

PATTERN OF TRADING PARTNER SELECTION IN DEPUTIZATION SYSTEMS BASED ON ADAPTIVE NEURO- FUZZY INFERENCE SYSTEM

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Abstract

Purpose: The purpose of this study is to develop a model for selecting a business partner in agency systems based on the method of the adaptive neural-fuzzy system.

Methodology: The present research is applied in terms of purpose and descriptive in terms of the research method. The statistical population of the study, based on the subject of the research, the objectives of the research, and the spatial scope of the research, includes 98 agencies of Parsian Insurance Company in East Azarbaijan Province. According to the available statistics, the number of agencies of Parsian Insurance Company in East Azarbaijan Province is 98; Given that designed systems require more samples to arrive at the right answer. Therefore, the sample size will be done using the all-count sampling method. A questionnaire was used to collect the data of the input variables and the sales amount of different types of insurance policies was used for the output part. An adaptive neurophysiological system (ANFIS) has been used to analyze the data. Also, to evaluate the performance of each of the designed systems, the characteristics of the mean error squares and the root mean of the mean error squares were used.

Main Findings: The research findings show that the best model designed to select a business partner in agency systems is a system with foot membership functions, some repetitions of 30, and two membership functions at each input.

Application of Study: The results of this study can be used in agency systems to select business partners.

Novelty/Originality: The novelty of this study is developing a model for selecting a business partner in agency systems based on the method of the adaptive neural-fuzzy system.

Keywords: *Business Partner, Agency Granting Systems, Adaptive Neural-Fuzzy System, Scoring Systems, Insurance Companies.*

INTRODUCTION

During the past decade, the deputization and scoring right has been developed as a governing pattern around the world. For instance, the deputization industry has been developed faster than the total economy of the United State by the scoring right in America (Boulay, J., et al., 2020). The deputization systems as a new method for the entrance to foreign markets is like scoring. In a deputization contract, the scorer assigns the franchisee the right of using an invention or innovation, trading mark, product formulation, company title, or any other thing. In addition to the scorer, s/he grants the operational and managing helps (such as raw materials, equipment, train, and financial resources) to the franchisee, too. On one side, the scorer receives a determined sum or a specific percentage of the sale as the scoring right (Barthélemy, J. 2008). The high expenditures and the risk of new product development and the method of interference in the new markets are radical factors, which lead the organizations and companies to participate in deputization activities (Brookes, M., & Altinay, L. 2011). Meanwhile, the performance of the scoring system is a fundamental problem for both the researchers and the executive managers (Perrigot, R., López-Fernández, B., & Basset, G. 2020). Indeed, the weak performance of scoring systems has attracted the researchers' attention to the presentation of strategies for increasing the performance of these systems (Chaudey, M., & Fadaïro, M. 2017). Granting the monopoly has the advantage of assigning the risks of activity in different places to the applicant individual. Of course, they should accept the expenditures of preparing the system and scoring process. Anyway, they are not forced to invest in different places by all their capital and the investment risks are naturally reduced. The deputization is a form of participation in trading activities and relies on the strategic and operational relations that enable the participant companies to gain the benefits of products, services, and scoring systems. That aims to repeat the scorer's business model by the right of enjoyment and local knowledge. The deputization instigates entrepreneurship (Sié, L., Pett, T., & Hipkin, I. 2015; Barthélemy, J. 2008).

Most of the studies done in the case of deputization evaluate the strategies existing about the scoring reasons; few studies discuss the procedure of scoring formation and operation (Dant, R. P. 2008). Indeed, small companies have applied this method for developing their business for more than 100 years (Dant, R. P., & Grünhagen, M. 2014; ITA, 2016). The deputization systems support each other and act as the networking organizations for compatibility and what prevents the partners (scorer, franchisee, managers, and providers) from involvement in the opportunistic behaviors (Paswan, A. K.,

[Wittmann, C. M., & Young, J. A. 2004](#)). The study of the research literature reveals that the existence of strong cooperative relationships between the deputization partners reduces or eradicates the negative conflicts.

The deputization has special importance for the senior managers and main decision-makers in the organizations for the decision-making and compilation of strategy. since the customers' increasing demand for the improvement of quality and innovation in the services has created a challenge for the companies; while the existence of trading partners in the deputization systems is the only reliable and sustainable source for the competition ([Alon, I. 2012](#)). However, no considerable study has been accomplished in the case of the manner of trading partner selection and these studies even have been criticized due to the lack of theoretical foundation. Indeed, as it has been referred by different researchers, the past-related studies did not present a theoretical foundation or scientific regular framework for designing the deputization pattern and the trading partner selection ([Alon, I., Ni, L., & Wang, Y. 2012](#); [Fernández-Monroy, M., Martín-Santana, J. D., & Galván-Sánchez, I. 2018](#); [Shaikh, A. 2016](#)).

On the other side, the frameworks and models represented in the case of deputization had a partial look at this subject. Therefore, the selection of trading partners requires a framework, which removes the deficiency of current methods by applying a comprehensive viewpoint. With regard to the difficulties existing in the companies in the case of trading partner selection in the deputization systems, it is required to design a framework for designing a trading partner selection pattern in the scoring systems to remove the deficiencies of current models and study the related dimensions by applying a comprehensive viewpoint. For this reason, there is no integrated and comprehensive literature about the deputization and the necessity of doing research for integrating the theoretical literature is felt.

