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EVALUATING FACTORS AFFECTING INSURANCE CUSTOMERS LOYALTY USING FUZZY ANP AND FUZZY DEMATEL METHODS

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ABSTRACT

As competition in the market becomes more intense, meeting customer needs with an aim of satisfying customers' needs and creating loyalty in them is more crucial. In the present study was conducted with the aim of identifying and ranking the factors affecting the loyalty of insurance customers by multiple criterion decision-making method in uncertainty environment. The research population included insurance industry experts, especially experts of Tejarat-e No Insurance Company of Mazandaran Province and a number of experts in the field of customer loyalty and related areas of the study. Using convenient sampling method, they were included in two groups. The first group included 20 senior experts and managers for localizing of the model and due to subject specificity and limitation in recognition of experts. The second group included 6 experts. The method of this research is an analytic type of descriptive-survey study. In addition, it is considered as an applied study in terms of objective. The results of DEMATEL method showed that the factor of before and after sales service is the most influential factor and the criterion of customer trust is the mostly influenced factor. Moreover, fuzzy analytic network process show that customer trust factor is the most important criterion of customer loyalty in Tejarat-e No Insurance Company of Mazandaran Province, followed by the quality of service, customer satisfaction, communication factor and before and after sales service, respectively.

Keywords: Customer loyalty, Multiple criterion decision-making, Fuzzy DEMATEL, Fuzzy analytic network process, Ranking.

INTRODUCTION

Today's world is full of complexities that have caused many challenges for organizations in the field of growth and excellence and managers as planners, organizers and leaders of the human development are facing many challenges (Amiri et al., 2016). Therefore, in today's competitive and challenging environment, the most emphasis is on establishing sustainable and profitable relationships with customers. Traditional marketing in theory and practice has always focused on attracting new customers and increasing sales, but nowadays, this view has changed and marketers of the companies face new reality. Population composition in different communities has undergone significant changes. In addition, the speed of economic growth and development of countries is slow. The competitor companies' behavior is very complex and many industries are facing surplus capacity, so companies can no longer attract new customers as past. In such an environment, new marketing directs companies to retain existing customers with a lasting relationship in addition to strive to attract new customers (Panahi et al., 2014). Service industries

such as insurance and financial institutions have faced many challenges in recent years. The most important of these challenges has been to expand the scope of competition among them and to enhance the level of knowledge of customers. In this regard, one of the most important factors that companies should pay attention to it is loyalty and the impact of factors affecting loyalty (Bagheri Renani, 2015). In the current competitive market, one of the key factors in profitability and consequently the survival of companies is the return of the customers, as loyal customers increase profitability through increased long-term commitment and reduce costs of attracting new customers. Increased customer return leads to increased sales, reduced costs, accepting a rise in price, and verbal advices without cost to customers (Taghavi Fard et al., 2016). Loyal customers are considered verbal advertising and profitable and long-term investment for companies through their repurchase (Hansen et al, 2009). Researchers and marketing experts have recognized the importance of customer loyalty as a strategic goal in all service industries (Nyadzayo et al., 2016). Hence, the role of customer loyalty has become more evident with intensification of competition in the manufacturing and service sectors. Nowadays, marketing involves maintaining and enhancing customer satisfaction, paying attention to satisfaction and quality of product from the customer's point of view, and loyalty to the organization. For this reason, organizations strive to have loyal customers (Hyun et al., 2011). Many marketing researchers have examined customer loyalty and the fundamental concepts associated with it. In fact, loyalty is one of the key elements of an organization's success. Loyalty means the intention of a customer to have a continuous relationship with a product or service (Han et al., 2008). Castro et al. (2004) argue that loyalty is resulting from belief in quality, psychological decision-making (behavioral destinations), and positive attitudes. Employees' abilities and attitudes along with the equipment and supports that they have for service provision are the basis of customer loyalty (Khayat et al., 2015). The most complete definition of loyalty has been presented by Oliver. He defines loyalty as having a deep commitment to repurchase a product or service (Kang and James, 2004). Customer loyalty remains constant through measures such as continuous purchases and regular support of different products and services offered, word of mouth advertising and safety from promotional activities of competitors (Huang et al., 2011). Factors affecting customer loyalty are very diverse (Taghavi Fard et al., 2016). Today's economic, industrial, social, and cultural conditions of Iran require new and different solutions to solve the problems and bottlenecks. Moreover, given the special status of the insurance industry as one of the most important sources for supporting economic resources and generating economic revenues, research in its various processes has high priority and importance in enhancing the loyalty of the clients of the organization. Therefore, the need to identify and prioritize the factors affecting customer loyalty in the insurance industry, especially Tejarat-e No insurance company as well as marketing management concepts to develop and improve the loyalty of the organization's clients reflect the importance of identifying and prioritizing the factors influencing customer loyalty in this industry. However, limited efforts have been made to identify factors affecting customer loyalty under uncertainty conditions in the insurance industry, especially Tejarat-e No Insurance Company. Lack of accurate and comprehensive identification of factors affecting customer loyalty and prioritizing them in the insurance industry, especially Tejarat-e No Insurance Company, and providing appropriate solutions highlight the importance of this research. Moreover, as the costs associated with



ignoring factors affecting customer loyalty in uncertain conditions in the current competitive environment are irreparable, it is necessary to identify the factors affecting customer loyalty in the insurance industry, especially Tejarat-e No Insurance Company.

Given what was stated above, the existence of several key factors affecting customer loyalty in different organizations as well as the existence of multiple goals in the nature of customer loyalty have caused that the identification and prioritization of factors affecting customer loyalty in uncertainty conditions in decision-making theory to be considered seriously as an important and challenging issue in multiple criterion decision-making literature and marketing management. The main question of this research is how to use a fuzzy multiple criterion hybrid model to identify and prioritize the factors affecting customer loyalty in uncertainty conditions in the insurance company, especially Tejarat-e No Insurance Company.

RESEARCH LITERATURE

Theoretical Principles

Today's world is full of complexities that have caused many challenges for organizations in the field of growth and excellence and has made the managers as planners, organizers and leaders of the human development face many challenges (Shoghi et al., 2012). In any organization, whether manufacturing or service organization, customers are the most important factor for the survival and growth of organization. If the organization can act successfully in obtaining their satisfaction and loyalty, in fact, it has provided the conditions for its long-term growth and survival (Aghajani et al, 2016). Nowadays, customer loyalty is one of the new topics in marketing (Khayat et al., 2015). Owing to its ultimate impact on customer repurchase, loyalty is perhaps one of the most important structures in marketing. Customer loyalty is a complex concept that relates to the willingness for re-purchasing and analyzing consumers' prices. Customer loyalty ensures the future revenue with customers. Accordingly, customer loyalty is the ultimate goal of companies (Evans et al., 2009). Loyalty occurs when customers feel strongly that the desired organization can meet their needs well so that competitor organizations are excluded from the minds of the customer and they are exclusively purchasing from their desired organization (Tajzadeh et al., 2010).

