quality is viewed as a strategy to meet or exceed customers' needs. The emergence of quality plays a vital role and has become a top priority for companies to achieve their goals and gain competitive advantages (Sukwadi & Yang, 2014). As service industries face increased competition from market pressures, providing high-quality service is an essential strategy for business survival and growth. The quality strategy applied by service industries must consider customer satisfaction as one of the primary indicators to measure a company's performance (Sukwadi & Yang, 2014).

Tourism is one of the world's fastest-growing service industries and the major source of foreign exchange earnings and employment for many countries (Sukwadi & Yang, 2014). To be successful in the hotel industry and have loyal customers, hoteliers must provide customers with unmitigated service satisfaction (Choi & Chu, 2001; Nunkoo et al., 2020) and also service experiences (Sukwadi, 2015a). If a hotel's service quality does not meet the quality expected by the customer, that customer will not use the services of that hotel again; moreover, the hotel will lose further sales as a cause of influences on relatives, friends or acquaintances (Haywood, 1983). Members of the hospitality organization have the responsibility to deliver quality service to customers (Su, 2004; Sukwadi et al., 2012). In the hotel industry there are some problems, some customers critical expected service may be different to that of other customers (Nasution & Mavondo, 2008; Sukwadi, 2017).

Latent Dirichlet Allocation (LDA) is one of many methods related to topic clustering. In LDA, the generated topic from a document is different from one to another, hence it does not group a document into particular topics (Blei et al., 2003). The recent studies in LDA include applications to scientific abstracts from the C. Elegans Community (Blei et al., 2003) and methods applicable to clustering topic from review on the Internet (Ahani et al., 2019; Lee & Yu, 2018).

Quality Function Deployment (QFD) is a method to establish a customer's needs with voice of customer and transform it to qualitative and quantitative requirements (Jafarzadeh et al., 2018). The recent studies in QFD include applications of QFD in the hospitality industry (Ikiz & Masoudi, 2008; Paryani et al., 2010).

In this research, Latent Dirichlet Allocation (LDA) will be integrated with Quality Function Deployment (QFD) to evaluate hotel service qualities. LDA can be integrated with QFD for the input of voice of customers. This method has an advantage to classified frequent reviews related to that particular topic groups within a short amount of time to analyze the VoC in QFD (Özdağoğlu et al., 2016). One of the research works applying LDA and QFD is to classify customers'

needs in Italian Restaurants. The benefits using LDA in QFD are to shorten the amount of time for collecting the voice of customers from months or weeks to days and to analyze them in an objective manner. The other benefit of using the topic modeling is to facilitate an analysis of online customer's reviews (Özdağoğlu et al., 2016).

This current research aims to determine the customer requirements from reviews based on the TripAdvisor website; choose the technical requirement to be developed by the hotel; and give the suggestions to the hotel to meet customer satisfaction based on HOQ.

2. Literature review

2.1. Latent Dirichlet Allocation (LDA)

Latent Dirichlet Allocation is a probabilistic model of text created to classify latent topics from a document; each topic is characterized by a distribution of a word (Blei et al., 2003). The basic idea of Latent Dirichlet Allocation is a document that has many topics (Blei, 2012). LDA method treats topics as a "flat" probability distribution without an immediate relationship between topics (Blei et al., 2010).

To begin the iteration of the LDA model, one parameter is required (k as a total number of topics to identify) (Lee & Yu, 2018). RStudio has package called *ldatuning* (Nikita, 2016), which simultaneously runs three approaches to determine the total number of topics through the density minimization method (Cao et al., 2009), KL divergence minimization method (Arun et al., 2010), and expectation-maximization method (Bastani et al., 2020; Griffiths & Steyvers, 2004; Lee & Yu, 2018).

