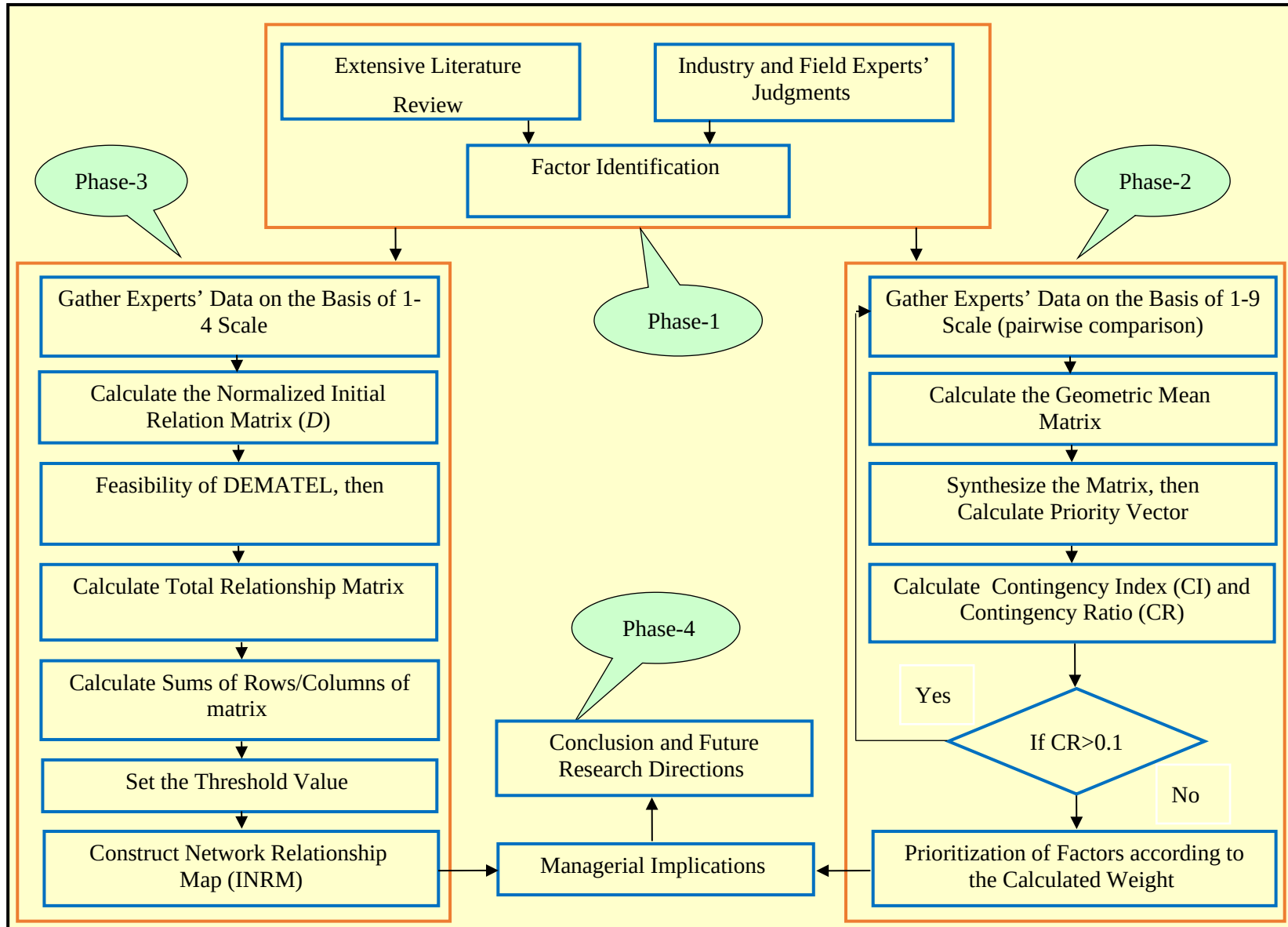




Research Highlights

- Identified and analysed factors associated with the customer retention
- Conducted a four-phased study to measure and improve customer retention
- Presented the real-life applicability by taking data from authorized automobile workshops
- Proposed various strategies for improving customer retention

Graphical Abstract



Measuring and improving customer retention at authorized automobile workshops after free services

Abstract: Customer retention is vital for businesses with much research literature now available. But nothing has been investigated regarding measuring and improving customer retention at authorised automobile workshops after free services. Even after providing extensive warranties and other free service benefits, customers don't use authorised workshops although their vehicles are still under warranty. By not arranging regular maintenance services, customers lose warranty benefits, with product performance and safety related awareness undermined; companies lose huge business potential. Therefore, this study aims to measure and improve customer retention at authorized automobile workshops after free services. To achieve this, a four-phased study has been conducted. In phase one, a combination of a literature review and expert opinions is used to identify customers' retention factors. The second and third phases describe how data is collected from industry experts and customers. Analytical Hierarchy Process (AHP) and Decision Making Trial & Evaluation Laboratory (DEMATEL) are used to prioritise and examine inter-relationships among factors. In the last phase, the study recommends three business strategies to help a company to improve customer retention and make their Annual Maintenance Contract (AMC) product more customer friendly.

Keywords: Customer retention; Preventive maintenance services; AHP, DEMATEL; Annual Maintenance Contract (AMC); Warranty benefits.

1. Introduction

To be successful in today's competitive world, companies are striving to provide excellent service to customers so that they are retained and become loyal (Kaura et al., 2015; Su et al., 2016; Kumar and Dash, 2017b). Customers will become loyal only when they feel satisfied with the experience of the company's products/services (Chiu et al., 2016; Padilla et al., 2017). This study is an attempt to measure the customer experience at authorised automobile workshops. After buying a company product, customers have to visit authorised automobile workshops for preventive maintenance services. For an automobile product, preventive maintenance services play an important role in maximising performance by ensuring cleanliness of various filters, replacement of consumable oil and adjustment of mechanical parts if necessary (Sabharwal et al., 2010; Bouguerra et al., 2012; Mashhadi et al., 2016).

Preventive maintenance helps in reducing failure during the normal life of equipment (Mashhadi et al., 2016). Service providers aim to give their best and are keen to monitor customer expectations (Kassim et al., 2016; Padilla et al., 2017; Chiu et al., 2016; Li et al., 2017). But after conducting a sample survey with automobile company employees, our research team learned that this particular company retained 84% consumers during the first year of the Free Service Coupon (FSC) period, dropping to 29% in the second year. Consumer retention further dropped to only 8% by the fifth year, which is considered as the average life cycle for two wheelers. Consumers are not keeping up proper preventive maintenance services for their product although vehicles are still under warranty. This will not only impact on customer satisfaction, loyalty and retention but also on product performance; this is directly related to company image and sales. This problem motivates us to conduct this study.