Customer Loyalty

The term loyalty refers to a strong commitment to repurchase a product or service in the future to acquire the same brand or product in spite of potential competitors' marketing efforts and their influences (Hamidzadeh et al., 2009). Jacoby and Kinez (1971) have provided the most comprehensive definition for "loyalty. They define loyalty as bias to a brand, and behavioral response over time that an individual prefers a particular brand over other brands and makes a psychological commitment to it (Mullan and Gilmore, 2008). In the customer loyalty literature, there are typically three types of views: behavioral loyalty, attitudinal loyalty (Yap et al, 2012), and composite loyalty (Rauyrueen and Miller, 2007).

1. Behavioral loyalty: it is related to purchasing behavior and is measurable based on indicators such as purchase ratio, purchase frequency, and probability of purchase (Bamani Moghaddam et al., 2011).



2. Attitudinal loyalty: it arises from customers' commitment to a particular brand due to the specific values of that brand (Alam et al., 2012).
3. Composite loyalty: it occurs when the customer recommends purchasing the same product to others as he or she purchases and uses the same product (Rauyruen and Miller, 2007).

Dic and Basou (1994) stated that customer loyalty is probably one of the best measures of success in an organization. Hence, developing, maintaining, and enhancing customer loyalty has remained the focus of most marketing activities of companies. Based on the definition, loyalty is a continuous and deep commitment to repurchase or encourage purchasing a particular product or service in the future, and as a result, repeated consumption of the same brand. Loyal customers help companies reduce marketing costs. More customer demand effectively increases market share (Nyadzayo and Khajehzadeh, 2016). Therefore, increasing customer loyalty is a vital for researchers (Zeithaml and Bitner, 2000). Loyalty is conceptualized from a service organization perspective (Chaudhuri and Holbrook, 2001). Grimler and Berun (1999) argue that service loyalty explains a limit in which a customer offers repeat purchasing behavior from a service provider and shows a positive attitude towards the provider, and thus, considers using the services of the provider, when needed. Holbrook et al. (2001) stated that brand loyalty requires the behavioral outcome of customer preferences for a particular brand or the choice of similar brands over a period of time. According to Acer, it is a level of customer dependency on a brand. Previous studies suggest that loyalty involves two behavioral and attitudinal dimensions. Holbrook et al. (2001) stated that behavioral loyalty evaluates support of repeated brand purchases over time, while attitudinal loyalty explains oriented commitment based on certain preferences of certain unique values in relation to a brand (Nyadzayo and Khajehzadeh, 2016). There is much evidence in the existing literature that trust and loyalty influence customer commitment. For example, studies show that when customers receive the right service continuously, the level of their trust in long-term business relationships increases (Balaji, 2015). In addition, commitment has been considered as a key component of creating customer loyalty (Hur et al., 2013).

Loyalty Definitions

Loyalty is an important concept in marketing strategies. Loyalty makes customers less likely to seek information among solutions (Bakhshizadeh et al., 2016). Loyalty is the relatively biased behavioral response (in the form of a purchase or a recommendation to purchase) that one finds over time to a brand. It causes that in the decision-making and evaluation process, the person finds particular tendency to that brand among a set of other brands that are in his mind. Raman in 1999 described loyal customers as "the extraordinary marketing force", since they are marketing for organization by recommending it to others and word of mouth marketing (HUO and XU, 2011). Katler (2003) describes it as a lasting commitment in family, country, or friends and argues that this term was initially introduced to marketing literature with the emphasis on loyalty under the title of brand. With regard to the customer loyalty, he argues that customer loyalty requires discriminating between customers and no company can be expected to pay the equal attention to profitable non-profitable customers (Rahimi Kalur, 2015). Oliver (1999) considered customer loyalty as one's deep commitment to repurchase or purchase a future



product or service despite environmental impacts and marketing efforts associated with a potential to change the consumer's behavior (Yoo and Bai, 2012).

Multiple Criteria Decision-Making

In many decisions, human thoughts are associated with uncertainty, and this uncertainty is influential in decision-making. In such cases, it is better to use fuzzy decision-making methods (Ataei, 2010). According to Zimmerman, rates and weights are uncertain and ambiguous in fuzzy multiple criteria decision-making and they are usually expressed as linguistic variables and consequently, fuzzy numbers (Rafiei Gilevae et al., 2017). Multiple criteria decision-making is one of the areas of research in management sciences that has developed rapidly over the last decade due to various application requirements (Saaty et al., 2010). When several criteria are considered in decision making issues, it is called multiple criterion decision-making (Karbasian et al., 2011). Due to having subjective criteria, it is a descriptive approach. The purpose of multiple criteria decision-making is to determine the best option, while providing the highest satisfaction (Yang et al., 2007). Multiple-criteria decision-making is used to transfer the best of the option among the proposed options considering the alternative evaluation indicators (Torfia et al., 2010). The rates and weights are uncertain and ambiguous in fuzzy multiple-criteria decision-making and they are usually expressed as linguistic variables and consequently, fuzzy numbers (Zimmerman, 2005). The fuzzy multiple-criteria decision-making approach is proposed for problems taking the ambiguity and uncertainty into consideration (Amiri, 2007).

Fuzzy Set

A fuzzy set is a set containing elements with varying degrees of membership (Azar et al., 2014). Fuzzy sets in modern mathematics refer to sets in which the membership of a number or all elements is not clear and its elements belong to that set relatively (Ataei, 2010). Fuzzy sets are sets in which the membership of a number or all members is not clear and members belong to that set relatively. A generalized fuzzy set is a classical set that allows belonging chooses any number in the range $[0,1]$. In the fuzzy sets, in contrast to definite sets, elements are not divided into member and non-member classes, but based on what we define, the degree of membership of fuzzy sets is between zero and one and fuzzy numbers are a particular type of fuzzy sets that are relative (Abari et al., 2012). In other words, the condition for membership or non-membership of an element in set does not depend on completely membership or completely non-membership in that set. An element may have a higher membership degree or less membership than another element in a set. As membership of an individual or element in a fuzzy set may be uncertain, the membership of the elements in them is based on degree. Moreover, human evaluation of qualitative indicators has always been subjective, so it is inaccurate. Such an important issue can justify the use of fuzzy set theory in multiple-criteria decision-making (Amiri, 2007). The fuzzy set theory is a complete tool for modeling uncertainty and inaccuracy resulting from human mind that is neither accidental nor probabilistic. In fact, fuzzy logic provides a systematic basis in dealing with situations that are ambiguous and have not been defined well (Kahraman et al., 2004).