In terms of the application of LDA, Aziz et al. (2021) compiled 15 coherent topics out of 5942 academic studies, which applied machine learning to finance between 1990 and 2020. Additionally, Goloshchapova et al. (2019) analyzed key corporate social responsibility reports from 15 industrialized countries across 15 industrialized countries through text mining and LDA analyses. The study discovered company responses predominantly focused on 'employee safety', 'employee training support', 'carbon emissions', 'human rights', 'efficient power', and 'healthcare medicines'. Furthermore, the team of St John et al. (2021) collected the top 100 technology product funding projects on KickStarter and explored critical motivational factors through LDA analysis of the most funded projects. It was found by the researchers that prospective backers tend to be motivated by intangible social factors such as a sense of ownership and trust.

2.2. Quality Function Deployment (QFD)

QFD was introduced in the 1960s because Japanese industries impoverished after World War II used the method to develop new products under the Total Quality Control's umbrella (Akao, 1997). QFD is a quality method to design the quality

specification to better meet customer's expectations (Onar et al., 2016). QFD can translate customer's requirements into design requirements through the house of quality (HOQ) of QFD (Ping et al., 2020)

Bridging the customer requirements and design requirements may contain complex variables and subjective preferences (Yazdani et al., 2019). Customer requirements contain many other definitions such as customer needs, attributes or demanded quality (Onar et al., 2016). On the other hand, design requirements have many other definitions such as product features, engineering attributes, technical attributes, engineering characteristics or substitute quality characteristics based on customer's requirements (Wu & Liao, 2021).

Recently, Kamvysi et al. (2014) introduced a framework for prioritize students' course requirements within the QFD framework and incorporated other techniques, such as the fuzzy analytic hierarchy process (Fuzzy-AHP) and linear programming method to account for the subjective nature of human judgments. Moreover, using a specific measure, 'influence gap,' Parezanovic et al. (2019) examined the correlations among engineering characteristics and developed a new evaluation technique called 'smallest gap' technique in order to determine all interdependencies among engineering characteristics.

2.3. Hotel service quality

The word 'service' is defined as a product that needs customers in their activities. Two variables influence the quality of service: expected and perceive services. Companies must know any factor, whether it is controllable or not (Grönroos, 1984), which has an impact on those aforementioned variables. Experiences of customers in the past influence their expectation of services (Sukwadi et al., 2012; Sukwadi, 2015b).

Nowadays, service quality is more difficult to evaluate than product quality. When customers buy a product, they can judge the tangible quality associated to the product such as color, hardness, etc., whilst when customers pay for a service, they cannot judge the tangible quality of the services (Parasuraman et al., 1985). Consequently, Parasuraman et al. (1988) put forth five criterias for service quality called "SERVQUAL Dimensions" (Table 1). According to Paryani et al. (2010), modifications for SERVQUAL dimensions for the hotel industry are as shown below (Table 2).

3. Methodology

3.1. Population and sample

According to Sugiyono (2016), the definition of 'population' is a generalized area with objects/subjects that have certain qualities and characteristics investigated by a researcher to

study and then obtain a conclusion. Additionally, a sample is a part of population. In this research, we collected customers' requirement from the year 2017 reviews of hotels at five major ports of entry in the TripAdvisor website, and then evaluated them on a hotel, which we will henceforth call Hotel X.

This research used the purposive sampling technique to select samples from the population. Purposive sampling is a method to gather data with some considerations (Sugiyono, 2016). The criteria for respondents on this research are people staying at four-star hotels from five major ports of entry in 2017 and at least once in 2018; people staying at Hotel X, at least once in 2018.

It is very important to determine the number of samples to correctly use the method and sampling technique. The larger the number of sample sizes, the more convincing the results presented; nevertheless, a rule of thumb exists: that 30 samples is considered the minimum number of samples (Cohen et al., 2007). As a consequence, the following rules of thumb exist according to Sekaran & Bougie, (2016):

- a. Most research has sample sizes between 30 to 500;
- b. If samples are sub-divided into subsamples, each subsample must have a minimum of 30 samples;
- c. The sample size in multivariate research (including multiple regression analysis) should be several times (preferably ten times or more) the number of variables in the research;
- d. For simple experimental research with a tight control, the number of sample sizes is between 10 to 20.

