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Research on the influence of after-sales service quality factors on customer satisfaction

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ABSTRACT

Determining customer satisfaction elements in retailing after-sales services have been well explored; however, the increasing competition in this area demands the investigation of actual instrumentality of these elements on satisfaction of customers. In the present research, we have proposed a framework for assessing the instrumentality of after-sales services on customer satisfaction. Kano model and SERVQUAL framework were used to categorize customer satisfaction elements. In addition, in order to address behavioral dissimilarities among customers, RFM clustering technique was used for analysing 243,180 customers of automobile after-sales services. Accordingly, dissatisfaction decrement index and satisfaction increment index were measured for every cluster separately. We identified a group of 21 quality elements and demonstrated the instrumentality and quality of these quality elements on customer satisfaction. RFM clustering technique is applied to address customer dissimilarities and we demonstrated the preferences and desires of customers in each cluster. While some papers have already identified the influential factors of after-sales services on customer satisfaction, this is for the first time that the instrumentality of after-sales services is being identified. Accordingly, this study demonstrates how different after-sales services quality elements affect customer satisfaction. Therefore, the results of this study can help companies to allocate their resources more efficiently.

1. Introduction

Customer satisfaction is a multidimensional and extensive notion; many different variables can directly affect customer satisfaction and customer loyalty throughout the customer life cycle (brand name, salesforce, product or service quality, after-sales services (ASS), etc. (Jap, 2013). Therefore, in order to make customers satisfied, it is necessary for companies to put many different factors into perspective and to consider continuous evaluation and improvement of their different service activities such as addressing customer queries and complaints, meeting customer expectations, etc (Sivadas and Baker-Prewitt, 2000). After-sales services, among numerous factors influencing customer satisfaction, has proven to be an undoubted predictor of customer satisfaction and customer retention (Kurata and Nam, 2010). The provision of after-sales services for durable products is not only a mandatory requirement by law, but also an opportunity for firms to boost their competitiveness (Li et al., 2014). The most common approach for automobile companies to provide after-sales services is to delegate these services to retailers (Davies, 2004). For example, manufacturers such as Toyota, Volkswagen, and BMW contract with their retailers to provide after-sales services such as periodic maintenance service, and repair services (Li et al., 2014). Accordingly, vendors, as the initial communication point with consumers throughout the supply chain, play a subtle and vital role in keeping customers satisfied; vendors are accountable for an important feedback loop between businesses and consumers (Ali and Dubey, 2014). This vital importance demands careful and attentive attention. Therefore, it is beneficial for companies to study their retailers' performance thoroughly.

So far in the literature, the majority of studies have focused merely on identifying customer satisfaction elements regarding after-sales services. For example, Murali et al. (2016) have identified 21 elements of after-sales services which directly affect customer satisfaction. Nonetheless, the mere recognition of satisfaction elements is not sufficient; different satisfaction elements have different characteristics and dissimilar effects on customer satisfaction (Kano, 1984). Therefore, managers need to know how exactly each of these service elements affect

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customer satisfaction. Accordingly, managers can make more precise and efficient decisions regarding each satisfaction element if they know how exactly each element contributes to customer satisfaction (Bandyopadhyay, 2015). For example, mere respectful interpersonal behavior of service people may not enhance customer satisfaction, but rude behavior of service people can lead to customer dissatisfaction. Therefore, it is beneficial for executives to know how each element of quality contributes to customer satisfaction.

In order to address this gap, we proposed a general framework which can be applied to different contexts. We used this framework to assess how each element of quality contributes to overall customer satisfaction in automobile after sales services sector. Fot this purpose, we integrated the existing metrics of service quality (SERVQUAL) with Fuzzy Kano model in order classify service quality elements, and assess the contribution of each element to satisfaction of customers. Moreover, recognizing attitudinal dissimilarities among individuals, we studied similar customers separately, taking advantage of RFM model for clustering. This approach helps us considering the desires of more customers, while maintaining the calculations feasible. In order to address differences in store formats (Koschmann and Isaac, 2018). We contribute to the retailing literature in two main ways. First, by the integration of SERVQUAL framework and Fuzzy Kano model we proposed a framework for classifying service quality elements in after-sales services and retailing area. This classification helps managers of companies to realize the importance and instrumentality of each of these service quality elements on satisfaction of customers. Resultantly, executives may assign the limited corporate resources more reasonably and efficiently. Second, taking advantage of data mining technique for clustering customers, we categorized customers with similar behavior. Accordingly, we studied the needs of numerous number of customers in separate segments, a vital practice especially for retailers with myriad number of customers. Although this study is limited to automobile context, the same framework presented in this study can be applied to other retail contexts.

The rest of this study is structured as follows: initially, we discussed the literature on service elements of quality. Subsequently, we described the research methodology of this research. Thereafter, we present empirical results, discussion and conclusion, retail management implications, and research limitations.

2. Literature review

2.1. Service quality

Over the recent 20 years, as the economy has become mostly service-oriented, researches now consider services as the central orientation of marketing practices (Carrillat et al., 2007). Service quality (SQ), as one of the most determinant factors of customer satisfaction (Seth et al., 2005) and customer perceptions of corporate image (Yu and Ramanathan, 2012), has drawn the attention of myriad number of researchers. Clearly, for providing a high quality service, it is essential for managers to be able to measure it. Although there is not a consent on the most appropriate way for evaluating quality of services, SERVQUAL is unquestionably the most popular framework for assessing quality of services (Lee and Kim, 2014). SERVQUAL, grounded in the gap model, measures service quality with respect to the calculated difference of actual performance perception and customer expectation from the delivered service (Parasuraman et al., 1994). This measurement instrument, in its finalized form, is consisted of 22 quality elements classified in five classes (Parasuraman et al., 1988):

- **Tangibles**: Physical facilities, equipment, and appearance of the personnel.
- **Reliability**: Ability to perform the promised service dependably and accurately.
- **Responsiveness**: Willingness to help customers and provide prompt service.
- **Assurance**: Knowledge and courtesy of employees and their ability to inspire trust and confidence.
- **Empathy**: Caring, individualized attention the firm provides its customers.