Research Literature

In a study entitled "Investigating the factors affecting customer loyalty in the Malaysian and Jordanian hotel industry", Alsheikh et al. (2018) presented and validated a model of customer loyalty using marketing relationships and social exchange theory to identify solutions to customer loyalty challenges. Results showed that customer satisfaction, brand image, trust, easiness, and emotions affect customer loyalty (Alsheikh et al., 2018). In research entitled "investigating the factors affecting customer loyalty to club services at K.I.M Vietnam Center", Giao (2017) investigated the factors affecting customer loyalty to club services at K.I.M Vietnam Center. The results showed that four factors of habits, conversion costs, marketing communications, customer satisfaction, and quality affect the loyalty of the customers. In their research entitled "The effect of quality and satisfaction on loyalty of smartphone users", Minkyong et al. (2015) examined the impact of five quality factors, including system quality, network quality, content quality, customer support, adjustment and satisfaction on loyalty. The results of their research showed that several factors can affect users' loyalty. In the meantime, the content quality has the most effect on the satisfaction, followed by adjustment, system quality, and the customer support. Also, it was found that satisfaction had a positive effect on loyalty and network quality had a positive effect on users' loyalty (Minkyong et al., 2015). In their research entitled "The hierarchical impacts of perceived quality, perceived value, satisfaction and loyalty: A case study in Australian Public Recreational Centers", Howat et al. (2004) examined a perceived quality model of loyalty at Australian public recreational centers. The results of their study showed that general satisfaction was completely influenced by the perceived quality and perceived value. Moreover, perceived quality had the greatest impact on satisfaction and behavioral intentions (Howat et al., 2014). In their research entitled "the effect of service quality, trust and perceived value on loyalty in Malaysian service industries", Ferind et al. (2014) examined the effect of service quality, trust and perceived value on customer loyalty in the Malaysian service sector. Results revealed a positive relationship between service quality and trust, perceived value and service quality, customer trust and customer loyalty (Ferind et al., 2014). In a study entitled "investigating factors influencing the process of electronic loyalty formation with the mediating role of electronic commitment. Teymuri et al. (2017) examined the factors affecting the process of electronic loyalty formation through the mediating role of electronic commitment in the field of electronic banking. The results of the data analysis in their research indicate that individual and organizational factors, except for the ease of use perceived and organizational strategy, lead to the electronic commitment and it can affect the electronic loyalty of customers (Teymuri et al., 2017).

In research entitled "Prioritizing the factors affecting customer loyalty in Kaleh Company", Aghajani et al. (2016) prioritized the factors affecting customer loyalty in Kaleh Company using F.AHP technique. The results of their study showed that among the factors affecting the customer loyalty, service quality ranked first and customer satisfaction and innovation in provision of product, creating trust in customers, customer communication and providing fast and easy service to them, diversity of products, company performance, and appearance characteristic of products, respectively, ranked second to seventh according to the viewpoint of the respondents (Aghajani et al., 2016). In a study entitled prioritizing the factors affecting the customers' return using the fuzzy network analysis process and FVIKOR ranking method, Taghavi Fard et al.



(2016) examined and determined the priority for creating loyalty in customers of home appliance manufacturing companies. In this paper, they used fuzzy network analysis process technique to determine the most important factors affecting customer return. Then, they ranked 5 superior home appliance companies based on the views of managers and experts of home appliance companies based on the FVIKOR method (Taghavi Fard et al., 2016). In a study entitled "The effect of dimensions of price satisfaction on customer loyalty in the Banking Industry: A Case Study of Mellat Bank", Nazari et al. (2013) provided a generalized model, containing the dimensions of price satisfaction and its impact on customer loyalty. Based on the results obtained, they examined the indicators affecting the customer satisfaction and they evaluated their relationship with loyalty dimensions in one of the commercial banks of Iran. The results of their study showed that among the factors affecting customer satisfaction, price-quality factor had the highest and price transparency had the lowest effect on customer satisfaction (Nazari et al., 2013). In his study entitled "Explaining the evaluation of potential customers' loyalty and tendency to purchase from online stores", Hosseini (2012) examined the tendency of customers to repeat purchases from online stores to assess their status in transforming potential customers into loyal customers in an online store. The results of the study showed that the factors involved in repeated online purchasing included website quality, website trust, and subjective norms, respectively, while perceived benefits and online purchasing enjoyment indirectly affected the tendency to online purchasing. In a study entitled "Investigating the relationship of factors forming the relational marketing on Reliable customer loyalty", Ranjbarian et al. (2012) examined the relationship between the actors forming the relational marketing such as trust-building, commitment to service, quality of communication and conflict management and loyalty. Their research results showed that the factors that form the relational marketing have a positive and significant relationship with customer loyalty and the priority in terms of their significant relationship with customer loyalty was as follows: trust-building, conflict management, communication quality, and commitment to service and gender as a mediating variable had no effect on the relationship between independent and dependent variables (Ranjbarian et al., 2012). In a study entitled "Prioritizing the Factors Affecting Customer Loyalty Using the ECSI Model", Akbari et al. (2011) prioritized the factors affecting loyalty of Shirin Asal Company customers. The results of their research showed that all the identified factors had an impact on two main indicators of loyalty including repurchase and introducing the product to others (Akbari et al., 2011). In a study entitled "value perceived from mobile banking services and its impact on customer loyalty", Hassanzadeh and Kashani (2011) analyzed the relationship between perceptions of value, adherence, and decision to use mobile banking. Their research showed that adherence to service provider bank, adherence to mobile use, and decision to use mobile phones directly and positively and social value indirectly and positively influences the customers' decision to continue their relationship with the bank (Hassanzadeh Kashani et al., 2010). Several factors affect the loyalty of insurance customers. These factors both individually and in combination are considered important prerequisite for customer loyalty in insurance industry, because they affect customer loyalty. Hence, criteria and sub-criteria that affect customer loyalty in the insurance industry are listed in Table 1.