According to the rules above, the number of samples in this research was determined to be 41 because it is difficult to find appropriate respondents for this research.

3.2. Validity and reliability test

According to Widi (2011), validity is an index that indicates that the measuring instrument measures exactly what it claims to measure, while reliability is a test that generates the same result when repeated. The validation test for every stated item uses the product moment correlation technique between each statement score and total score. An instrument is valid if Pearson correlation positive, and value of sig. (2-tailed) is less than the significance level 0.05. Hinton et al. (2004) give guidance about the reliability test with Cronbach's Alpha greater than 0.5. The reliability test used Cronbach's Alpha because it is the most popular method for testing reliability (Hinton et al., 2004). The IBM SPSS Statistics 22 was applied to perform the validity and reliability test.

3.3. LDA and QFD

The review collection procedure consists of writing the customer's reviews taken from TripAdvisor; afterwards, we processed the reviews based on LDA with the RStudio. The output from the RStudio is used as the input of voice of customer in QFD method.

Table 1. SERVQUAL dimensions.

SERVQUAL Dimensions
TANGIBLES: Physical facilities, equipment, and appearance of personnel.
RELIABILITY: An ability to perform the promises services right.
RESPONSIVENESS: Willingness to help customers and provide prompt services.
ASSURANCE: Knowledge and politeness of employees and their ability to inspire trust
EMPATHY: The employees must care for the customers, individualized attention is provided to customers.

Table 2. Hotel SERVQUAL dimensions.

HOTEL SERVQUAL Dimensions
TANGIBLES: Physical aspects of services in hotel, including physical equipment, etc.
RELIABILITY: An ability to perform services right.
RESPONSIVENESS: Willingness to help customers and provide prompt services.
ASSURANCE: Knowledge and politeness of the hotel's staff and ability to inspire trust and confidence.
EMPATHY: The hotel employees must care for customers and provide individualized attention.

4. Result and discussion

4.1. Profile of respondents

Respondents' demographic collected from 41 respondents were classified based on gender indicated that gender imbalance existed with overrepresented males, 29 males (71%), and 12 females (29%). In addition, the respondents were all Indonesian (100%). However, this result is similar to that of a research work about the hotel service quality with its respondents being 71.11% males and 28.89% females (Wahyudi & Sudibya, 2016).

According to (De Mooij & Hofstede, 2011), every country has its own national culture. There are 6 dimensions of national culture: collectivism-individualism, power distance, femininity-masculinity, uncertainty avoidance, long term orientation, indulgence-restraint (Hofstede, n.d.). Indonesia is one of the asian countries, in terms of femininity-masculinity, assessed with a score of 46 (Admin, n.d.), which indicates that Indonesia is a low masculinity country. In a masculine country, roles of male and female are differentiated, whereas in a feminine culture, roles between male and female are overlapped. In a masculine country, wives perform most of the household work; but in a feminine country, men also do the household work and shopping. A masculine country culture also has another connotation: the culture has a dominant value of achievement and success and demonstration of their success. On the other hand, a feminine country culture has a dominant value of caring for others and quality of life (Mooij & Hofstede, 2011).

Masculine/feminine countries' societies also have another difference; as mentioned above, a masculine country society has a dominant value of achievement and success, and they also demonstrate their achievements; therefore, brand names or products indicate their success (Mooij, 2004), as opposed to a feminine country. In a feminine country, the society has a dominant value of caring for others and quality of life (Mooij & Hofstede, 2011). Therefore, people there consider to stay at places that make them comfortable. By associating with the result of importance rating in HOQ (Figure 2), the importance rating for CR 2, 3, 5, 7, 8 and 9 are ranked the highest.