Since the presentation of SERVQUAL, it has been used in a variety of contexts; however, the operationalization of this model has been criticized by many researchers (Carrillat et al., 2007; Calvo-Porral et al., 2013; Shokohyar et al., 2013). The most deficiency of SERVQUAL addressed by the literature is its operationalization Calvo-Porral et al. (2013); Van Dyke, Kappelman, and Prybutok (1997) believe that the proposed SERVQUAL framework is not an adequate measure since it is too superficial to encapsulate the intricate cognitive procedure of individuals. Furthermore, Robinson (1999) insisted that considering a one-size-fits-all measurement instrument as the global approach for measuring satisfaction in different contexts is not a realistic approach. Accordingly, he proposes considering separate measurement frameworks with respect to each context and industry. In addition, Cronin and Taylor, 1992 argue that service excellence and customer satisfaction are different concepts and should not be confused. They believe that the quality of service must be quantified merely with respect to customers' attitude toward the service because the difference between customers perception and customer expectation denotes satisfaction of customers—not quality of service. This view led to the development of a measurement instrument which is based merely on service performance known as SERVPREF. Although many researchers have attempted to solve the SERVQUAL-SERVPREF debate, both approaches have enjoyed widespread acceptance (Carrillat et al., 2007).

Jain and Gupta (2004) believe that SERVPERF is of greater effectiveness and more informative power; therefore, they favoured employing this measurement framework for comparing service quality among industries, companies, and organizations. In contrast, they suggest employing SERVQUAL for regular diagnosis in order to determine quality deficits of a certain service.

2.2. After-sales service (ASS)

After-sales services (ASS) is mostly used to describe services which are delivered after the delivery of a certain commodity for the purpose of supporting consumers' usage of product throughout its life cycle (Gaiardelli et al., 2007). After-sales service is defined and approached with various perspectives. For instance, Rigopoulou et al. (2008) view ASS as all of the processes that are performed in order to support the transaction of a product. Moreover, this term is referred to two broad types of activities in retail literature (Mouly Potluri and Hawariat, 2010); for service delivery companies, after-sales services are considered as supplementary services among diverse services that these companies deliver to their customers (Oliva and Kallenberg, 2003). In contrast, companies that produce tangible products treat ASS as services delivered to the customers via their distribution chain (Gaiardelli et al., 2007). Moreover, Kurata and Nam (2010) define ASS as customer, product, and technical support. Despite the fact that researchers have defined ASS concept differently with respect to its extension and role throughout the value chain, all of the stated definitions for ASS have two common features. The common characteristics of ASS definitions are as follows:

- ASS is a customer-oriented process in order to meet customer needs and keep the customer satisfied.
- The concept of ASS represents a cross-functional process which is carried out by different actors.

During recent years, offering reasonable after-sales services has turned to a major revenue source. Furthermore, companies focus more on keeping existing customers satisfied than on capturing new customers due to the relatively high customer acquisition costs. As a result,

ASS concept has increasingly become an important strategic source of differentiation and competitive advantage (Li et al., 2014).

2.3. After sales services as predictor of customer satisfaction

Many researchers have studied the impact of after-sales services on customer satisfaction and customer retention in different industry sectors (Kurata and Nam, 2010; Rigopoulou et al., 2008; Van Birgelen et al., 2002; Blut et al., 2018; Arabi et al., 2018). For instance, Parasuraman et al. (1994) revealed that SERVQUAL classes in service industry are key determinants of customer satisfaction. Furthermore, Rigopoulou et al. (2008) in a study of after-sales services of electronic appliances, investigated the impact of ASS quality on the satisfaction of customers and behavioral intentions. Kursunluoglu (2014) demonstrate that quality of services have to be improved by retailers as it can explain the satisfaction of customers and consumer loyalty. Arasli et al. (2005), in a study of Cyprus banking sector, determined that assurance, reliability, empathy and tangible dimensions of services can predict customer satisfaction.

Although SERVQUAL contains basic classes of service quality elements, it does not specify certain quality elements for each sector. This implies that quality elements depend on the context in question. Accordingly, quality elements should be considered with respect to the intended sector (Chang and Yeh, 2002). Pakdil, Işın and Genç (2012), studying after-sales services of a manufacturer, found immediate identification of product defects, competency and experience of employees, and good customer service during the warranty period as the main customer expectations. In addition, Levesque and Boeck (2017) confirmed proximity of service centre as determining factor for improved service experience. Moreover, Kasper and Lemmink (1989) found response time, repair time, price-performance ratio, service contract options, availability of spare parts, and general behavior of technicians as the main important factors for customer satisfaction. Hau et al. (2016), in a study of paired patient-physician interactions, revealed that individuated interactions between service front liners and customers can lead to higher service perceptions. Other researchers have also considered other alternatives. We summarized their contributions on Table 1.

Table 1
Quality Elements.

SERVQUAL classes	Quality elements
Tangibles	• Availability of information and advice at service centre (Parasuraman et al., 1985) • Proximity of service centre (Levesque and Boeck, 2017) • Modern looking equipment and fixtures (Ahmad et al., 2014) • Visually appealing service material (Ahmad et al., 2014) • Convenient operating hours (Kumar et al., 2017; Ahmad et al., 2014) • Price performance ratio of services rendered (Kumar et al., 2017; Kasper and Lemmink, 1989)
Reliability	• Provision of service as promised (Wilson et al., 2012) • Availability of spare parts during service calls (Kasper and Lemmink, 1989; Pakdil et al., 2012; Saccani et al., 2014) • Availability of technical services staff Kasper and Lemmink (1989) • Consistency of service quality (Seth et al., 2005; Pakdil et al., 2012) • Choice and range of service (Haywood-Farmer, 1988; Kasper and Lemmink, 1989) • Good customer service during the warranty period (Pakdil et al., 2012)
Responsiveness	• Immediate identification of defects (Pakdil et al., 2012) • Time taken in servicing (Kumar et al., 2017; Kasper and Lemmink, 1989) • Time taken for resolving the complaint (Van Birgelen et al., 2002; Kasper and Lemmink, 1989) • The store employee gives prompt service to customers (Ahmad et al., 2014) • Reasonable warranty policy (Pakdil et al., 2012) • Responsiveness to customer complaints (Parasuraman et al., 1985; Pakdil et al., 2012)
Assurance	• Competency and experience of employees (Pakdil et al., 2012) • General attitude and behaviour of technician (Kasper and Lemmink, 1989) • Handling customers (Parasuraman et al., 1985) • Professionalism of service people (Parasuraman et al., 1985) • Interpersonal behaviour of service people (Parasuraman et al., 1985)
Empathy	• Individuated interactions between service front liners and customers (Hau et al., 2016) • Personalized attention of staff (Kumar et al., 2017) • Availability of service people (Ahmad et al., 2014) • Service contract options (Kasper and Lemmink, 1989)