METHODOLOGY

The present study is applied in terms of objective and descriptive-survey in terms of data collection method. The population of this study included insurance industry experts, especially Tejarat-e No Insurance Company of Mazandaran and a number of professors in the loyal customers in the field. The first group consisted of 20 senior experts and managers of the studied company used to localize the model and to evaluate the content validity of the model and factors using a mathematical scoring model. The second group included the community of experts for use of research techniques in operation and fuzzy DEMATEL methods. According to Saaty (2002), they were selected to be 6 experts related to the study company using the judgmental convenient sampling method. These had master and PhD level of education and had an employment history of more than 12 years. To collect the information, research literature was reviewed and the interview was performed with experts to identify the factors. Moreover, in order to collect the data, two types of questionnaires were used (screening questionnaire and pairwise comparisons questionnaire) during the research. Additionally, the Cronbach's alpha was used to assess the reliability of the questionnaire in the first part of the questionnaire, developed to evaluate the importance of the criteria and sub-criteria. According to this method, the reliability of all research variables is greater than 0.7.

Table 1- Criteria and sub-criteria affecting customer loyalty in the insurance industry

Row	Criteria	Definitions	Sub-criteria	Authors
1	Before and after sale service Customer satisfaction	According to Waitsch (2005) definition, after sale service is often referred to as the service provided to the customer after delivering the goods or services. It is after-sale support. Based on the Gayardlee et al (2007), after sale service includes activities as such goods delivery, installation and initiating, product related training, support of customers, any kind of maintenance, any process of repairing and updating (Divandari and Torkashvand, 2011).	Performance of accountability centers	Haghighi Kaffash et al (2010)
			Addressing the complaints of insurers	Haghighi Kaffash et al (2010)
			Providing appropriate feedback	Haghighi Kaffash et al (2010)
			Providing appropriate service to insurers	Haghighi Kaffash et al (2010)
2	Customer satisfaction	Customer satisfaction results from achieving to goods or service with an emphasis on the minimum deviation from customer expectations (Mousavi et al., 2009).	Meeting the expectations related to inflation	Mahdavi and Abed (2014)
			Meeting the expectations after death	Mahdavi and Abed (2014)
			Meeting the expectations in ease of payment	Mahdavi and Abed (2014)
			Satisfaction with all types of insurance policies	Mahdavi and Abed (2014)

			Updated information	Mahdavi and Abed (2014)
			Providing up-to-date information	Mahdavi and Abed (2014)
			Providing reliable information	Mahdavi and Abed (2014)
3	Communication	Communication is the formal and non-formal dialogue that results in the exchange of meaningful and timely information between the purchaser and the seller (Rashid, 2003).	Staff interactions with insurers	Haghighi Kaffash et al (2010)
			Establishing intimate and friendly relationships with insurers	Haghighi Kaffash et al (2010)
			Empathy with insurers	Haghighi Kaffash et al (2010)
4	Service quality	Zitamel and Berry (1985) have defined service quality as "a universal judgment or a service-related superiority attitude. They stated that judgment on the service quality reflects the degree of differences between consumers' perceptions and expectations. Bitner and Hobert define service quality as general consumer perception of the organization and its services (Khayat et al., 2015).	Perceived value	Jafari Nia et al (2012)
			Providing the services	Jafari Nia et al (2012)
			Reputation	Jafari Nia et al (2012)
5	Customer trust	Kracher and Wiedenbeck have defined online trust as "view of trust expectation in online conditions and personal risk taking that will not make a profit (Chiu et al., 2012).	Providing necessary advises in critical time	Mahdavi and Abed (2014)
			Honesty	Mahdavi and Abed (2014)
			Trust in specialist representatives and sellers	Mahdavi and Abed (2014)
			Observing the ethics in the sales flow	Mahdavi and Abed (2014)
			Lack of exaggeration in introducing the services	Mahdavi and Abed (2014)



DATA ANALYSIS METHOD

In this study, a fuzzy approach was used to perform pairwise comparisons of model factors in order to consider subjective issues and uncertainty in decision-making. It has a higher capability than other similar methods. A scoring technique was used in this study to define and determine the factors affecting the loyalty of the customers and analyzing the data collected through questionnaire as well as screening. In order to determine the relationships and the way of impact of factors and severity of its impact, Fuzzy Decision-Making Trial and Evaluation Laboratory (FDEMATEL) method is used and to prioritize them, Fuzzy Analytical Network (FANP) and Tzeng (2011) solution method are used. These methods are described above:

Fuzzy DEMATEL Method

The fuzzy DEMATEL method examines the structure of inter-criteria effects (Tsai et al., 2009). It tries to solve the problem of organizations and improve them by applying group decision-making in fuzzy conditions (Jeng and Tzeng, 2012). The steps of this method are as follows:

Step 1: Creating a fuzzy direct correlation matrix by determining the effect of the criterion i on j with the guidance of Table 2.

Table 2: Linguistic scales for pairwise comparisons (Modiri et al., 2014)

Linguistic phrases for pairwise comparisons		Fuzzy numbers
Very high effect	$\frac{4}{5}$	(0.75, 0.75, 1)
High effect	$\frac{3}{5}$	(0.5, 0.75, 1)
Low effect	$\frac{2}{5}$	(0.25, 0.5, 0.75)
Very low effect	$\frac{1}{5}$	(0, 0.25, 0.5)
No effect	$\frac{0}{5}$	(0, 0, 0.25)

Step 2: Normalizing the direct relationships matrix through equations 1 and 2:

$$\tilde{X} = K \cdot \tilde{X} \quad (1)$$

$$k = \min \left[\frac{1}{\max_{1 \leq i \leq n} \sum_{j=1}^n \tilde{A}_{ij}}, \frac{1}{\max_{1 \leq i \leq n} \sum_{i=1}^n \tilde{A}_{ij}} \right] \quad i, j = 1, 2 \dots n \quad (2)$$

Step 3: Calculating the matrix of general relationships through equation 3.

$$\tilde{T} = \tilde{X}(I - \tilde{X})^{-1} \quad (3)$$

Step 4: Determining the vector \tilde{R} and \tilde{D} through equations 4 to 6:

$$\tilde{T} = [\tilde{t}_{ij}]_{n \times n}, \quad i, j = 1, 2 \dots n \quad (4)$$

$$\tilde{R} = [\sum_{j=1}^n \tilde{t}_{ij}] = [\tilde{r}_i]_{n \times 1} \quad (5)$$

$$\tilde{D} = [\sum_{i=1}^n \tilde{t}_{ij}] = [\tilde{d}_j]_{1 \times n} \quad (6)$$

Step 5: Calculating $(\tilde{R} + \tilde{D})$ and $(\tilde{R} - \tilde{D})$ mapping the relationships of the effects on the coordinate axis.