In terms of individualism-collectivism, differentiation exists between individualist and collectivist countries. Indonesia's score for this criterion is 14 (Admin, n.d.), which indicates that Indonesia is a collectivist country. Indonesia people prefer to stay at hotels that they trust because of their previous experiences or because of having read their brochures (Kartini, 2014). This is illustrated by the sales process in individualist and collectivist countries. Individualist country's sales processes are aimed at getting to the main idea fast; it is different in a collectivist culture, in which the parties must establish a relationship and gain trust from the customer first. Advertising in an individualist culture is based on persuasion, while in a collectivist culture is trust (De Mooij & Hofstede, 2011).

4.2. Number of topics, customer's requirement (VOC) and technical requirements

The customer's requirements obtained using the LDA method were determined by subjecting the reviews collected from the TripAdvisor website to be processed in RStudio using the Gibbs sampling method and Griffiths, Cao Juan, Arun metrics to select the best number of topics from the reviews. For this data, the best number of topics was 10 as shown in Figure 1; the criteria is shown in Table 3. Criteria in the topics were summarized into 10 customer requirements, as shown in Table 4. Technical requirements (as shown in Table 5) were obtained by interviewing the human resources manager of Hotel X.

4.3. Validity and reliability test

The validity test was done by considering the Pearson correlation whether positive or negative and comparing the sig. (2-tailed) score with the significance level. All Pearson correlations in Table 6 were positive, and all sig. (2-tailed) scores in Table 6 were lower than significance level (0,05). All the data in the questionnaire were valid and could be used for data processing

The reliability test was done by classifying the scores for Cronbach's Alpha using SPSS with the guidance given by Hinton et al. (2004). The value of Cronbach's Alpha was 0.81. It showed that the questionnaires were reliable and could be used for data processing.

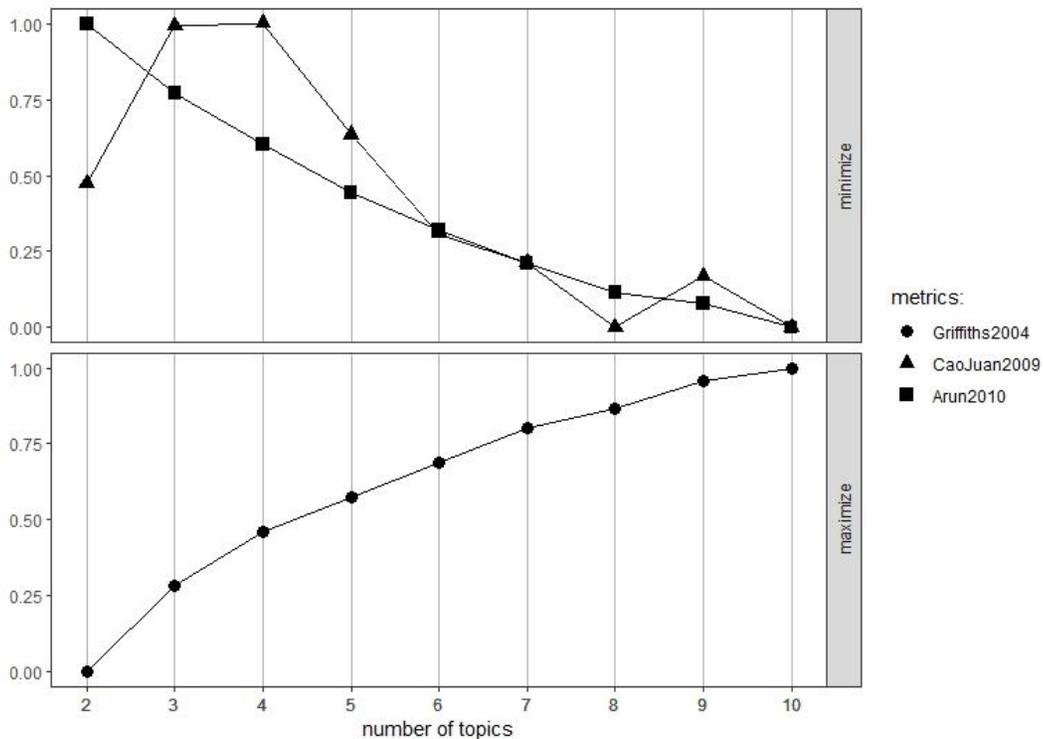


Figure 1. The best number of topics.