2.4. Fuzzy Kano Model

Evidently, the quality of products and services has a direct impact on the satisfaction of customers (Susanti C., 2013), yet each element has a distinct effect on the satisfaction of customers. Utilizing the "motivation-hygiene concept" (Herzberg, 1965), Kano, (1984) proposed a model to discern the functionality of different quality components on customer satisfaction. Their recommended framework, Kano Model, is widely applied for categorizing and prioritizing consumer needs. Thus, this framework is appropriate for understanding customers' desires. Kano classes are as follows:

(1) **Must-be:** A series of minimal needs that the deficient performance of them leads to consumer dissatisfaction. Contrary, adequate provision of these needs does not guarantee consumer satisfaction.
(2) **One-dimensional**: Appropriate fulfilment of one-dimensional elements enhances customer satisfaction. In contrast, inadequate performance of such features leads to discontentment. In general, the impact of these components on satisfaction is symmetric and linear.
(3) **Attractive**: Fulfilment of an attractive element triggers the satisfaction of customers, but absence of such components will not cause dissatisfaction. These parameters may be unexpected for the consumer and make them happy.
(4) **Indifferent**: The satisfaction of customers is not influenced with the existence or lack of such characteristics (Lofgren and Witell and Löfgren, 2007).
(5) **Reverse**: The existence of such elements leads to discontentment, whilst the lack of these elements entails contentment.
(6) **Questionable**: The outcome of the survey is not sufficient for determining the impact of such properties on the satisfaction of customers. This status originates from one of these reasons: incomplete information, inadequate wording of the questions, and ambiguous questions.

Figure 1 presents how customer satisfaction is related to functional presence of quality elements in different Kano classes. Kano Model applies a survey including pairs of dysfunctional and functional questions for each quality component. Functional questions stand for conditions where the questioned quality component is adequately provided. In contrast, dysfunctional questions specify situations where the performance of the selected quality element is deficient. Five distinct responses –like, neutral, expect, accept, and disapprove– are suggested in the traditional Kano questionnaire. Thus, quality components are categorized into the formerly stated six categorizations (Table 2).

As previously stated, responding the original Kano questions, participants must select one of the five available choices; however, participants can have numerous inclinations and feelings. Therefore, their final decisions can not result in specific results in many cases (Lee and Huang, 2009). To address this gap, Fuzzy Kano Model was developed. Meng et al. (2015) proved that the integration of the Kano Model and

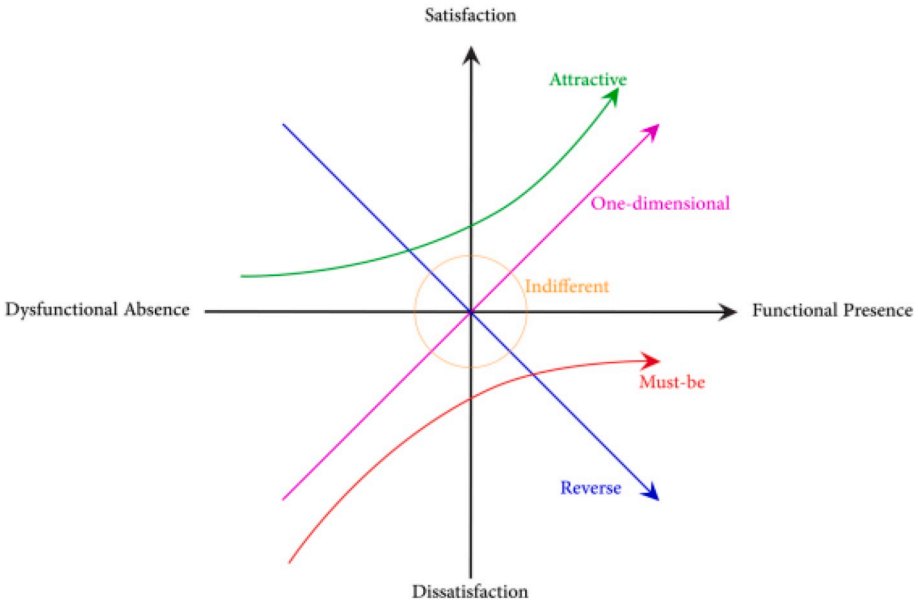

Fig. 1. Kano Model

Table 2
Kano model Evaluation table.

Service quality elements		Dysfunctional				
		Like	Expect	Neutral	Accept	Dislike
Functional	Like	Q	A	A	A	O
	Expect	R	I	I	I	M
	Neutral	R	I	I	I	M
	Accept	R	I	I	I	M
	Dislike	R	R	R	R	Q

A: attractive; O: one-dimensional; M: must-be; I: indifferent; R: reverse; Q: questionable.

Fuzzy framework is useful in deducing consumers' uncertainties and vagueness psychology. If participants are allowed to select multiple choices on a fuzzy basis while selecting their answers, the outcomes will be closer to their genuine thoughts (Matzler and Hinterhuber, 1998). Fuzzy Kano surveys is comprised of pairs of functional and dysfunctional questions; nevertheless, participants can show their personal inclinations towards every choice. Hence, the Fuzzy Kano Model offers greater flexibility for participants to show their genuine understandings compared to the original Kano Model.

Mikulić and Prebežac, 2011 provided a comprehensive study and comparison of various methods of quality component categorizations, namely the Kano Model, PRCA, CIT and IGT. They discovered that every method has significant constrictions in comparison to the Kano Model. Since the presentation of this model, several scholars have used it in different contexts (Matzler and Hinterhuber, 1998; Tan and Shen, 2000; Tan and Pawitra, 2001; Pawitra and Tan, 2003; Lee et al., 2008; Shokohyar et al., 2017; Baki et al., 2009; Shokouhyar et al., 2017).