In order to provide a quality experience for consumers, customer retention at workshops is of vital importance (Rekik et al., 2016; Cui et al., 2017). A retained consumer not only helps companies in promoting new products but can also promote workshop services by word of mouth (Haverila, 2011; Wang and Tzeng, 2012; Nilashi and Ibrahim, 2014). It is accepted that a happy customer attracts many new customers, whereas an unhappy customer deters at least ten prospective customers (Liu et al., 2013; Khatwani et al., 2014; Khatwani et al., 2014; Chiang, 2016). Hence it is important for every company to ensure timely servicing of vehicles for satisfactory performance of the product (Cherubini et al., 2015; Levesque and Boeck, 2017). Most companies provide free services during vehicle sales so that vehicles are maintained with the utmost care by trained technicians at authorised workshops. Free services help in reducing the cost of ownership initially and also help in creating awareness of preventive maintenance (Geraldine, 2013; Su et al., 2016; Padilla et al., 2017). After the free service period, consumers need to visit workshops regularly for further preventive maintenance services so that vehicles perform as per expectation (Cherubini et al., 2015; Cui et al., 2017). However, for various reasons, customers do not visit authorised workshops and instead, get their vehicles repaired at local garages (Wang et al., 2011; Heitz-Spahn, 2013; Paparoidamis et al., 2015). A vehicle can be damaged due to unskilled staff, non-genuine parts or lack of specialised tools at these garages. For these reasons, customer satisfaction can decrease towards the product itself, directly impacting on company image and sales (Yuen and Chan, 2010; Amin and Nasharuddin, 2013; Paparoidamis et al., 2015). Therefore, it is important for automobile companies to find out the customer retention factors associated with authorised workshops where customers come to get preventive maintenance services of

their vehicle. Much research literature is available regarding customer retention ([Wang and Tzeng, 2012](#); [Liu et al., 2013](#); [Khatwani et al., 2014](#); [Chiang, 2016](#); [Rekik et al., 2016](#); [Kumar and Dash, 2017](#)), but no work has been done related to measuring and improving customer retention at authorized automobile workshops after free services. This study is an attempt to fill this literature gap. The objectives of the study are firstly, to identify the most important customer retention associated factors and measure their importance; secondly, to develop cause-effect relationships among the factors so that analysis can help service providers to take better decisions when implementing marketing strategy.

The methodology used to find the most important factor for customer retention at authorized automobile workshops after free services is also important; it must be able to deal with this complex situation in decision making for implicating any marketing strategy. Identifying the major factors for customer retention is not only of paramount importance for an automobile company but also important for customers, so that they get a better experience from service providers. Thus it is necessary to determine the importance of the conditions and also to continuously address the flaws by providing a better overall service. AHP and DEMATEL have the capabilities not only to determine the importance of the factors, but also to build the cause-effect relationships within the factors ([Wang and Tzeng, 2012](#); [Chiang, 2016](#); [Kumar and Dash, 2017b](#)). Evaluation through these multi-criteria models provides an opportunity for service providers to improve their results on a regular basis ([Wang and Tzeng, 2012](#)). Weights of parameters are determined through Analytic Hierarchy Process (AHP) ([Saaty, 2008](#)) but AHP is not able to find contextual relationships within the parameters ([Wu and Tsai, 2012](#)). It considers all factors as independent and does not fulfil the objective of the study; to understand the contextual relationships within the factors is also important so that actions for improvement can be identified from cause-effect viewpoints ([Wu and Tsai, 2012](#); [Kumar and Dash, 2016c](#); [Hsu et al., 2017](#)). A DEMATEL method can generate causal diagrams to narrate the cause-effect relationships among the factors ([Hsu et al., 2017](#); [Kumar and Dash, 2017](#)). But no literature is available where the integrated approach of AHP and DEMATEL has been used in the context of customer retention at authorized automobile workshops after free services. Therefore, to fill this gap, the aim of this study is to develop deeper understanding of all customer retention parameters using AHP and DEMATEL. The study establishes clear factors which effect customer retention at authorized automobile workshops after free services. If these are implemented, the company will benefit. The motivation behind this study is to develop deeper understanding of factors associated with

customer retention by a literature review and expert discussion; it employs AHP and DEMATEL to determine the weights and cause-effect relationships of parameters.

The whole study has been divided into seven parts. The introduction is given in the first part. The second part of the study is related to the literature review. Solution methods are explained in the third part. The research framework of the study is given in the fourth part. Analysis is set out in the fifth part. Managerial implications and recommendations are suggested in the sixth part. Conclusions and future research directions are provided in the last part of the study.

2. Literature Review

This section presents the literature related to customer retention and its prediction methods, identifying the factors related to customer retention. In the first section, literature of customer retention and its prediction methods are given with related studies presented in tabulated form. In the second section, problems associated with the study are discussed; the process of factor identification and their relevance are also given.

2.1 Customer retention and its prediction methods

For prediction of future behaviour, customer retention is a strong indicator of behaviour intention with a plethora of research findings available in current literature (Lam and Hsu, 2006; Park et al., 2006; Haverila, 2011; Wang and Tzeng, 2012; Liu et al., 2013; Nilashi and Ibrahim; 2014; Khatwani et al., 2014; Chiang, 2016; Rekik et al., 2016; Kumar and Dash, 2017; Cui et al., 2017). Multi Criteria Decision Making (MCDM) methods are used to predict customer retention in different fields (Wei et al., 2010; Zolfani et al., 2012; Zolfani et al., 2013). In existing literature, these methods have been widely employed because of their inherent capabilities and potential to handle various criteria to select the best alternative(s) (Park et al., 2006; Wei et al., 2010; Khatwani et al., 2014; Aghdaie and Alimardani, 2015; Kumar and Dash, 2016c). The unique feature of these methods is that if we have a different unit of measurement for our selected criteria, we can deal with those criteria (Gal et al., 2013; Aghdaie and Tafreshi, 2017). Another potential capability of MCDM methods analysis is that more conflicting criteria, even with the presence of multiple non-commensurable items, can be managed and handled easily. The analysis of working concurrently with different alternatives is also possible with these methods (Gal et al., 2013; Zavadskas et al., 2016; Aghdaie and Tafreshi, 2017; Tamošaitienė et al., 2017). Table 1 shows the related list of conducted studies by different authors, their application area and MCDM methods used.