4.4. House of quality (HOQ)

Customer's requirement (shown in Table 4) if associated with hotel SERVQUAL dimensions (Table 2) can be seen in Table 7. All customer's requirement from reviews on TripAdvisor collected suitable to the hotel SERVQUAL dimensions; then, customer's requirement going to be improved can fulfill all dimension in hotel SERVQUAL dimensions.

Customer's requirement CR 2, 3, and 4 can be classified as the tangible dimension. The tangible dimension, according to Paryani et al. (2010), is about the physical aspects of services in a hotel, including physical equipment, etc. CR 2 is about the hotel room condition and services and therefore can be classified to be tangible. CR 3 is about the conditions of room and bathroom facilities and amenities; it can be classified to be tangible because it is clearly referred to as "facility". CR 4 is about the condition and ambience of the hotel facility and can be classified as tangible because because it is clearly referred to as "facility". For example, the visitors' comments for this dimension may be that the hotel room is good, the pool is clean, the bathroom is clean and has good amenities, and all bathroom equipment is usable.

All customer's requirements can be classified into the reliability dimension. According to Paryani et al. (2010), reliability is an ability to perform the hotel service-related promises right; all of the customers' requirements are something that Hotel X provides to customers from their website or brochure; this is to say, Hotel X makes the customer promises about the services it will provide. For example, in the website, a photo of a hotel room is very good, hence the hotel must provide the same conditions shown in the photo they provide to the customer; this applies to the facilities the hotel has too: if the hotel shows that its pool, gym or restaurant has good ambience and conditions, this is what it must provide the customers.

Customers' requirements CR 1, 2, 7 and 10 can be classified as responsiveness dimensions. According to Paryani et al. (2010), responsiveness indicates willingness to help customers and provide prompt services. CR 1 is about the breakfast service and food. During breakfast time, the customer may need food that the hotel does not provide. Let us suppose that the customer wants something: the chef should be willing to cook it for the customers; or let us supposed that the food at the the buffet runs out: hotel personnel should restock food immediately before the customers start to complain.

CR 2 is about the hotel room condition and service. The customer may need help from the hotel to do something for

them. For example, they need help to upgrade their room, then the hotel will do this for them if an empty room is available. Alternatively, the customer may want to have in-room dining, the hotel then should provide for them immediately according to their order. CR 7 is about the check-in service. Let us suppose that many customers need the check-in service at the same time; customers would complain if the check-in service takes a long time. CR 10 is about the airport transfer and transportation service; customers may need to have transport to go to their destination. the front office should provide customers with this, they may call a taxi for the customer or provide shuttle service (which can be booked), and immediately accompany them to their destination.

Customers' requirements 5 and 8 can be classified as assurance. According to Paryani et al. (2010), assurance is related to knowledge and politeness from the hotel's staff and the ability to inspire trust and confidence. CR 5 is about privacy in a hotel, when in the check-in area, the customer gives their identity to the staff, thus the staff must keep the customer's identity confidential and never provide information related to this to other people; the staff must make the customer trust them their identity; other customers' privacy-related examples are as follows: the staff not entering the room without the customer's permission; the staff must make the customer feel safe; the hotel uses *don't disturb* signs to anticipate that. CR 8 is about the staff's attitude and service; the staff must be always friendly to customers to make them feel comfortable during their stay because when they stay at the hotel, they will run into the staff every day. If the staff does not have a good attitude, they will make the customers feel uncomfortable. Customers' requirement 8 can be classified as the empathy dimension. According to Paryani et al. (2010), empathy means that the employees must care for customers and provide them with individualized attention. The staff needs to help customers with warmth and sincerity and never antagonize in regard to the topic of service. For example, if the customer needs a new amenity, like towels, the staff must provide a prompt response with a caring attitude.