Step 6: Forming weighted super matrix

The weighed super matrix was converged through the equation $\lim_{K \rightarrow \infty} (W^a)^K$ to form the weighed super matrix. Finally, final weights were determined through D.ANP method (Jeng and Tzeng, 2012).

ANP Algorithm

The ANP method was proposed by Saaty & Takizawa (1986). As ANP is the extended form of AHP, it includes all positive characteristics of AHP, such as simplicity, flexibility, applying qualitative and quantitative criteria concurrently, and the ability to examine the compatibility of judgments and can consider the complex relationship (interaction and feedback) between and

within decision elements by using a network structure rather than a hierarchical structure. The difference between ANP and AHP has been shown in Diagram 1-3. ANP process considers any issue and subject as a "network" of criteria, sub-criteria, and options (all of them are called elements) collected together in a cluster. All elements in a network have a relationship with each other. ANP process can be divided into two parts (control hierarchy and network communication). The control hierarchy includes the relationship among the goals, criteria and sub-criteria and it affects the internal relationship of the system. The network communication includes dependency between elements and clusters. This capability of the ANP allows considering the interdependence of the elements and thus provides a precise approach to complex issues. The effect of elements on other elements in a network is considered by a super matrix (Saaty, 1999).

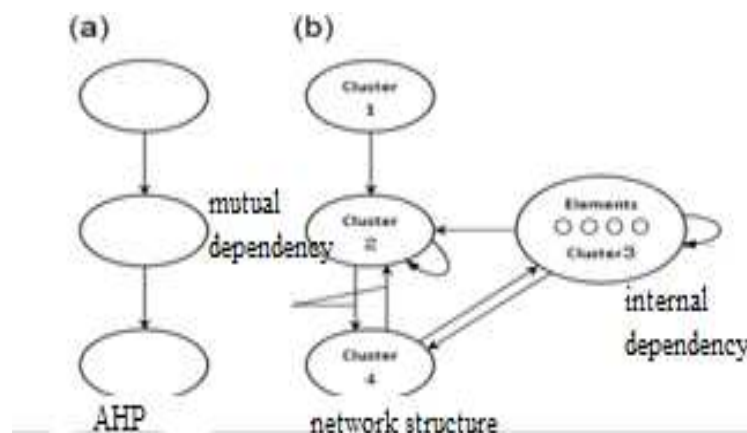


Diagram 1: Structural differences between a 'Hierarchy' and 'Network' (source: Chung et al, 2005)

Fuzzy Analytic Network Process

The Fuzzy Analytic Network Process (FANP) approach is very useful when the dependency between the selection criteria is so high, so that the FANP process simply determines the relationships between the criteria. The FANP process involves the following steps.

1. Developing a model and structuring the problem.

The problem should be clearly stated and decomposed into a logical system, for example, a network. This structure can be obtained by decision-makers and through methods such as brainstorming or other appropriate methods (Yuksel and Dagdeviren, 2007).

2. Pairwise comparison matrices.

Forming a pairwise comparison of options (criteria) with a classical 1-9 range of Saaty and developing the pairwise comparison matrix using the triangular fuzzy numbers (l, m,u) and matrix are as follows:


$$\tilde{A} = \begin{bmatrix} (a_{11}^l, a_{11}^m, a_{11}^u) & (a_{1r}^l, a_{1r}^m, a_{1r}^u) & \dots & (a_{1n}^l, a_{1n}^m, a_{1n}^u) \\ (a_{r1}^l, a_{r1}^m, a_{r1}^u) & (a_{rr}^l, a_{rr}^m, a_{rr}^u) & \dots & (a_{rn}^l, a_{rn}^m, a_{rn}^u) \\ \vdots & \vdots & \vdots & \vdots \\ (a_{m1}^l, a_{m1}^m, a_{m1}^u) & (a_{mr}^l, a_{mr}^m, a_{mr}^u) & \dots & (a_{mn}^l, a_{mn}^m, a_{mn}^u) \end{bmatrix}$$

$$\tilde{A} = \begin{bmatrix} (1, 1, 1) & (a_{1r}^l, a_{1r}^m, a_{1r}^u) & \dots & (a_{1n}^l, a_{1n}^m, a_{1n}^u) \\ \left(\frac{1}{a_{1r}^l}, \frac{1}{a_{1r}^m}, \frac{1}{a_{1r}^u}\right) & (1, 1, 1) & \dots & (a_{rn}^l, a_{rn}^m, a_{rn}^u) \\ \vdots & \vdots & \vdots & \vdots \\ \left(\frac{1}{a_{1n}^l}, \frac{1}{a_{1n}^m}, \frac{1}{a_{1n}^u}\right) & \left(\frac{1}{a_{rn}^l}, \frac{1}{a_{rn}^m}, \frac{1}{a_{rn}^u}\right) & \dots & (1, 1, 1) \end{bmatrix}$$

3. Super matrix formation

The logarithm of the least squares and Cheng developmental analysis method are used to obtain the weight of the indicators. Then, the logarithm of the least squares method is described.

The logarithm method of the least squares of the fuzzy weights is shown below. To obtain the weight of the indicators with respect to the super matrix $W^{\%}$, the following steps were taken to calculate $W_1^{\%}$, $W_2^{\%}$ and the corresponding weight.



$$W^{\%} = \begin{matrix} \begin{matrix} \acute{e} & 0 & 0 \\ \grave{e} & & \grave{u} \\ \tilde{e} & & \tilde{u} \end{matrix} \\ \begin{matrix} W_{21}^{\%} \\ W_{22}^{\%} \end{matrix} \end{matrix} \begin{matrix} \grave{u} \\ \tilde{u} \end{matrix}$$

In the matrix $W^{\%}$, $W_{21}^{\%}$ is the matrix of the decision-making team's views on pairwise comparisons of ranking indicators relative to the primary goal. The matrix $W_{22}^{\%}$ is also the views of the experts on pairwise comparisons of indicators relative to each other (control indicator). The logarithmic method of the least squares of fuzzy weights n of the table n is shown below.

$$\tilde{w}_k = (w_k^l, w_k^m, w_k^u) \quad k = 1, 2, 3, \dots, n$$

So that,

$$w_k^s = \frac{\left(\prod_{j=1}^n a_{kj}^s \right)^{\frac{1}{n}}}{\sum_{i=1}^n \left(\prod_{j=1}^n a_{ij}^s \right)^{\frac{1}{n}}}, \quad s \in \{l, m, u\}$$

Then, matrix W_i^c is calculated using the logarithmic method of the least squares fuzzy weight of each of the prioritization indicators (Yuksel and Dagdeviren, 2010).