Table 1. AHP-DEMATEL and hybrid studies on customer retention

Authors	Application area	Used methods
Park et al. (2006)	Airline service quality and passengers' future behaviour retention	Hybrid MCDM
Wang and Tzeng (2012)	Brand marketing for creating brand value	DEMATEL, ANP, VIKOR
Haverila (2011)	To select the feature of mobile and repurchase retention	Hybrid
Nilashi and Ibrahim (2014)	Purchasing intentions business to consumer	Hybrid
Liu et al. (2013)	How improving services in metro-airports can help tourism development	Hybrid
Chiu et al. (2013)	Prediction of consumers' repurchase intention for improving e-store business	DEMATEL, ANP, VIKOR
de Dienes Alicia (2011)	Functional food products and consumer repurchase retention	AHP and Choice Based Conjoint
Huang et al. (2012)	Identifying influencing factors for smart phone operation systems	DEMATEL and SEM
Hu et al. (2014)	Exploring smart phone improvements and customers' repurchase retention	Hybrid
Khatwani et al. (2014)	Evaluating internet information search channels	Hybrid
Anand et al. (2015)	Comparative analysis about intention among gender	Hybrid
Khatwani and Das (2016)	Understanding information given by internet channels	Hybrid
Maymand et al. (2017)	Factors effecting shopping behaviour of foreign tourists	Hybrid
Lin et al. (2016)	E-service quality performance and e-store	VIKOR
Chiang (2016)	Fair trade products purchase	AHP
Yogi (2015)	Measuring the customers' intention about quality	Fuzzy Logic
Rekik et al. (2016)	Assessing e-commerce web sites ranking	Fuzzy ANP
Kumar and Dash (2017a)	Measuring and evaluating e-malls on their technical and web dimensions	Fuzzy Delphi, Fuzzy TOPSIS
Kumar et al. (2017a)	Comprehensive evaluation of internet shopping malls	AHP, TOPSIS
Kumar and Dash (2017b)	Measuring repurchase intention of online consumers	Fuzzy Delphi and DEMATEL
Kumar and Dash (2016c)	Consumer decision-making in e-marketplace	DEMATEL
Tajadod et al. (2016)	Maintenance strategy selection and retention	Hybrid
Bouguerra et al. (2012)	How customers accept different maintenance policies	Hybrid
Cui et al. (2017)	Selecting a remanufacturing quality strategy based on consumer preferences	Hybrid
Kassim et al. (2016)	Consumer behaviour towards safer car purchasing decisions	Hybrid
Padilla et al. (2017)	Service value on repurchase intentions in business-to-business	Hybrid
Chiu et al. (2016)	Tourists' expectations on purchase	Hybrid
Li et al. (2017)	Evaluation of in-flight service quality	Fuzzy AHP

Table 1 shows that numerous researchers used various MCDM methods such as AHP, ANP, DEMATEL, VIKOR and hybrid methods to predict customer retention in different fields. But in existing literature, no research has been conducted related to measuring and improving customer retention at authorized automobile workshops after free services where MCDM methods are used.

2.2 Problem statement and factors

If a customer is retained at a workshop station after free services, then they can get proper preventive maintenance services for their products. This will impact on their satisfaction with products and the probability of becoming loyal is increased. Therefore, every automobile company is trying hard to give excellent service to the customer so that they can be retained at workshops even after free services. This study is focused on a giant automobile company, one of the largest two-wheeler manufacturers in India. The case company has over 6000 service networks in the country and is known for having the best service facilities in the country. The case company has state of the art facilities, consumer centred processes and is recognised as a provider of quality care to all stake holders such as consumers, dealers, employees and society in general. The company has sold millions of two wheelers on the market but consumer retention in workshops is comparatively low beyond the FSC period. Thus the company is losing lots of service business opportunities. Since product usage life is in general reducing due to changes in taste and the availability of new featured products, consumer retention plays an important role in generating product self-referral sales. As consumers move away from authorized workshops post FSC period, their chances of buying products in the future also drop. The case company intends to improve their business efficiency through higher consumer retention in workshops for service and repair; they also aim to increase product referrals sales by providing creative positive consumer experiences with their products. The company is facing fierce competition in the market, so keeping existing customers in its fold is one of the key priorities for management.

The company has identified a problem - after taking free services, customers are not visiting authorized workshops; they are not arranging proper preventive maintenance services for their products. Because of this, the company is losing not only revenue but also the chance to encourage customer loyalty. Companies are conscious of this problem and want to know what the important factors are; they want to know what impacts on customer retention at

workshops. Related to this, we had a discussion with a company employee who has extensive experience in the area of customer interface and service quality. The following factors related to customer retention have been selected and the citation of each is mentioned in Table 2.

2.2.1 Proximity of service centre (F_1)

In today's busy life, everyone wants service at their doorstep or nearby (Heitz-Spahn, 2013). Distance of service station from home or workplace plays an important role in customer retention (Saccani et al., 2007). Traffic jams are common nowadays in most towns; hence customers avoid going to places which are far off and in built up areas. Customers may be better motivated if they get service nearby; therefore proximity of a service centre may effect utilization as longer distances imply more difficult journeys (Knoben and Oerlemans, 2006). It is important for every service industry to be accessible to consumers (Levesque and Boeck, 2017). Companies who have good network coverage enjoy the trust and confidence of consumers (Byrne, 2015). Hence proximity of the service centre plays a very important role to ensure customer retention at workshop stations. By accounting for proximity in a marketing concept, companies can enhance their service and experience with customers (Levesque and Boeck, 2017). Therefore, proximity is an important factor towards customer satisfaction and cost advantage for the service provider (Cherubini et al., 2015).

2.2.2 Time taken in servicing (F_2)

In today's competitive business environment, time factor is important for everyone (Idrees and Xinping, 2017). Customers are becoming more time conscious with little time to waste. Although actual servicing of a two wheeler takes around one hour, due to the long wait in a queue, it takes at least a half day for a regular service. If a waiting time for servicing is regarded as too long, many customers are not retained (Heitz-Spahn, 2013). Quality of the service experience depends on the time taken in providing that service (Wang et al., 2011). Customers now want immediate services; therefore, tatkal or express services are becoming more and more popular these days. Speed of service along with proximity play important roles in customer retention (Heitz-Spahn, 2013). Even with service failure, a consumer wants a timely response on any problems; this helps customer retention (Paparoidamis et al., 2015). Hence, workshops that have good marketing concepts such as service appointments or an express service facility enjoy high customer retention, even if they charge additional money for such services (Van Birgelen et al., 2002; Idrees and Xinping, 2017).

2.2.3 Low customer awareness of warranty benefits (F_3)

Some automobile companies provide great benefits such as six free services and up to five years' warranty with a product. Most customers, even while purchasing products, are in a hurry and don't want to be educated or have tips on maintenance of their product. Warranty provides peace of mind to a consumer so that they can enjoy good performance of the product without worry (Bouguerra et al., 2012). Warranty awareness plays an important role in successfully establishing a brand and providing customer retention (Severi and Ling, 2013). Awareness of warranty schemes is lacking; many customers don't even go through the owner's manual supplied by the company (Maronick, 2007). Such customers are not aware of various benefits associated with the product; hence they don't continue services beyond the free service. It is important to educate customers on warranty and free service benefits during their visits to the showroom and workshop so that they are retained for a longer period of time and their vehicle performs in a satisfactory manner (Albaum and Wiley, 2010). On the other hand, low customer awareness on warranty affects customer satisfaction level (Sabharwal et al., 2010).

2.2.4 High cost of repair (F_4)

Cost of repair is a factor which is directly related to price consciousness (Mashhadi et al., 2016). Generally, a price conscious customer starts to compare service charges of an authorised service station with local garages without thinking about service standards or manpower norm (Mashhadi et al., 2016). Although an authorised service centre provides a quality service through appropriate usage of tools and equipment with a reasonable overall cost of repair, customers feel that their charges are too high. Many customers do not understand the background, going for quick solutions with low cost. This is one reason why customers switch and do not return to an authorised service centre after enjoying free services (Blut, et al., 2014). Therefore, cost of repair is a very significant factor for customer retention (Lockett et al., 2011; Sabbaghi et al., 2015).