The HOQ matrix structure on the left side is customers' requirements, while on the upper side are technical requirements; correlation matrix is below technical requirements. On the right side is the importance rating, improvement ratio, absolute weight, relative weight, target, sales point, average score of Hotel X, on the bottom side is absolute importance and relative importance. Formation of HOQ will be shown in Figure 2.

Table 3. Criteria for the best number of topics.

Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10
breakfast	hotel	room	pool	villa	resort	check	staff	night	service
food	room	bed	beach	pool	spa	room	stay	place	minute
good	good	water	great	stay	relax	book	help	look	airport
restaurant	stay	shower	restaurant	area	love	arrival	friend	stay	shuttle
nice	location	towel	bar	night	place	receipt	service	better	taxi
choice	nice	door	love	private	enjoy	manage	welcome	expect	location
service	floor	clean	nice	bedroom	massage	call	great	price	free
order	breakfast	bathroom	location	breakfast	view	wait	best	thing	take
buffet	quit	work	good	staff	experience	came	smile	book	use
staff	comfort	use	kid	bathroom	perfect	went	family	noise	min

Table 4. Customer's requirements.

No.	Customer's requirements
CR 1	Breakfast service and food.
CR 2	Hotel room condition and service.
CR 3	Room and bathroom facility and amenities condition.
CR 4	Hotel facility condition and ambience.
CR 5	Privacy in hotel.
CR 6	Spa and massage facility and experience.
CR 7	Check-in service.
CR 8	Staff's attitude and service.
CR 9	Disturbance at night
CR 10	Airport transfer and transportation service.

Table 5. Technical requirements.

No.	Technical requirements
1	Layered control.
2	Different menus everyday.
3	Daily evaluation.
4	Keep customers identity confidential.
5	<i>Don't disturb</i> sign.
6	No construction work at night.
7	Pickup waiting time.
8	Pickup point.

Table 6. Validity test of questionnaire.

Questionnaire validity			
Statement	Pearson Correlation	Sig. (2-tailed)	Significance Level
1	0.473	0.002	0.05
2	0.529	0	0.05
3	0.631	0	0.05
4	0.598	0	0.05
5	0.493	0.001	0.05
6	0.585	0	0.05
7	0.625	0	0.05
8	0.748	0	0.05
9	0.561	0	0.05
10	0.633	0	0.05

Table 7. Relation customer requirement and hotel SERVQUAL dimensions.

Dimension	CR
Tangibles	CR 2, CR 3, CR 4
Reliability	CR 1, CR 2, CR 3, CR 4, CR 5, CR 6, CR 7, CR 8, CR 9, CR 10
Responsiveness	CR 1, CR 2, CR 7, CR 10
Assurance	CR 5, CR 8
Empathy	CR 8

HOQ Hotel X															
Customer Requirements	Layered Control	Different Menus Everyday	Daily Evaluation	Kept Customer Identity Confidential	Don't disturb sign	No Construction Work at Night	Pickup Waiting Time	Pickup Point	Importance Rating	Current Service	Target Service	Improvement Ratio	Sales Point	Absolute Weight	Relative Weight
	breakfast service & food	9	9	9						4	4	5	1,3	1,5	7,5
hotel room condition & service	9		9						5	4	5	1,3	1,5	9,4	11,4
room & bathroom facility & amenities condition	9		9						5	5	5	1,0	1,5	7,5	9,1
hotel facility condition & ambience	9		9						4	4	5	1,3	1,5	7,5	9,1
privacy in hotel	9		9	9	9				5	4	5	1,3	1,5	9,4	11,4
spa & massage facility and experience	9		9						4	4	5	1,3	1,5	7,5	9,1
check in service	9		9						5	5	5	1,0	1,5	7,5	9,1
staff attitude & service	9		9						5	4	5	1,3	1,5	9,4	11,4
disturbance at night	9		9			9			5	4	5	1,3	1,5	9,4	11,4
airport transfer & transportation service	9		9				9	9	4	4	5	1,3	1,5	7,5	9,1
Absolute Importance	900,0	81,8	900,0	102,3	102,3	102,3	81,8	81,8							
Relative Importance	38,3	3,5	38,3	4,3	4,3	4,3	3,5	3,5							
Our Current Performance	5	5	5	5	5	5	5	5							
Target	5	5	5	5	5	5	5	5							
Scale	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes							
Unit of Measurement	Available	Available	Available	Available	Available	Available	Available	Available							