3. Research methodology

The statistical population of this research is comprised of individuals who had visited official retailers of five major automobile companies for after-sales services over the period 2015–2016.

At first place, considering SERVQUAL classes, we identified a group of 21 quality elements via a focus-group study of 16 automotive retail industry experts who are marketing managers and retail personnel of 6 different automotive retail companies which deliver after-sales services to customers (Table 3).

Subsequently, we designed the Fuzzy Kano questionnaire, using the selected quality elements. The survey consists of two sections—21 functional and 21 dysfunctional queries. One pair of functional-dysfunctional query was designed for all components. For instance, the following questions were designed for "Availability of staff" item. Note that the questionnaire contains questions in both functional and dysfunctional form with a scope for customers to give more than single response. Participants are provided with five options for each question: It is pleasant, it is expected to be like that, not different, it is okay for me, and I do not like it. We verified validity of the questionnaire via interviews with researchers and experts. A sample result is presented in Table 4 for a given customer and will be used in Section 3.2 for illustration. The respondents are asked to give their responses (for each of the five responses). The percentage represents the membership degree of the respondent's preference for the answer. List of all questions in the survey is presented in Appendix A.

Table 3
Selected quality Elements.

SERVQUAL classes	Quality element
Tangibles	• Availability of information and advice at service center • Proximity of service center • Modern looking equipment and fixtures • Convenient operating hours
Reliability	• Provision of service as promised • Availability of spare parts during service calls • Availability of technical services staff • Consistency of service quality • Good customer service during the warranty period
Responsiveness	• Immediate identification of defects • Time taken in servicing • Time taken for resolving the complaint • The store employee gives prompt service to customers • Responsiveness to customer complaints
Assurance	• Competency and experience of employees • General attitude and behavior of technician • Handling customers • Professionalism of service people • Interpersonal behavior of service people
Empathy	• Individuated interactions between service front liners and customers • Availability of service staff

Table 4
The Fuzzy Kano's questionnaire.

Availability of staff'	Functional	Dysfunctional
	How do you feel if the service staff are always available?	How do you feel if the service staff are not always available?
It is pleasant.	0.4	0
It is expected to be like that	0.2	0
Not different.	0.2	0
It is okay for me	0.2	0
I do not like it	0	1

3.1. Clustering

Second, in order to consider attitudinal dissimilarities, we studied similar customers separately using K-mean *clustering* algorithm. Clustering is the process of categorizing physical or abstract objects into classes of similar objects. K-mean clustering algorithm is used because of its high-speed performance in large data size. K-mean is a commonly used and simple unsupervised machine learning algorithm to cluster observations into a user-specified number of clusters; It has several applications in transportation (Shokoohyar et al., 2020a; Shokoohyar et al., 2020b; Agard et al., 2006; Ghazanfari et al., 2011), and customer behavior analysis (Shokoohyar, 2018a; Shokoohyar, 2019). For a detailed review on clustering methods, we refer the readers to (Rana et al., 2011; Vora and Oza, 2013). K-means algorithm groups different instances of a certain event on the basis of existing similarities in the attributes of events. In this case, *RFM* indicators are used as the clustering attributes. RFM stands for *Recency*, *Frequency* and *Monetary* value: Recency shows the number of days that has passed from the date that a given consumer visited the official retailers. Frequency is a criterion representing the number of times a customer has made a service order from a retailer. Monetary value is a measure that denotes the total monetary value of all of the orders of a customer. RFM analysis is a marketing technique that provides behavioral knowledge about customers' actual marketing levels. It is a useful method to improve customer segmentation and it is extensively used in the literature: improving Customer Relationship Management (CRM) for enterprises (Hosseini et al., 2010), customer value analysis of an outfitter (Wu et al., 2009; Shokohyar et al., 2021). For detail review of the RFM model we refer the readers to Wei et al. (2010) and Bose and Chen, 2009.

The general data of 243,180 customers are collected from the databases of five automobile companies. The provided databases included two tables–customer table and order table. Customer tables encompass demographic columns such as name, age, gender, contact number, and registry date of customers. The order tables include specific data regarding the orders. For each customer recency, frequency and monetary values are calculated based on the data available in the order tables and then are scaled, before being used for clustering. The scaled indicators then are used for generating clusters with K-means algorithm. To determine the right number of clusters the elbow method is used. Based on the elbow method, we categorized similar customers in 3 clusters. The summary results of the k-means clustering are discussed in Section 4.

3.2. Analysis

At third place, according to Morgan Table, the size of sample was found to be 1347 (margin of error = 3.5%, Confidence = 99%). In order to meet the sample size, we selected 1700 customers on a random basis from three clusters proportionally, and sent the questionnaires to them. We considered a minimal incentive for the responders. Overall, 1477 responses are received and after the initial evaluation, 1351 are extracted. We measured tau-equivalent reliability measure which was 0.831 .

We calculated matrix $S_{5\times5}$ by combining $F_{5\times1}$ and $D_{1\times5}$, where $F_{5\times1}$ is the responses of functional questions and $D_{1\times5}$ holds the responses of dysfunctional questions. Figure 2 demonstrates Kano Model calculations.

Thereafter, for each of the returned acceptable questionnaires, the membership value was calculated as shown below (Lee and Huang, 2009):

- Must-be $= a_{25} + a_{35} + a_{45}$
- One-dimensional $= a_{15}$
- Reverse $= a_{21} + a_{31} + a_{41} + a_{51} + a_{52} + a_{53} + a_{54}$
- Attractive $= a_{12} + a_{13} + a_{14}$
- Indifferent $= a_{22} + a_{23} + a_{24} + a_{32} + a_{33} + a_{34} + a_{42} + a_{43} + a_{44}$
- Questionable $= a_{11} + a_{55}$

Table 5 presents the result of calculations for "Availability of service staff" element for a customer as an example. A Customer feeling is $F = \begin{bmatrix} 0.4 \\ 0.2 \\ 0.2 \\ 0.2 \\ 0 \end{bmatrix}$ and $D = [0, 0, 0, 0, 1]$. Applying $S_{5\times5} = F_{5\times1} \times D_{1\times5}$, we derive Kano's two-dimensional fuzzy relation combination: $S_{5\times5} = \begin{bmatrix} 00000.4 \\ 00000.2 \\ 00000.2 \\ 00000.2 \\ 00000 \end{bmatrix}$. Mapping $S_{5\times5}$ with Kano model evaluation table (Table 2) we derive membership value of each class as presented in Table 5.