2.2.5 Service quality/personalised attention (F_5)

A high quality of service and personalised attention paid to the customer are now essential at workshops to meet customer expectations (Amin and Nasharuddin, 2013; Su et al., 2016; Padilla et al., 2017). Whenever a customer reports to a workshop with a problem, his first priority is to get the problem resolved. If their problem is not resolved or the problem is not resolved to their satisfaction, they feel annoyed. In a service industry, service quality is a

differentiating factor in service loyalty (Edward and Sahadev, 2011; Su et al., 2016). Customers also want proper attention and a positive experience during a visit. Customers are becoming more dynamic and demanding; hence personalised attention helps in retaining customers at a service station. Customer retention largely depends on the quality perception of a brand (Shanka, 2012). Relational quality has a significant impact on recommendation of a service to others as well as retention (Yuen and Chan, 2010; Kaura et al., 2015; Su et al., 2016).

2.2.6 Workshop timing (F_6)

Service time matching is one of the problems these days for customers. Most educated persons are employed and go to their jobs during day time. When they return in the evening from their work place, they may not find any workstations open. Because of this time matching problem they opt for a local garage. Therefore, it is important that workshop timing is adjustable for such customers so that they can avail services as per their work convenience. Customer satisfaction is largely impacted by timing of service operations (Srivastava and Sharma, 2013; Parmenter, 2015). A workshop whose timing is flexible retains more customers as it enables a range of customer bases to access services. Service timing and duration play important roles in the service industry (Yeoh and Chan, 2011; Wu, 2013). Customers should not have to take leave from work to use services. Many workshops now provide a pick-up and drop-off facility, helping customers to avail services on time.

2.2.7 Availability of local technicians at doorstep (F_7)

Proximity of a service centre plays an important role in customer retention. Similarly if local technicians are available on the doorstep, a customer finds it convenient and cheap to avail services at these shops. Availability of local expertise is important and directly challenges big brands. In many instances such technicians are ex-authorized workshop technicians; hence customers find them trustworthy. Therefore we need to ensure that authorized services reach out to more customers and that service centres are available in new areas so that customers do not need to go to local technicians (Seiders et al., 2002). Availability of a doorstep service plays an important role in product competitiveness (Kumar et al., 2011; Kaura et al., 2015).

2.2.8 Careless attitude (F_8)

Many customers are very casual and do not have a disciplined attitude. They can be short of time and money and do not access services as arranged in spite of close proximity. Customers with a careless attitude cannot develop a working relationship due to negative feelings (Yao and Khong, 2012). Many such customers do not recognise any difference between an authorised workshop and local technicians; therefore they do not come to the workshop on time. This is one of the factors for low customer retention at workshops (Déjus and Antuchevičienė, 2013).

Based on the above review, the citations of each factor are summarized in Table 2 with support references as the foundation for AHP and DEMATEL.

Table 2. Customer retention factor and their citation

Factors	Support References
Proximity of service centre (F ₁)	Miciak and Desmarais (2001); Knobens and Oerlemans (2006); Saccani et al. (2007); Libai et al. (2010); Heitz-Spahn (2013); Cherubini et al. (2015); Byrne, (2015); Levesque and Boeck (2017)
Time taken in servicing (F ₂)	Van Birgelen et al. (2002); Wang et al. (2011); Heitz-Spahn (2013); Kaura et al. (2015); Paparoidamis et al. (2015); Idrees and Xinping (2017)
Low customer awareness of warranty benefits (F ₃)	Dommeyer and Gross (2003); Maronick (2007); Albaum and Wiley (2010); Sabharwal et al. (2010); Bouguerra et al. (2012); Severi and Leing (2013)
High cost of repair (F ₄)	Lockett et al. (2011); Blut, et al. (2014); Kaura et al. (2015); Mashhadi et al. (2015); Mashhadi et al. (2016)
Service quality and personalized attention (F ₅)	Yuen and Chan (2010); Edward and Sahadev (2011); Shanka (2012); Geraldine (2013); Amin and Nasharuddin (2013); Murali et al. (2016); Nyadzayo and Khajehzadeh (2016); Su et al. (2016); Díaz (2017); Padilla et al. (2017)
Workshop timing (F ₆)	Yeoh and Chan (2011); Srivastava and Sharma (2013); Wu (2013); Parmenter (2015)
Availability of local technician at doorstep (F ₇)	Seiders et al. (2002); Kumar et al. (2011); Kaura et al. (2015); Padilla et al. (2017)
Careless attitude (F ₈)	Yao and Khong (2012); Déjus and Antuchevičienė (2013); Awa et al. (2016); Su et al. (2016); Padilla et al. (2017)

3 Solution Methods

The objective of the study is to measure and improve the customers' retention at authorised workshops. To measure the importance of customers' retention factors, it is necessary to find the factors' ranks and the inter-relationship among them (Mangla et al., 2016). Therefore, to

evaluate the associated factor of customer retention, AHP was employed to prioritise factors with DEMATEL used to find the inter-relationship among the factors.

3.1 AHP method

For handling multi-criteria at the same time, AHP is a powerful tool (Saaty, 1980; Saaty, 2008). Suppose we have n criteria in our study, through AHP $n \times (n-1)/2$ mutual comparisons are possible (Saaty, 1980). The experts' preferences are obtained using scale 1-9 with comparison as shown in Eq.1.

$$A = (a_{ij}) = \begin{bmatrix} a_{11} & a_{12} & \cdot & \cdot & \cdot & a_{1n} \\ a_{21} & a_{22} & \cdot & \cdot & \cdot & a_{2n} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ a_{n1} & a_{n2} & \cdot & \cdot & \cdot & a_{nn} \end{bmatrix} = \begin{bmatrix} 1 & a_{12} & \cdot & \cdot & \cdot & a_{1n} \\ 1/a_{12} & a_{22} & \cdot & \cdot & \cdot & a_{2n} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & a_{n-1n} \\ 1/a_{1n} & 1/a_{2n} & \cdot & \cdot & 1/a_{n-1n} & 1 \end{bmatrix} \quad (1)$$

Where a_{ij} is the preference matrix for i and j . For calculating the weight for the criterion, Eq. 2 has been used.

$$Aw = \lambda_{max} w \quad (2)$$

Eq.3 and Eq.4 are used to check the reliability of the opinions of experts.

$$Consistency\ Index\ (CI) = \frac{\lambda_{max} - n}{n - 1} \quad (3)$$

$$Consistency\ Ratio\ (CR) = \frac{CI}{RI} \quad (4)$$

RI represents Random Index with n criteria given in Table 3.

Table 3. Random Index

n	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.45

If $CI \leq 0.1$, the consistency of the pairwise matrix is shown, then we can proceed to find the final weight; otherwise, revision of the experts' opinion is required.