CONCLUSION

Various articles were used to identify and extract factors. As the number of identified factors was high and in order to localize the indicators and reduce inputs and also to determine their importance relative to each other and to evaluate their validity, the weight limitation was applied to the model. For this purpose, a 22-item questionnaire in a 5-point scale ranging from highly important to non-important was designed and 20 questionnaires were distributed among the first sample group. All questionnaires were completely collected. Scoring method was used to determine the most important factors. The factors that their weight was more than the average (60) were selected by experts. Out of 22 sub-factors, 15 sub-factors were excluded from the final conceptual model. Finally, 5 main indicators along with 15 influential sub-indicators were selected as highly important and main factors for the final solution of the model. The most important factors are shown in Table 3.

1-What are the criteria affecting the loyalty of insurance customers?

Table 3- Factors and sub-factors affecting loyalty of insurance customers

Main criteria	Sub-criteria	Code
Before and after sale services C_1	Providing the right service	C_{11}
	Addressing and handling the complaints	C_{12}
	Performance of accountability centers	C_{13}
Customer satisfaction C_2	Providing reliable information	C_{21}
	Updated products	C_{22}
	Meeting the expectations	C_{23}
Customer trust C_3	Providing advice	C_{31}
	Observing the ethics	C_{32}
	Trust in representatives and sellers	C_{33}
Service quality C_4	Providing the service	C_{41}
	Perceived value	C_{42}
	Reputation	C_{43}
communications C_5	Interaction among employees	C_{51}
	Establishing intimate relationships	C_{52}
	Sense of empathy	C_{53}



Finally, according to the factors and sub-factors listed in Table 3, the decision-making model was formed as follows.

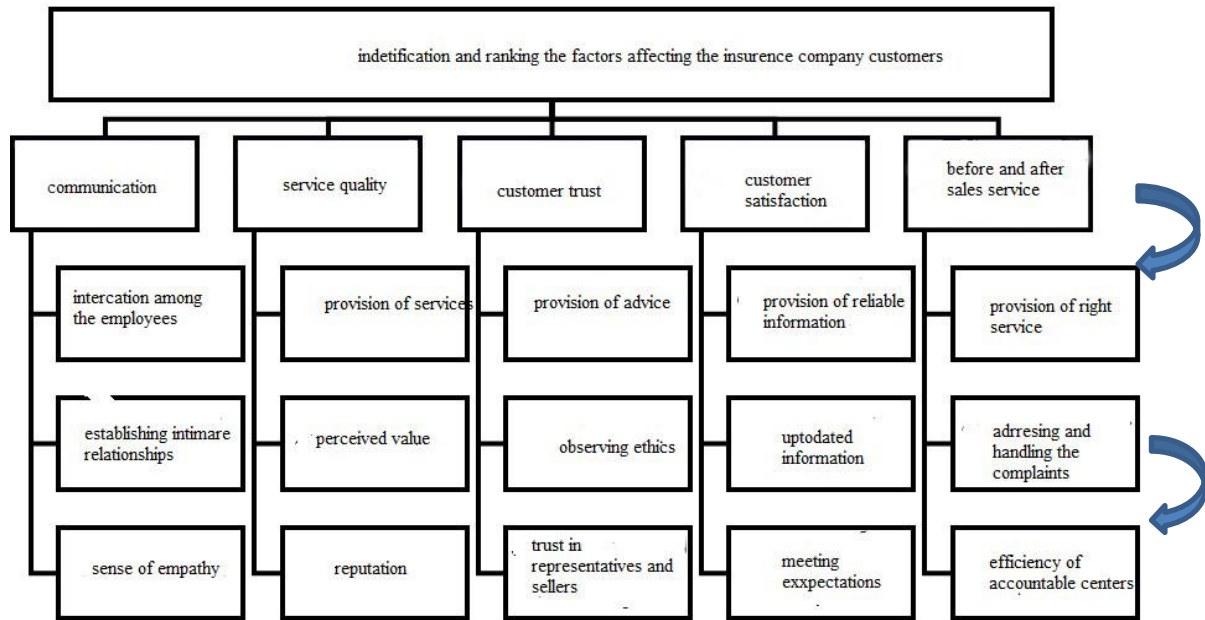


Diagram 2- Research model with network structure

DEMATEL Solutions

The sum of the elements of the columns and rows of the matrix \tilde{T} for the main factors and their sub-factors are calculated and named as \tilde{R} (influential) and \tilde{D} (influenced) vectors. The calculations are given in Tables 4 and 5:

Table 4- Values of criteria and sub-criteria \tilde{R} , \tilde{D} , $\tilde{R} + \tilde{D}$, and $\tilde{R} - \tilde{D}$

Factors/ Sub-Factors	\tilde{D}	\tilde{R}	$\tilde{D} + \tilde{R}$	$\tilde{D} - \tilde{R}$
Before and after sales services	2.77	1.871	4.641	0.898
Providing right service	0.439	0.588	1.028	-0.15
Addressing and handling the complaints	0.452	0.357	0.81	0.095
Performance of accountability centers	0.4	0.346	0.745	0.054
Customer satisfaction	2.437	2.683	5.12	-0.246
Providing reliable information	0.585	0.561	1.145	0.024
Updated products	0.513	0.476	0.988	0.037
Meeting the expectations	0.475	0.536	1.011	-0.06
Customer trust	2.502	3.014	5.516	-0.513
Providing advice	0.467	0.493	0.96	-0.03
Observing the ethics	0.469	0.381	0.85	0.088

Trust in representatives and sellers	0.402	0.464	0.867	-0.06
Service Quality	2.663	2.809	5.472	-0.146
Providing the service	0.539	0.462	1.001	0.076
Perceived value	0.531	0.549	1.08	-0.02
Reputation	0.53	0.589	1.119	-0.06
Communication	2.531	2.524	5.054	0.007
Interaction among employees	0.533	0.438	0.971	0.095
Establishing intimate relationships	0.491	0.615	1.106	-0.12
Sense of empathy	0.537	0.508	1.044	0.029

Diagram 2 shows the importance of influencing and being influenced among the other criteria. The horizontal axis of the diagram shows the importance of criteria and the level of importance of criteria. It can be concluded that the level of importance of the criteria is respectively "before and after sale service factor", "communication factor", "service quality factor", "customer satisfaction factor", and "customer trust". Indicators that according to Table 6 have positive $\tilde{D}-\tilde{R}$ value indicate the influence of these factors and the factors that have negative $\tilde{D}-\tilde{R}$ indicate that they are influenced by other factors. Thus, among the main factors of "before and after sales service" with a value of 0.898 was the most influential indicator and "customer trust" with a value of the -0.513 was the most influenced indicator. In general, positive \tilde{D} indicates cause \tilde{R} -factors and negative \tilde{D} . Finally, the cause and effect relationships are indicated effect factors \tilde{R} -plotted by drawing points with coordinates \tilde{D} and the degree of \tilde{R} based on the matrix $\tilde{R}-\tilde{D}$ and $\tilde{R}+$ influence of other factors on each other on a Cartesian coordinate system. Accordingly, the cause-effect diagram and the network relationship map of factors have been shown in Figure 3.