Subsequently, we defuzzified the derived values considering α threshold to be 0.5 which is presented in Table 6. When quality attribute level is greater than $\alpha = 0.5$, "1" is represented; and otherwise "0" is represented. For instance, in this example, only the membership value of the must-be class is greater than 0.5, and therefore must-be Kano class is presented with 1 in Table 6.

The same calculations were implemented for all the customers for each quality element. For each quality element, then frequency of classes is calculated. Next, based on of *high frequency approach*, each quality element is assigned to the class with the highest frequency. In cases where the identification frequency is equal, the outcome is determined based on the prioritization of quality attribute category; First is must-be, then one-dimensional, attractive, indifferent and reverse attributes. The high identification frequency of quality attribute fuzzy Kano's model is used extensively in the literature (Shokouhyar et al., 2017, 2019, 2020). For this purpose, we used a custom code which reads the data from excel sheets, process the calculations, and write the results on a specified Excel sheet, using Openpyxl and Numpy libraries in the Python programming environment. This program determines the categorization of each component on the basis of high frequency approach.

Thus, we deduced customer satisfaction coefficient (satisfaction increment index (SII) and dissatisfaction decrement index (DDI)) for every quality component based on the formula suggested by Berger et al. (1993).

SII determines whether enhancement of a particular quality component improves customer satisfaction (Berger et al., 1993). If SII is closer to 0, it shows that a quality component has inadequate positive impact on customer satisfaction. On the other hand, if SII for a quality element is close to 1, it shows that the quality component has comparably significant positive impact on customer satisfaction. Additionally, when a quality component has low SII, it does not indicate dissatisfaction. Contrary, when DDI is closer to 0, it shows that a quality component has minor impact on the satisfaction of customers. In contrast,

how do you feel if the sale representative sent from the company does not change over time? (Functional question)	I like it that way. I expect it to be that way. I am neutral. I can accept it to be that way. I dislike it that way.
how do you feel if the sale representative sent from the company is changed over time? (dysfunctional question)	I like it that way. I expect it to be that way. I am neutral. I can accept it to be that way. I dislike it that way.

Kano Model evaluation table

Service quality elements		Dysfunctional				
		Like	Expect	Neutral	Accept	Dislike
Functional	Like	Q	A	A	A	O
	Expect	R	I	I	I	M
	Neutral	R	I	I	I	M
	Accept	R	I	I	I	M
	Dislike	R	R	R	R	Q

Note: A: attractive; O: one-dimensional; M: must-be; I: indifferent; R: reverse; Q: questionable

Fig. 2. Kano model calculations.

$$S_{5\times5} = F_{5\times1} \times D_{1\times5} = \begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} & a_{15} \\ a_{21} & a_{22} & a_{23} & a_{24} & a_{25} \\ a_{31} & a_{32} & a_{33} & a_{34} & a_{35} \\ a_{41} & a_{42} & a_{43} & a_{44} & a_{45} \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} \end{bmatrix}$$

Table 5
Membership value of Each class for one of the customers.

Quality Element	Kano Model Classes					
	A	O	M	I	Q	R
Availability of service staff	0	0.4	0.6	0	0	0

Table 6
Defuzzified membership value of Each class for one of the customers.

Quality Element	Kano Model Classes					
	A	O	M	I	Q	R
Availability of service staff	0	0	1	0	0	0

when DDI is close to 1, it specifies that inefficient quality component provision can reduce customer satisfaction. DDI and SSI are measured using the following formulas:

$$SII = (A + O)/(A + O + M + I)$$

$$DDI = -(O + M)/(A + O + M + I)$$

4. Data analysis and findings

The reported result of k-means algorithm, depicted on Table 7, showed unbalanced distribution of customers in three clusters (Cluster 1 = 167,753, Cluster 2 = 49,064 and Cluster 3 = 26,363). This disproportionately can be justified considering the aggregate values of their corresponding attributes, which, in turn, verify behavioral varieties in the studied customers.

Cluster 1 ranks third with respect to the monetary criterion, 26.1$ per visit, while having the most number of customers. Low monetary value per visit can be justified with two main reasons. First, repair and maintenance for cheaper cars costs less on average compared to more expensive cars. Second, cars that are repaired and maintained on a regular basis tend to undergo fewer number of major functional damages. Clearly, this cluster mainly encompasses customers with higher

Table 7
Clusters.

	Size	Recency	Frequency	Monetary
Cluster 1	167,753	16	11	26.1
Cluster 2	49,064	42	3.1	38.2
Cluster 3	26,363	8	46.9	73.8

levels of car depreciation; the frequency criterion for this cluster is 11 times per year. This implies that customers in cluster 1 visit official retail stores for after-sales services on average 11 times per year. Accordingly, it is evident that customers in cluster 1 use their cars very frequently—about 3 times more than customer in cluster 2. Taking into account the relatively low corresponding monetary value for this cluster, it can be inferred that this segment mainly encompasses individuals who own relatively cheap cars and use their cars on a daily basis. These behavioral characteristics can mainly be attributed to taxi drivers who own relatively cheap cars with high car depreciation levels.

Cluster 3, the smallest cluster in size, ranks first with respect to the monetary value with the average value of 73.8$ per customer visit. This unusual high monetary value can only be attributed to heavy trucks. Furthermore, the frequency value for this cluster is 46.9 per year, which is by far the highest frequency among clusters. Therefore, it can be substantiated that customers in this cluster visit retailers for after-sales services about 4 times per month. This high frequency value also strengthens the hypothesis that this cluster includes mainly heavy truck drivers.

Customers in cluster 2 visit official retailers 3.1 times per year. This means that customers in this cluster visit retailers approximately every 4 months. For instance, monetary value per visit for customers in cluster 2 is 38$–slightly more than that of customers in cluster 1 and about half of monetary value for customers in cluster 3. Therefore, this cluster encompasses individuals who use their cars less frequently and own relatively more expensive cars compared to customers in cluster 1. This behavior can be mainly attributed to individuals who own more expensive car and use their car as a family car.