3.2 DEMATEL method

DEMATEL is generally applied to building causal diagrams among the factors (Kumar and Dash, 2016). With the help of causal diagrams, we see the influence relationships among the

factors (Wu and Tsai, 2012; Hsu et al., 2017). The steps for conducting DEMATEL are given below:

Step 1: Experts submit their opinions on the basis of scale 0-4 (0 means 'no influence' and 4 means 'high influence') with average matrix calculated by Eq.5.

$$A = [a_{ij}] = \frac{1}{H} \sum_{k=1}^H x_{ij}^k, \text{ where } H \text{ is the number of experts for all } i \text{ and } j. \quad (5)$$

Step 2: Normalization by using Eq.6 and Eq.7

$$F = m \times A \quad (6)$$

$$\text{Where, } m = \min \left[\frac{1}{\max_i \sum_{j=1}^n a_{ij}}, \frac{1}{\max_j \sum_{i=1}^n a_{ij}} \right], i, j \in \{1, 2, \dots, n\} \quad (7)$$

Step 3: Total relation matrix (T) is calculated by Eq.8 and Eq.9.

$$T = \lim_{m \rightarrow \infty} (K + K^2 + \dots + K^m) = \sum_{m=1}^{\infty} K^m \quad (8)$$

$$T = K(I - K)^{-1} \quad (9)$$

r and c as mentioned in Eq.10 and Eq.11 represent the sum of rows and columns of the matrix.

$$r = [r_i]_{n \times 1} = \left[\sum_{j=1}^n t_{ij} \right]_{n \times 1} \quad (10)$$

$$c = [c_i]_{1 \times n} = \left[\sum_{i=1}^n t_{ij} \right]_{1 \times n} \quad (11)$$

Step 4: To avoid the minor effects, Eq.12 has been used.

$$\Omega = \frac{\sum_{i=1}^n \sum_{j=1}^n [t_{ij}]}{N} \quad (12)$$

Where N is number of elements in the matrix T .

4 Proposed Research Framework

The framework involves four phases. The most important factors related to customer retention are found through extensive literature review and expert discussion. Phase 2: prioritizing the factors by using the AHP method. Phase 3: analysing the causal interactions

among factors by using the DEMATEL method. Managerial implications and conclusion along with future research directions are suggested in phase 4. All phases for this study are shown in Fig.1 as a form of research framework.

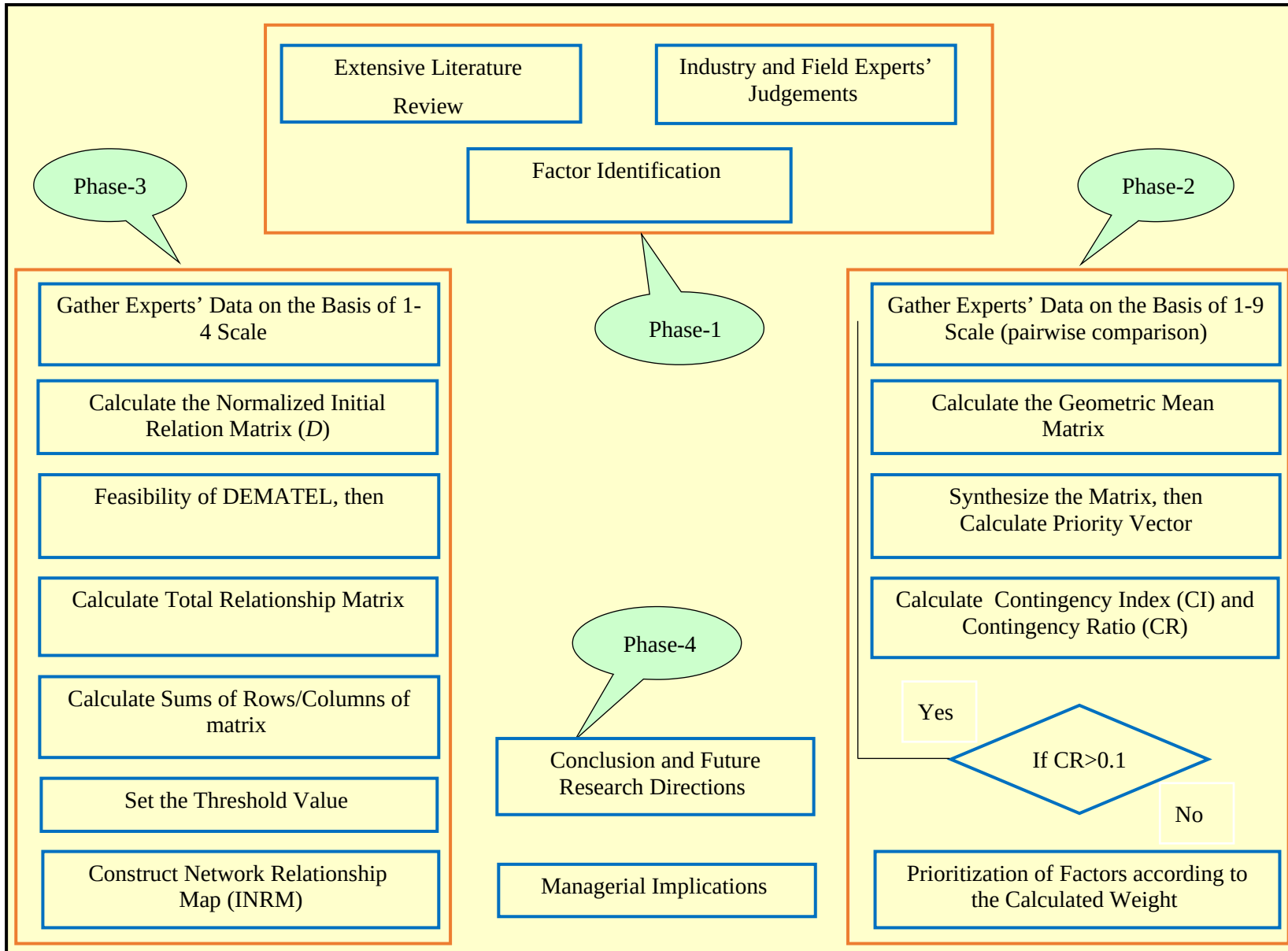


Fig. 1. Four phased research framework

5 Data Collection

After finalizing customer retention factors through an extensive literature review and expert discussion, the questionnaire was developed. A rigorous process has been followed to collect data from industry experts and customers by using convenience sampling. Group size affects the efficiency of group decision-making (Anderson et al., 2001); 5-20 experts should participate in the validation. Accordingly, the size of a decision-making group should not be too large; it should be roughly 5-50 (Gumus 2009). For an effective evaluation for this study, ten experts from different authorised workstations were selected; all have a minimum of seven years' experience at a minimum of 5 workshops. All are also purchasers of products in the last six years. They have used services in the last five years, with three visits in a year at a workstation. The details of experts are depicted in Table 4.

Table 4. Industry experts' profile

Expert	Education	Experience (Years)	Department
1	B. Tech, PGDIT	16	Customer Interface
2	MBA	07	Sales Learning
3	B. Tech	09	Spare Parts
4	B. Tech	09	Field Service Support
5	Graduate	18	Dealer Development
6	B. E, MBA	14	Service Planning
7	B. E. PDGM	11	Service Planning
8	DME, AME, PGDM	26	Field Service Support
9	B. Tech	07	Customer Interface
10	B. Tech, MBA	08	Sales Learning

To make our results robust and to validate the outcome of experts' data, the research team decided to collect customer data from the zone-wise workstations. In total, twenty five customers were invited to participate; the selection criteria and zone-wise details of respondents are shown in Table 5.