Factor weighting using fuzzy analytic network process

At this stage, using the equations specified in the matrix T, the weighted super matrix is calculated, and then, it is converged and the limited super matrix is obtained and according to it, the weight and priority of the factors are determined. Finally, by defuzzification of the weights, the weights of factors and sub-factors are determined, as shown in Table 5.

As Table 5 shows, the highest weight relates to the factor of "providing the right service" which ranks first. Moreover, the factors of reputation, trust in representative and sellers, establishing intimate relationships, and perceived value, respectively, ranked second to fifth. They accounted for almost 50.26% of total weight of the sub-factors. This indicates the importance of these sub-factors. Other factors have been also presented in Table 5. Chart 4 shows the priority of the main factors and Chart 5 shows the final priority of the sub-factors by the FANP method.



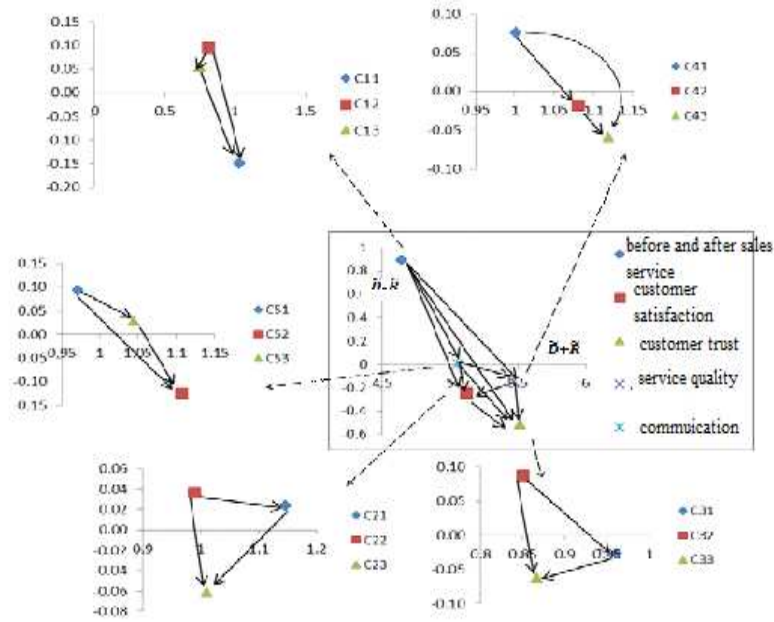


Diagram 3- Map of network of relationships between criteria and sub-criteria

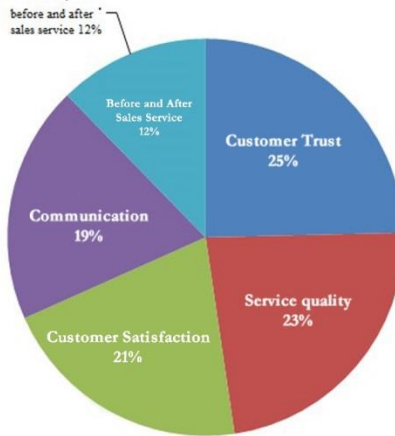


Diagram 4- Relative priority of the main factors

DISCUSSION AND RECOMMENDATIONS

The first objective of the research was to identify the factors affecting brand equity in the insurance industry, especially Tejarat-e No Insurance Company in Mazandaran Province. Based on the studies conducted and after screening, 22 important factors were identified. Their main criteria included “before and after sales services”, customer satisfaction, customer trust, quality of service and communication”, which are in line with the first objective of the research.

The second objective of the study was to determine the relationships and effects of factors on each other. To achieve this objective, fuzzy DEMATEL method was used. The results of this technique are as follows: "Customer trust" was the most influenced factor. In other words, the

main problem and bottleneck is the increased loyalty of the customers of the organization that is solved by the influential factors. In fact, increase or non-increase in loyalty of the customers of the organization depends on this factor. Therefore, it can be concluded that in order to achieve organizational profitability, the organization must pay attention to the trust of the customer in the loyalty of the customers of the insurance company. In fact, it is the criterion that has the highest importance and it should be in the priority of solving the problem to improve the system. It can be concluded that before and after sales service factors have a significant impact on the loyalty of insurance customers. In addition, before and after sales service factors can be effective factors in enhancing the organization's customer loyalty and profitability with increasing efficiency and improvement of the process.

The third objective of the study was to calculate the relative weights of the criteria and sub-criteria by prioritizing them using the fuzzy analytic network process. The result of the research and priority of factors are as follows: among the main factors, "customer trust" with a weight of 0.246 has the highest impact on the customer loyalty from the view of experts in the insurance industry, especially Tejarat-e No Insurance Company in Mazandaran Province. As a result, "customer trust" factor is one of the most important factors affecting the customer loyalty of the organization and senior managers of the organization should pay much attention to this important factor.