Thereafter, we analysed the questionnaires' results, considering the Fuzzy Kano framework calculations illustrated on Fig. 2. Table 8 demonstrates the result of Fuzzy Kano calculations.

The results clearly illustrate the differing viewpoints among clusters regarding quality elements. For instance, customers in cluster 2 regard "General attitude and behavior of technician" as "Must-be" element, while customers in cluster 1 regard this element as "Indifferent". This dissimilarity can be justified with regard to the aforementioned nature of these clusters; as mentioned previously, customers in cluster 1 visit retailers approximately 3.5 times more than customers in cluster. This result is in line with that of the study conducted by Kim and Byon (2018) that identify the mediating role of "Satisfaction with employee" between service quality and customer citizenship. In contrast, there is an all-inclusive consent among clusters concerning three quality elements namely, "provision of service as promised", "professionalism of service people", and "the store employee gives prompt service to customers". Consistent with the marketing literature (Kim and Byon, 2018; Chopra, 2014), we also found that customers in all clusters regard "provision of service as promised" and "professionalism of service people" as must-be elements, while they consider "the store employee gives prompt service to customers" element as one-dimensional. This convergent perspective implies the relative high importance of these elements.

Furthermore, both customers in cluster 2 and cluster 3 find "proximity of service centre" and "good customer service during the warranty period" attractive, while customers in cluster 1 regard these elements as one-dimensional. These findings are consistent with those of the study of Wisniewski (2001), who analyses the gap between customer satisfaction and customer perception, using SERVQUAL calculation at retail services sector. In addition, customers in cluster 2 and cluster 3 are indifferent toward "interpersonal behavior of service people" and "individuated interactions between service front liners and customers" elements.

Subsequently, we calculated customer satisfaction coefficient (both SII and DDI) for each quality element for all clusters, using the formula presented in research methodology section (Table 9).

This Table clearly illustrates the subtle nuances among clusters. As previously mentioned, satisfaction increment index (SII) and dissatisfaction decrement index (DDI) determine the quantitative impact of their corresponding quality elements on customer satisfaction. In other words, these metrics specify the size and direction of customer satisfaction sensitivity for each quality element. Higher SII or DDI signify greater impact on customer satisfaction or dissatisfaction.

For instance, "availability of service staff" maintains a relatively high level of DDI among all clusters. Therefore, it is clear that provision of this element is crucial for preventing customer dissatisfaction, and no deviation in this element is acceptable. In contrast, SII index for this element is dissimilar among clusters; customers in cluster 2 believe that good provision of this element is not sufficient for customer satisfaction, while customers in cluster 1 and cluster 3 demonstrate high influence of this element on customer satisfaction enhancement. This means that customers in cluster 1 and cluster 3 consider this element as "one-dimensional, and customers in cluster 2 find this element a "most-be" element".

Similar divergence can be seen in "proximity of service centre" results. Both SII and DDI rate high for cluster 1–0.57 and −0.58 respectively. In contrast, the results for cluster 2 and cluster 3 are dissimilar; both clusters maintain high level of SII, while having a relatively low DDI. In other words, customers in cluster 2 and cluster 3 find this element "attractive". The highest level of discrepancy.

Table 8
Kano classification of quality Elements.

SERVQUAL classes	Quality element	Kano class		
		Cluster		
		1	2	3
Tangibles	• Availability of information and advice at service center	O	M	O
	• Proximity of service center	O	A	A
	• Modern looking equipment and fixtures	A	O	I
	• Convenient operating hours	M	O	M
Reliability	• Provision of service as promised	M	M	M
	• Availability of spare parts during service calls	O	I	M
	• Availability of technical services staff	M	O	M
	• Consistency of service quality	O	M	O
	• Good customer service during the warranty period	O	A	A
Responsiveness	• Immediate identification of defects	M	O	O
	• Time taken in servicing	M	O	M
	• Time taken for resolving the complaint	M	O	M
	• The store employee gives prompt service to customers	O	O	O
	• Responsiveness to customer complaints	O	M	O
Assurance	• Competency and experience of employees	O	M	O
	• General attitude and behavior of technician	I	M	O
	• Handling customers	I	O	O
	• Professionalism of service people	M	M	M
	• Interpersonal behavior of service people	I	A	I
Empathy	• Individuated interactions between service front liners and customers	I	A	I
	• Availability of service staff	M	O	M

5. Discussion and conclusion

This study investigates the nature of different quality elements on customer satisfaction in after-sales services practices. Identifying 21 quality elements with respect to SERVQUAL classes, we demonstrated the instrumentality and quality of these quality elements on customer satisfaction. For this purpose, we took advantage of Fuzzy Kano model (Lee & Haung, 2009). Further, in order to address customer dissimilarities, we used RFM clustering technique. Shown on Table 10, the result of Fuzzy Kano calculations demonstrates the preferences and desires of customers in different clusters. Former papers have identified and assessed the impact of different quality elements on customer satisfaction in this field; however, they ignored the quality of this impact on customer satisfaction (Murali et al., 2016). Moreover, previous papers have underscored the importance of customer dissimilarities. This framework can help retail managers to study customer satisfaction,

Table 9
SII and DDI of quality Elements.