Figure 2. HOQ of hotel X.

4. Conclusions

In this paper, customers requirements from the RStudio will be an input for HOQ. As mentioned earlier, in this HOQ, the input for voice of customers from the secondary data; therefore, the voice of customers is an output from the LDA method based on reviews from TripAdvisor. In this research, we used the case study from Hotel X in Jakarta. We disseminated the questionnaire to customers who had stayed in Hotel X at least once in 2018. There were two questionnaires for this HOQ. The first questionnaire was to determine the importance rating from the customer requirements obtained from LDA method. The second questionnaire was for Hotel X, with the purpose of determining the satisfaction aspect for each customer requirement provided by the customer. The importance rating from the first questionnaire can be seen in Figure 2; the importance rating confirmed the national culture theory provided by Geert Hofstede

All respondents were from Indonesia, immersed in the feminist culture; therefore, comfort, when staying at a hotel, is important to them and can be seen in Figure 2. The score about service and the usable of amenities get the highest rate of importance. The satisfaction rating collected from the output average score of the questionnaire. The questionnaire was distributed to Indonesian, who gave answers based on their hotel experience.

Figure 2 showed each average score for every CR, particularly, the 3rd and 7th CR of Hotel X rated the maximum satisfaction at 5, which means that the hotel has succeeded at fulfilling customers' requirements 3 and 7. The rest of CRs receives a rating of 4, which means that the hotel is close to fulfill the customer requirements.

The other important part of HOQ is the correlation matrix. This correlation matrix measured the effect of the technical requirement on the customers' requirements. The correlation matrix has four indicators: strong, medium, weak and no correlation. The layered control has a strong correlation with all customers' requirements because all aspects in Hotel X must go through the layered control before provided to customers; every item in the hotel room must go through layered control before the customer's stay; every food item from the kitchen, before served to the customer, must go through layered control by the staff, etc. Different menus everyday have a strong correlation with breakfast service and food but have no correlation with other customer requirement. Strong correlation exists between everyday different menus and breakfast service and food because the rotation of menus everyday keeps customers excited to come again next time. Daily evaluation has a strong correlation with all customers' requirements because the daily evaluation is an evaluation that analyzes all the events taking place on the previous day and plans for the present.

Besides examining problems, during daily evaluation, supervisors or management must brief all the staff on the daily tasks of the hotel.

Keeping the customer's identity confidential has a strong correlation with privacy in a hotel. Every customer who stayed at the hotel must give his or her identity to the hotel at check in. the hotel's staff must keep the customers' information confidential without giving details to anyone. *Do not disturb* signs have strong correlation with privacy in a hotel by keeping the staff from coming to the room. No construction work at night has a strong correlation with disturbance at night. Construction work usually causes unbearable noise; by not allowing construction work at night, disturbance may be eliminated from the hotel, which may keep customers comfortable during their stay at the hotel. Pickup waiting time has a strong correlation with airport transfer and transportation service. The shuttle service of Hotel X must come to the pickup points as soon as possible before customers' arrival. The pickup point (a place where customers board the shuttle) has a strong correlation with airport transfer and transportation service. The highest relative importance score of technical requirements exists between layered control and daily evaluation; it means that the hotel must focus on both layered control and daily evaluation at the same time in the future.

Conflict of interest

The authors do not have any type of conflict of interest to declare.

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