Table 5- The weight and priority of the criteria and sub-criteria influencing the loyalty of insurance customers

Weight and priority of main factors		Sub-factors	Code	Weight and relative priority of sub-factors		Weight and final priority of sub-factors	
Before and after sale services C ₁	0.123 (5)	Providing the right service	C ₁₁	0.0642	(1)	0.5217	(9)
		Addressing and handling the complaints	C ₁₂	0.0327	(2)	0.2658	(14)
		Performance of accountability centers	C ₁₃	0.0262	(3)	0.2125	(15)
Customer satisfaction C ₂	0.207 (3)	Providing reliable information	C ₂₁	0.0742	(2)	0.3589	(7)
		Updated products	C ₂₂	0.0576	(3)	0.2788	(12)
		Meeting the expectations	C ₂₃	0.0749	(1)	0.3623	(6)
Customer trust C ₃	0.246 (1)	Providing advice	C ₃₁	0.0931	(1)	0.3779	(1)
		Observing the ethics	C ₃₂	0.0675	(3)	0.2741	(8)
		Trust in representatives and sellers	C ₃₃	0.0857	(2)	0.348	(3)



Service quality C ₄	0.23 (2)	Providing the service	C ₄₁	0.0628	(3)	0.2726	(10)
		Perceived value	C ₄₂	0.0801	(2)	0.3477	(5)
		Reputation	C ₄₃	0.0875	(1)	0.3797	(2)
communications C ₅	0.194 (4)	Interaction among employees	C ₅₁	0.0494	(3)	0.2553	(13)
		Establishing intimate relationships	C ₅₂	0.0815	(1)	0.4209	(4)
		Sense of empathy	C ₅₃	0.0627	(2)	0.3238	(11)

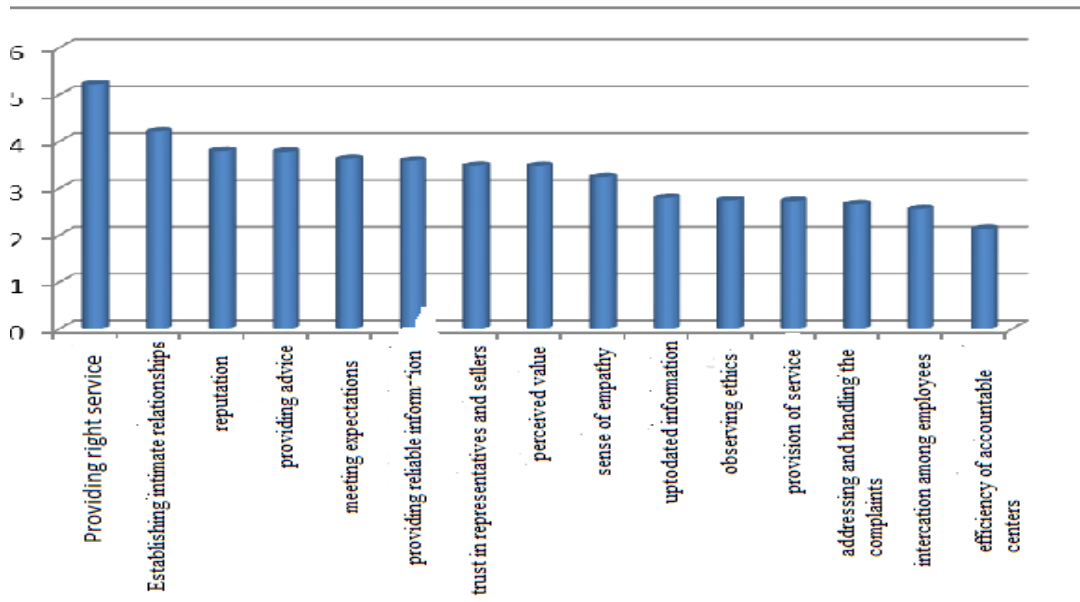


Diagram 5- Final priority of sub-factors

Among the sub-criteria and the operational level, the sub-criterion of "providing necessary advice at critical time" with the final weight of 0.3779 present of the total weight of the sub-factors obtained the first priority. As the results show, increasing customer loyalty of the organization is dependent on the "customer trust factor" and it is always trying to play a role in increasing customer loyalty to the organization and so on. In addition, in the present study, several solutions are provided given the results of the research. According to FDEMATEL results, "customer trust" factor is the most influential factor in increasing the loyalty of insurance customers. An increase or non-increase in the loyalty to organization depends on this criterion and we should try to use its influence in strengthening the system. Therefore, it is suggested to senior managers of the organization and decision-makers of the insurance industry to take steps to increase the loyalty of their customers and maintain their competitive position by increasing the trust of the representatives and sellers, improving the necessary advice at critical times, increasing ethics, and so on.

According to FDEMATEL results, "before and after sales service" factor is the most influential factor in increasing the loyalty of insurance customers, which should try to provide suggestions

in this regard to make the company successful, because an increase or non-increase of customer loyalty to the organization depends on this criterion and we should try to use the influence of this criterion in order to strengthen the system. Therefore, senior managers and decision-makers sector in the insurance industry are recommended to increase the quality of their services, increase the efficiency of their accountability centres, increase the addressing and handling the insurers' complaints, and so on to increase the loyalty of their customers and try to maintain their competitive position.

According to F.ANP results, among the main criteria, the most important factor is "customer trust" factor. Moreover, among the sub-indicators of this factor, the indicator of providing the necessary advices at critical time plays an important role in the customer loyalty of the organization. Therefore, senior managers and decision-makers sector in the insurance industry are recommended to improve the provision of necessary advice at critical times, increase the trust of specialist representatives and sellers, increase the ethics, and so on, in order to increase the customer loyalty.

Based on FANP results, among the key criteria, "quality of service factor" ranked second in terms of importance. In addition, among the sub-factors of this factor, reputation indicator plays an important role in the loyalty of the customers of the organization. Therefore, senior managers and decision makers sector in the insurance industry are recommended to help the organization in increasing the loyalty of their customers by increasing the reputation, increasing perceived value, improving service provision and so on.

It should be noted that according to FANP results, among the main criteria, "customer satisfaction" ranked third in terms of importance. In addition, among the sub-factors of this factor, expectations related to the inflation indicator plays an important role in the loyalty of the organization's customers. Therefore, senior managers and decision makers sector in the insurance industry are recommended to help the organization in increasing the loyalty of their customers by increasing the met expectations relative to inflation, increasing the provision of reliable information, improving the updated products and so on.

According to the results of FANP, among the main criteria, "communication" ranked fourth in terms of importance. In addition, among the sub-indicators of this factor, the indicator of intimate relationship with insurers plays an important role on the loyalty of the customers of the organization. Therefore, senior managers and decision makers sector in the insurance industry are recommended to help the organization in increasing the loyalty of their customers by establishing the intimate relationship with insurers, increasing the sense of empathy, increasing interaction among the employees and so on.

In addition, according to the FANP results, among the main criteria, "before and after sales service" factor had the lowest importance and it ranked fifth. In addition, among the sub-indicators of this factor, the indicator of providing a good service to the insurers plays an important role in the loyalty of the customers of the organization. Therefore, senior managers and decision makers sector in the insurance industry are recommended to help the organization in increasing the loyalty of their customers by improving the right service provision to insurers, increasing the addressing and handling the complaints of the insurers, increasing the efficiency of the accountability centres.



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