SERVQUAL classes	Quality element	Cluster 1		Cluster 2		Cluster 3	
		SII	DDI	SII	DDI	SII	DDI
Tangibles	• Availability of information and advice at service center	0.52	−0.59	0.35	−0.60	0.55	0.53
	• Proximity of service center	0.57	−0.58	0.59	−0.24	0.58	−0.31
	• Modern looking equipment and fixtures	0.58	−0.21	0.58	−0.51	0.33	−0.28
	• Convenient operating hours	0.28	−0.58	0.56	0.53	0.26	−0.61
Reliability	• Provision of service as promised	0.35	−0.60	0.47	−0.57	0.33	-.060
	• Availability of spare parts during service calls	0.51	−0.61	0.28	−0.32	0.29	−0.58
	• Availability of technical services staff	0.44	−0.56	0.53	−0.62	0.29	−0.58
	• Consistency of service quality	0.56	−0.57	0.48	−0.56	0.59	−0.57
	• Good customer service during the warranty period	0.51	−0.53	0.58	−0.31	0.59	0.30
Responsiveness	• Immediate identification of defects	0.47	−0.50	0.55	−0.53	0.54	−0.57
	• Time taken in servicing	0.31	−0.58	0.53	−0.52	0.28	−0.59
	• Time taken for resolving the complaint	0.44	−0.51	0.51	−0.58	0.48	−0.53
	• The store employee gives prompt service to customers	0.57	−0.54	0.54	−0.58	0.55	−0.56
	• Responsiveness to customer complaints	0.51	−0.52	0.29	−0.60	0.50	−0.52
Assurance	• Competency and experience of employees	0.53	−0.61	0.48	−0.60	0.51	−0.62
	• General attitude and behaviour of technician	0.29	−0.28	0.36	−0.57	0.55	−0.53
	• Handling customers	0.32	−0.30	0.54	−0.57	0.53	−0.57
	• Professionalism of service people	0.29	−0.55	0.33	−0.60	0.28	−0.57
	• Interpersonal behaviour of service people	0.30	−0.29	0.70	−0.21	0.29	−0.23
Empathy	• Individuated interactions between service front liners and customers	0.25	−0.28	0.71	−0.20	0.28	−0.26
	• Availability of service staff	0.28	−0.60	0.54	−0.59	0.30	−0.61

Table 10
A summary of findings.

Kano class	Cluster 1	Cluster 2	Cluster 3
Must-be	• Convenient operating hours • Provision of service as promised • Availability of technical services staff • Immediate identification of defects • Time taken in servicing • Time taken for resolving the complaint • Professionalism of service people • Availability of service staff	• Availability of information and advice at service center • Provision of service as promised • Consistency of service quality • Responsiveness to customer complaints • Competency and experience of employees • General attitude and behaviour of technician • Professionalism of service people	• Convenient operating hours • Provision of service as promised • Availability of technical services staff • Availability of spare parts during service calls • Time taken in servicing • Time taken for resolving the complaint • Professionalism of service people • Availability of service staff
One-dimensional	• Availability of information and advice at service center • Proximity of service center • Availability of spare parts during service calls • Consistency of service quality • Good customer service during the warranty period • The store employee gives prompt service to customers • Competency and experience of employees • Responsiveness to customer complaints	• Convenient operating hours • Immediate identification of defects • Availability of technical services staff • Time taken in servicing • Handling customers • The store employee gives prompt service to customers • Time taken for resolving the complaint • Availability of service staff • Modern looking equipment and fixtures	• Availability of information and advice at service center • Immediate identification of defects • General attitude and behaviour of technician • Consistency of service quality • Handling customers • The store employee gives prompt service to customers • Competency and experience of employees • Responsiveness to customer complaints
Attractive	• Modern looking equipment and fixtures	• Proximity of service center • Good customer service during the warranty period • Interpersonal behaviour of service people • Individuated interactions between service front liners and customers	• Proximity of service center • Good customer service during the warranty period
Indifferent	• General attitude and behaviour of technician • Individuated interactions between service front liners and customers • Interpersonal behaviour of service people	• Availability of spare parts during service calls • Handling customers	• Modern looking equipment and fixtures • Individuated interactions between service front liners and customers • Interpersonal behaviour of service people

while taking into account a wide number of important influencing factors such as behavioral dissimilarities among customers, dissimilar characteristics of different quality elements, and distinct functionality of each quality component on the satisfaction of customers. The results of this study not only helps managers to realize the contribution of quality elements on the satisfaction of customers, but also enables marketers to study a large number of customers with different desires efficiently.

The highest level of discrepancy among clusters relates to the "Availability of spare parts during service calls" quality element; customers in cluster 3 regard this element as a "must-be" factor, while customers in cluster 2 are neutral toward the provision of this element. These findings further extends the results of studies on characteristics of buyer-supplier relationships for product support (Saccani et al., 2014; Shokoohyar, 2018b). On the other hand, customers in all three clusters consensually regard "professionalism of service people" as a "must-be element". This finding is also in line with previous research in other context concerning professionalism of service people (Lee, 2014). Furthermore, the results show that customers have very dissimilar views regarding modern looking equipment and fixtures element. Customers in cluster 1 find this quality element attractive, while customers in cluster 2 and cluster 3 regard this quality element one-dimensional and indifferent respectively. This can also further extend the findings of studies on relationship between customer loyalty and retailing service quality (Sivapalan and Jebarajakirthy, 2017).

Must-be is almost the most dominant category for quality elements among all clusters; customers in three clusters consider 14 distinct quality elements as must-be. Among these elements, seven elements are shared at least between two clusters. The provision of these elements is crucial for avoiding consumer dissatisfaction. However, satisfactory provision of such elements is not sufficient for enhancing the satisfaction of customers (Kano, 1984). On the other hand, attractive class encompasses the least number of quality elements among all classes. There are only 5 distinct quality elements in attractive class. Providing these of these elements can improve the satisfaction of customers, while deficiency in these elements does not lead to customer dissatisfaction. Thus, firms can achieve competitive edge via investment on such components (Matzler and Hinterhuber, 1998). Cluster 2 encompasses the least number of must-be elements, while having the most number of attractive elements. This relatively low standard can be justified with regard to their RFM algorithm result that describe these customers as individuals who do not use their cars for business purposes and might have less technical knowledge. On the contrary, customers in cluster 1 consider only modern looking equipment and fixtures element as attractive element.

Taken together, our study illustrates how differently quality elements affect customer satisfaction. Moreover, our findings imply that different customer groups can have disparate desires and priorities. As mentioned before, the purpose of this study is to construct a comprehensive framework to study customer satisfaction. Accordingly, this paper illustrates how marketing managers in retail industry can use SERVQUAL framework, Fuzzy Kano model, and clustering technique concurrently in their marketing practices. This study shows RFM clustering technique for clustering customers can be beneficial for managers in two main ways. Frist, it is evident that retail companies are mostly serving a huge number of customers; therefore, it is very difficult for these companies to study customer satisfaction without data mining approaches. Second, RFM modelling can help managers to consider attitudinal dissimilarities among customers by categorizing similar customers in different clusters.