Table 5. Zone-wise customer data

Zone	Respondents		Selection Criteria
Zone 1	Male	8	In order to capture a range of opinions, the researchers decided to collect data from customers. Therefore the customers are selected from workshops having low free service redemption ratio. Two workshops in each region of India are selected <i>i.e.</i> East, West,
	Female	2	
Zone 2	Male	8	
	Female	2	

Zone 3	Male	3	North, South and Central Regions. Consumers randomly selected have availed at least 2 free services and visited a workshop for their 3 rd service. This has helped to understand consumer behaviour aspects which are driving the retention drop in workshops.
	Female	1	
Zone 4	Male	3	
	Female	-	
Zone 5	Male	3	
	Female	-	

6 Analysis and Discussions

6.1 Determining the relative importance of factors using AHP

Through AHP, we can determine the relative importance of the factors. The hierarchical structure of a problem based on an AHP perspective is provided in Fig. 2.

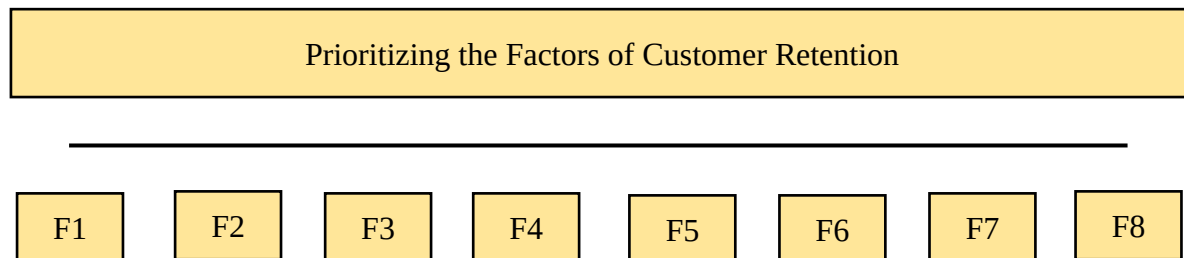


Fig. 2. The hierarchical structure of a problem based on AHP perspective

The data has been collected from experts and customers as mentioned in Section 3.1 with pair-wise evaluation matrix being used for the same. The final rank of the factors is found after using the geometric mean of individual opinions (Saaty, 2008). AHP steps mentioned in section 3.1 are followed to calculate Eigen values and Eigen vectors for both data sets; these are 8.551 and 8.276 with Consistency Index (*C.I.*) = 0.079 and 0.039. The relative weight and corresponding rank for the factor are shown in Table 6.

Table 6. Weight of each factor

Factors	Industry Experts		Customers	
	Weight	Rank	Weight	Rank
Proximity of service centre (F_1)	10 %	4	09%	5
Time taken in servicing (F_2)	11%	3	20%	2
Low customer awareness of warranty benefits (F_3)	09%	5	09%	5
High cost of repair (F_4)	17%	2	10%	4
Service quality and personalized attention (F_5)	27%	1	24%	1
Workshop timing (F_6)	10%	4	15%	3
Availability of local technician at doorstep (F_7)	10%	4	06%	7
Careless attitude (F_8)	06%	6	07%	6

The consistency ratio (*C.R.*) is calculated, giving values of 0.056 and 0.028 (*C.R.* = 0.079/1.41 and 0.039/1.41); these are ≤ 0.10 and considered to be acceptable. Based on Table 5, service quality and personalized attention (F_5) is the most important factor with experts' weight 27% and customers' weight 24%. The importance of all eight factors can be prioritized. According to the experts: Service Quality and Personalized Attention (F_5) > High Cost of Repair (F_4) > Time Taken in Servicing (F_2) > Workshop Timing (F_6), Availability of Local Technician at Doorstep (F_7) > Low Customer Awareness of Warranty Benefits (F_3) > Careless Attitude (F_8). According to customers: Service Quality and Personalized Attention (F_5) > Time Taken in Servicing (F_2) > Workshop Timing (F_6) > High Cost of Repair (F_4) > Low Customer Awareness of Warranty Benefits (F_3) > Careless Attitude (F_8) > Availability of Local Technician at Doorstep (F_7). The graphical representation of weight is given in Fig. 3.

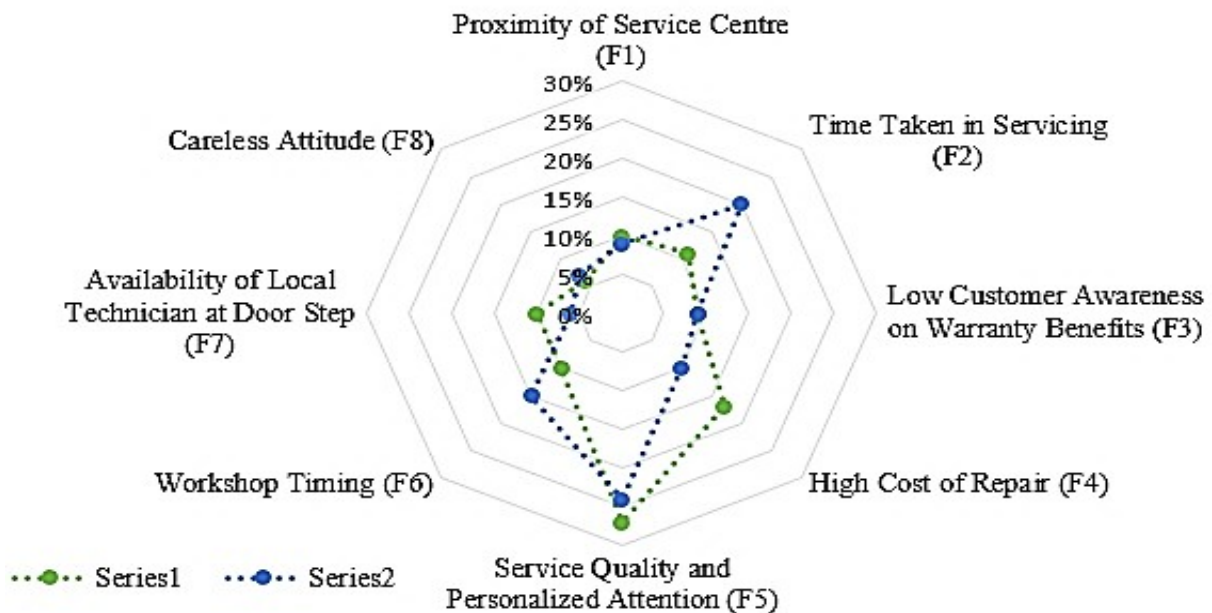


Fig. 3. Rank comparison

6.2 Spearman's rho correlation coefficient (*R*)

The results of the experts are compared with customers' opinions to check the accuracy of the experts' results. The rank of experts is based on their industry knowledge and expertise with customers' rank based on their experience during their workshop visit. Therefore, obtained ranks can be different. Because of this, management can face problems in taking the final decision in implementing any marketing strategy. *R* is a useful and important measure to establish the level of relationship and to check the reliability between ranks obtained by experts' and customers' opinions (Raju and Kumar, 1999). With the help of this method we

can test H_0 . The similarity between two rankings is calculated using Eq. (13) compared with a pre-determined level of significance (α) value.

$$r_s = 1 - \left[\frac{6 \cdot \sum_{j=1}^K (d_j)^2}{K \cdot (K^2 - 1)} \right]$$

(13)

Where j and K are the number of alternatives; d_j is the difference between ranks obtained through two different data sets. The p-value approach is utilized to accept and reject the null hypothesis; it shows that $p < .05$. Therefore the null hypothesis is rejected and it is to be concluded that H_1 stands. There is similarity between two rankings with 0.736 calculated as the Spearman's rank correlation (R) value.

6.3 Determining inter-dependence among factors using DEMATEL

To determine inter-dependence among factors, the DEMATEL method is employed. The influence evaluation matrix for the factors is built by using the experts' and customers' opinions. The scale as mentioned in Section 3.2 is used to collect data and follow all the steps for DEMATEL; $r-c$ and $r+c$ values are calculated as depicted in Table 7.

Table 7. Impact of each factor

Factors	Industry Experts		Customers	
	$r_i - c_j$	impact	$r_i - c_j$	impact
Proximity of service centre (F_1)	-0.54	effect	-1.15	effect
Time taken in servicing (F_2)	1.20	cause	0.41	cause
Low customer awareness of warranty benefits (F_3)	1.09	cause	-0.11	effect
High cost of repair (F_4)	-0.51	effect	-0.02	effect
Service quality and personalized attention (F_5)	1.09	cause	0.38	cause
Workshop timing (F_6)	0.22	cause	0.07	cause
Availability of local technician at doorstep (F_7)	-0.90	effect	-0.14	effect
Careless attitude (F_8)	-0.63	effect	0.56	cause

r and c values are calculated by using Eq.10 and Eq.11. The impact (effect/cause) relationship among the factors, $r-c$, has been measured as shown in Table 7. If a factor has $r-c$ positive value that means that this is a cause factor and an influence on other factors. But if a factor has $r-c$ negative value that means that this factor is an effect factor and is influenced by other factors. All eight factors have been divided into two groups *i.e.* (i) Cause group and (ii) Effect group with the help of $r-c$ values. When ($r-c$) has a positive value, *i.e.* a net cause, these factors are categorised as the cause group and directly affect the others.

The factors with high values are considered to have the highest direct impact on the other factors. The analysis of this study shows that time taken in servicing, service quality and personalized attention, workshop timing and low customer awareness on warranty benefits are all cause factors according to the industry experts' opinions with values of $r-c$ of 1.20, 1.09, 1.09 and 0.22. From the customers' points of view, time taken in servicing, service quality and personalized attention, workshop timing and careless attitude make up the cause group with 0.41, 0.38, 0.07 and 0.56 $r-c$ values. When ($r-c$) has a negative value, it is a net receiver and all net receiver factors are in the effect group and are affected by the others. The analysis shows that proximity of service centre, high cost of repair, availability of local technician at doorstep and careless attitude are in the effect group having ($r-c$) values of -0.54, -0.51, -1.91 and -1.63. These results are according to the industry experts' opinions. But proximity of service centre, low customer awareness of warranty benefits (F_3), high cost of repair and availability of local technician at doorstep with -1.15, -0.11, -0.02, -0.14 $r-c$ values are the cause group according to customers' opinions.

To avoid some negligible effects, a threshold value is computed by using Eq.12 with values greater than α (1.186, industry experts' data and 1.501, customers' data set) identified from matrix T . INRM has been constructed as shown in Fig. 4 and Fig. 5 (see Table 8 and Table 9).

[Fig. 4 about here]

[Fig. 5 about here]

[Table 8 about here]

[Table 9 about here]

6.4 Managerial Implications and Recommendations

Every manufacturing company would hope that customers come to their authorised workshops to take preventive maintenance services on time. When all preventive maintenance services are carried out in a timely fashion, the actual performance of their product can be measured; this will impact on customer intention and trust.

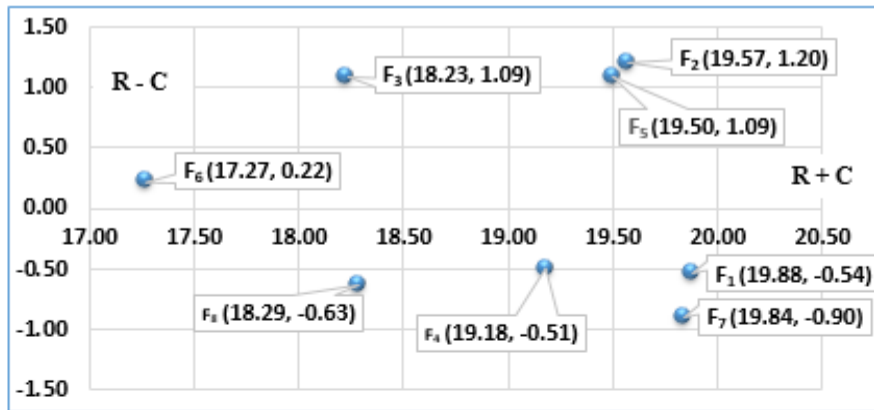


Fig. 4. Industry experts' opinions: cause-effect mapping

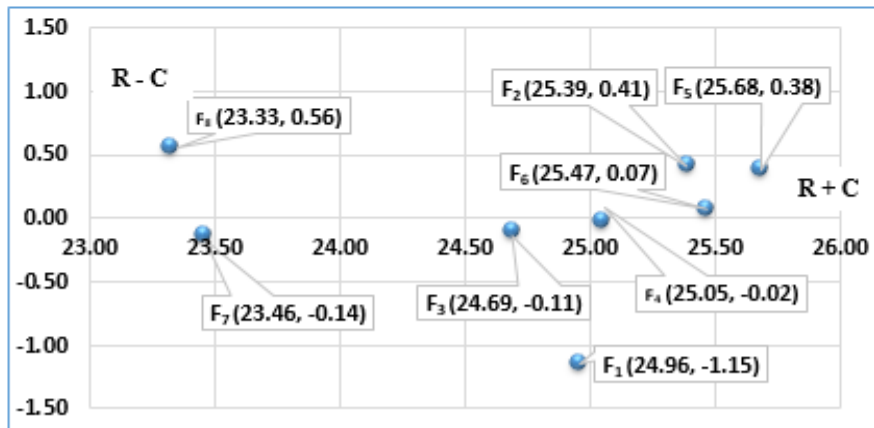


Fig. 5. Customers' opinions: cause-effect mapping

Table 8. Industry experts' cause factor: influence to factors

Cause Factors	Influence to the Factors
Time taken in servicing (F ₂)	1, 4, 5, 6, 7, 8
Low customer awareness of warranty benefits (F ₃)	1, 4, 5, 6, 7, 8
Service quality and personalized attention (F ₅)	4, 7
Workshop timing (F ₆)	5, 7

Table 9. Customers' cause factor: influence to factors

Cause Factors	Influence to the Factors
Time taken in servicing (F ₂)	1, 2, 3, 4, 5, 6, 7, 8
Service quality & personalized attention (F ₅)	1, 2, 3, 4, 5, 6, 7, 8
Workshop timing (F ₆)	1, 2, 3, 4, 5, 6, 8
Careless attitude (F ₈)	1, 2, 3, 4, 5, 6, 8

If the customer is not retained after taking free services, this can directly impact on company sales and reputation. XYZ manufacturing wants to identify desired features in the Annual Maintenance Contract (AMC) so that the company continues to improve its customer base market through innovative consumer solutions. It is hoped that customers continue to use their services in the long term. Outcomes of this study will help the company to add some lucrative services into the AMC so that the customer will continue to arrange preventive maintenance services even after free services. This study is an attempt to find out the major factors which influence customer retention.