From the practitioners' point of view, this study shows how differently individuals look at quality elements. Understanding these dissimilarities can help retail managers to align their development priorities with their actual customers' needs. Studying their customers with this approach, retail managers can understand their customers' desires. Retail stores, depending on their location and type, have customers with different priorities and desires (Van Birgelen et al., 2002). It is important for managers to thoroughly understand their target customers. This understanding can help them focus on the right features and meet their customers' desires efficiently.

There are some limitations in this study. First, we did not study longitudinal data in order to assess the instrumentality of quality elements on customer satisfaction. Instead, we used self-reporting data, increasing the chances of bias in our study. Therefore, more advanced analytical models which include longitudinal data assessment techniques can be used in order to increase the accuracy of this framework. Second, customers' desires and priorities might change over time. As a result, the result of this study is not consistent with time. Moreover, conducting this framework can be time consuming for retailers. Accordingly, it can be helpful to study the performance of quality elements on customer satisfaction, using the actual performance. Further, type and context of service is a determinant factor on customers' priorities; as a result, the findings of this study is limited to automotive after-sales service industry. However, the same approach can also be used for studying other sectors.

This paper also points to some compelling paths for the future studies. This paper studied the instrumentality of quality elements on customer satisfaction; however, the underlying psychological reasons for these customer perceptions are not identified. Clearly, understating the actual reasons for these classifications can help managers to understand their customers more thoroughly.

Appendix A. Kano Functional (F) and Dyfunctional (D) Questions, and Summary Statistics (Average)

#		Questions	It is pleasant.	It is expected to be like that	Not different	It is okay for me	I do not like it
1	F	How do you feel when adequate information and advice are provided at service center?	0.564	0.418	0.017	0.001	0.000
	D	How do you feel when adequate information and advice are not provided at service center?	0.000	0.000	0.019	0.294	0.687
2	F	How do you feel when service center is in the Close proximity?	0.672	0.269	0.058	0.001	0.000
	D	How do you feel when service center is not in the Close proximity?	0.000	0.000	0.065	0.385	0.551
3	F	How do you feel when equipment and fixtures are modern looking?	0.519	0.453	0.029	0.000	0.000
	D	How do you feel when equipment and fixtures are not modern looking?	0.000	0.000	0.053	0.593	0.354
4	F	How do you feel when operating hours are convenient?	0.419	0.564	0.007	0.010	0.000
	D	How do you feel when operating hours are not convenient?	0.000	0.000	0.037	0.343	0.620
5	F	How do you feel if services are provided as promised?	0.360	0.633	0.006	0.001	0.000
	D	How do you feel if services are not provided as promised?	0.000	0.000	0.071	0.341	0.587
6	F	How do you feel when spare parts are available during service calls?	0.517	0.367	0.086	0.030	0.000
	D	How do you feel when spare parts are not available during service calls?	0.000	0.000	0.011	0.343	0.646
7	F	How do you feel if the technical service staff are always available?	0.362	0.621	0.016	0.001	0.000
	D	How do you feel if the technical service staff are not always available?	0.000	0.000	0.047	0.276	0.677
8	F	How do you feel when service quality is consistent?	0.551	0.341	0.108	0.001	0.000
	D	How do you feel when service quality is not consistent?	0.000	0.000	0.018	0.313	0.669
9	F	How do you feel when good customer service is delivered during the warranty period?	0.612	0.344	0.044	0.001	0.000
	D	How do you feel when good customer service is not delivered during the warranty period?	0.000	0.000	0.067	0.307	0.626
10	F	How do you feel if defects are immediately identified?	0.404	0.564	0.032	0.001	0.000
	D	How do you feel if defects are not immediately identified?	0.000	0.000	0.000	0.384	0.616
11	F	How do you feel when time taken in servicing is short?	0.396	0.557	0.036	0.011	0.000
	D	How do you feel when time taken in servicing is not short?	0.000	0.000	0.013	0.373	0.614
12	F	How do you feel when time taken for resolving the complaint is short?	0.425	0.535	0.029	0.011	0.000
	D	How do you feel when time taken for resolving the complaint is not short?	0.000	0.000	0.011	0.370	0.620
13	F	How do you feel when the store employee gives prompt service to customers?	0.675	0.317	0.008	0.000	0.000
	D		0.000	0.000	0.022	0.336	0.642

(continued on next page)

(*continued*)

#		Questions	It is pleasant.	It is expected to be like that	Not different	It is okay for me	I do not like it
		How do you feel when the store employee does not give prompt service to customers?					
14	F	How do you feel if they are responsive to your complaints?	0.549	0.358	0.092	0.001	0.000
	D	How do you feel if they are not responsive to your complaints?	0.000	0.000	0.033	0.316	0.651
15	F	How do you feel if employees are competent and experienced?	0.550	0.339	0.110	0.001	0.000
	D	How do you feel if employees are not competent and experienced?	0.000	0.000	0.022	0.301	0.676
16	F	How do you feel when technicians are in general well-behaved?	0.308	0.674	0.018	0.000	0.000
	D	How do you feel when technicians are in general not well-behaved?	0.000	0.000	0.118	0.580	0.302
17	F	How do you feel when you are assured that your problem will be handled?	0.292	0.667	0.042	0.000	0.000
	D	How do you feel when you are not feel assured that your problem will be handled?	0.000	0.000	0.058	0.438	0.504
18	F	How do you feel when service people look professional?	0.215	0.756	0.030	0.000	0.000
	D	How do you feel when service people do not look professional?	0.000	0.000	0.019	0.301	0.680
19	F	How do you feel about respectful interpersonal behavior of service people?	0.484	0.438	0.077	0.001	0.000
	D	How do you feel about rude interpersonal behavior of service people?	0.000	0.000	0.049	0.554	0.396
20	F	How do you feel when service front liners interact with you in an individuated and personalized way?	0.419	0.493	0.087	0.001	0.000
	D	How do you feel when service front liners do not interact with you in an individuated and personalized way?	0.000	0.000	0.068	0.545	0.387
21	F	How do you feel if the service staff are always available?	0.365	0.620	0.013	0.001	0.000
	D	How do you feel if the service staff are not always available?	0.000	0.000	0.055	0.275	0.670

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