The study analysis can help companies to design more innovative value added products and service options for building a long term relationship with customers. The findings of this study can help companies to devise strategies to improve processes towards customer retention, accessing spare parts and service potential. This analysis is based on the collected data from industry experts and customers. From these results three strategies for improving customer retention at their authorised workshops after free services are recommended in Table 10.

Table 10. Strategies for improving customer retention at authorised workshops

Factor	AHP/DEMATEL analysis		Strategy for implication
	Industry/Customers Experts	Industry/Customers Experts	
	(weight, rank, impact)	influence to factors	
Time taken in servicing (F ₂)	(11%, 3, cause); (20%, 2, cause)	(1, 4, 5, 6, 7, 8; 1, 2, 3, 4, 5, 6, 7, 8)	Strategy 1
Service quality and personalized attention (F ₅)	(27%, 1, cause); (24%, 1, cause)	(1, 4, 5, 6, 7, 8; 1, 2, 3, 4, 5, 6, 7, 8)	
Workshop timing (F ₆)	(10%, 4, cause); (15%, 3, cause)	(5,7;1, 2, 3, 4, 5, 6, 8)	Strategy 2
Low customer awareness of warranty benefits (F ₃)	(09%, 5, cause); (09%, 5, effect)	(1, 4, 5, 6, 7, 8)	Strategy 3
Careless attitude (F ₈)	(06%, 6, effect); (07%, 6, cause)	(1, 2, 3, 4, 5, 6, 8)	

Strategy 1: This strategy is the most recommended. In AMC, the company must give priority to time taken in servicing, providing a quality service and personalized attention. After using analysis models *i.e.* AHP and DEMATEL for data sets (*i.e.* industry and customers), the factor service quality and personalized attention is ranked 1 in the cause group; this means that customers are much more conscious about service quality provided at workshop stations with this factor directly influencing almost all other associated factors. When they arrive at

workshops, customers want personal attention; they want to feel comfortable within the environment and are prepared to spend time at the workshop. If customers do this, they can see the new value added services of the company, and may even ask about other aspects as well. The opinions of industry experts are in agreement on this factor (rank 1 and cause group). The second factor in this category is time taken in servicing. This illustrates that customers are very much conscious about time. When they reach the workshop, they hope that the service man will service their vehicle first. The company must consider some value added features in their AMC regarding this factor so that customers feel happy and can be retained. As per the study analysis, this factor is in the cause group with a rank 2/3.

Strategy 2: The second recommended strategy is the workshop timing factor from the group of strategy 1 factors. In today's busy life style, customers want flexibility in workshop timing so that whenever they have time to get their service, they can. The company must think about how to manage their authorised workshops' timing and try to give more time flexibility to their customers. This factor shows time consciousness of the customer. We note that the time factor comes in both strategies *i.e.* time taken for services and workshop timing. A company that focuses on a strategy related to customer time management will definitely impact on customers' retention at workshops after free services.

Strategy 3: Low customer awareness of warranty benefits and careless attitude are of equal rank (rank 5 and 6) according to AHP analysis from both data sets. But DEMATEL analysis shows that low customer awareness of warranty benefits is in the cause group as per industry experts while careless attitude is in the cause group as per customers' opinions. This factor relates to customer awareness and their careless attitude. Some service providers are providing lucrative warranty benefits to customers but customers are not aware of this and are not enjoying the benefits from it. Therefore, customer awareness schemes must be initiated by the company. These awareness schemes definitely can impact on customer retention and address careless attitude also. The study recommends a third strategy related to the awareness of customers and their attitude. Companies must think about how they can create more awareness of warranty benefits and how a positive attitude can be built in the customer base.

7 Conclusions and Future Research Directions

To increase customer retention at authorized workshops, continuous evaluation of the provision of services to customers must be put in place by companies. This also will give a

company some competitive advantages. The evaluation of customer behaviour associated with customer intention is significant due to the critical role it plays in designing the Annual Maintenance Contract (AMC). After getting their feedback and knowing their feelings, the company can make a more effective AMC product for customers with a view to increasing rates of retention. It is necessary for decision makers to acknowledge the effectiveness of AMC assessment factors prior to implementation. But in existing literature, no discussion is available where evaluation of customer retention has been measured related to their experience at authorized workshops after getting free services by using the hybrid model of the AHP and DEMATEL method. To fill this literature gap the four phased study framework is proposed to measure and improve customer retention.

In the first phase, the factors associated with customer retention at authorized workshops have been identified through an extensive literature review and experts' discussion. In the second phase, AHP method is used to find priority of the associated factors with respect to experts' and customers' data sets. The result shows that service quality and personalized attention is the most important factor followed by high cost of repair and time taken in servicing, according to industry experts. But from the customer's point of view, service quality and personalized attention are most important, followed by time taken in servicing and workshop timing.

In the third phase, a DEMATEL method is used to find the inter-relationships among the factors with the weight of parameters determined through AHP. But AHP is not able to identify contextual relationships within the parameters. The DEMATEL method has the capacity to generate causal diagrams to narrate the cause-effect relationships among the parameters. The DEMATEL analysis divides all factors into cause-effect groups. Time taken in servicing, service quality and personalized attention, workshop timing and low customer awareness of warranty benefits are cause factors according to industry experts. But customer opinions are that careless attitude is also a cause group factor, not low customer awareness of warranty benefits. On the basis of this study, in the last phase in managerial implications, we recommend three strategies to companies and suggest these for inclusion in their AMC product. This will definitely impact on customer retention at authorized workshops.

Every research has some limitations. The first limitation is that the study is based on a small

number of expert sample groups. Further research can be conducted with a larger sample for a more sophisticated evaluation analysis. Secondly, prioritization of factors has been carried out by AHP; other MCDM methods can be used for comparison analysis of the results. In the present research, all pair comparisons between the identified factors are made on the basis of the decisions taken by the experts' group. Experts were not randomly chosen. Opinions of the group may be biased. A different group of experts may have different views. In future research, AHP and DEMATEL methodologies may be mixed with fuzzy set theory or grey set theory to improve the exactitude of judgments; results obtained from these techniques may be compared with the present study's results. Future research can be conducted to explore the contextual relationships between the identified factors associated with customer retention at authorized workshops and their hierarchical levels by using other structural models. This may lead to better understanding of identified influential factors with respect to performance outcomes. Further research can be conducted by designing a hypothesis based on DEMATEL results and can be validated through Structural Equation Modelling (SEM).

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