On the other side, the following reasons can be expressed to indicate the innovative, statistical, background, and operational significance of the subject and it shows the specific necessities of the present research.

- The research is innovatively significant since there is a considerable scientific gap in the deputization systems in the companies and institutions in the case of recognition of structures. As the first step for the bedding in the deputization systems, the competition has been increased among the competitors and the companies look for an unimitative competitive advantage. The present research would help the institutions and companies of private insurance to take effective steps to gain the unimitative competitive advantage by emphasizing on the design of trading partner selection in the deputization system in the recognition of different structures and dimensions.
- From the theoretical viewpoint, the research significance in the case of trading partner selection in the deputization systems is felt in the trading partner selection. It can be referred to a dynamic process in the deputization systems for accommodating the organization and facilitation of consistency with market changes, provision of customer's needs ([Shaikh, A., et al., 2018](#)), innovation, sensitizing the organization toward the opportunities that appeared in the market and provision of customer's satisfaction and facilitation of patterning ([Fernández-Monroy, M., Martín-Santana, J. D., & Galván-Sánchez, I. 2018](#)).
- From the viewpoint of being applicable in the first step, the researcher's studies reveal that so far, no considerable effort has been made in the private insurance companies in the case of presentation of a local model for designing the trading partner selection pattern in the deputization systems. The existence of the knowledge gap in the case of deputization in the private insurance companies of Iran is of special considerable importance. The theoretical gap existing in the selection of trading partners of private insurance companies can be considered as a serious issue by answering the following questions: what is the appropriate pattern for the trading partner selection in the scoring systems in the private insurance companies? What are the structures, dimensions, and modifiers of this model? The study of related literature reveals that no research has been done in the case of selection of trading partners of deputization systems in the private insurance companies and it is regarded as one of the most ingenious study domains.

RATIONALE OF THE STUDY AND OBJECTIVE OF THE STUDY

Therefore, concerning the previously mentioned discussions about the significance of the research subject and necessities, it seems necessary to research the presentation of the model for the trading partner selection by regarding its comprehensiveness and integration. It ultimately paves the way for applying the trading partner in the scoring systems based on the comprehensive recognition of structures and dimensions of deputization systems. So the researcher [s] aimed to develop a model for selecting a business partner in agency systems based on the method of the adaptive neural-fuzzy system

LITERATURE REVIEW

Although the selection of a trading partner in the scoring systems is limit in terms of number and rang, but the studies done in the case of scoring right have revealed the significance and use of extensive criteria of trading partner selection. The early studies have inclined to study the selection from the perspective of scoring right. For instance, [Jambulingam, T., & Nevin, J. R. \(1999\)](#) perceived in their multicasting studies in the United States that the efficiency of conventional relations could be improved by applying appropriate selection criteria. Although the researchers perceived that the financial affordance, experience, managing skills, demographic properties, and attitude toward business are the criteria used for the monopoly granting, but they concluded that the attitude toward scoring right is of special importance in comparison to the

other traditional criteria. In another study, [Doherty, A. M., & Alexander, N. \(2004\)](#) recognized that the scorers in the retail pedlary section of England evaluate a number of criteria such as the international financial consistency and the personal attitudes and characteristics of the franchisees. The writers concluded that the "appropriate emotional effect" (p.1224) among the partners is of special importance in addition to the other used criteria. A similar conclusion was done by [Clarkin, J. E., & Swavelly, S. M. \(2006\)](#) in a multi-sectional study of North America that reveal that while the scorers more use the financial criteria, but the attitude and personality are of important factors in the process of trading partner selection.

In contrast, the other researchers show considerable trust in what [Jambulingam, T., & Nevin, J. R. \(1999\)](#) have regarded as the traditional criteria. [Choo et al. \(2007\)](#) studied about the enfranchisement of fast foods in the United States in Singapore and revealed that the scorers have used three criteria for the selection of trading partner: financial affordance for the institution and development of the brand, access to salient estates and real estates and local knowledge for consistency of trading mark with regard to the market. Accordingly, [Hsu, P. F., & Chen, B. Y. \(2008\)](#) concluded that the commercial and financial ability is the most important selective criterion used by the international peddlers in Taiwan.

Although this matter has not been recognized by the researchers of the scoring domain, these studies disclose the use of duty (or traditional) criteria related to the trading partner. [Geringer, J. M. \(1991\)](#) has prepared a typology to represent the concept of the wide spectrum of the criteria specified in the strategic unity and the selection of a common investment partner. This typology subsequently has been used by the scoring researchers for recognizing the used selection criteria ([Doherty, A. M. 2009](#); [Brookes, M., & Altinay, L. 2011](#); [Altinay, L. 2006](#)). The work-related criteria include the operational skills and the required recourses of strategic unity for the competition ([Tatoglu, E. 2000](#)). In contrast, the trading partner-related criteria include the variables, which are related to the personality, culture, and history of special partners ([Glaister, K. W., & Buckley, P. J. 1997](#)). Table 1 represents the difference between the duty- and trading partner-related criteria.

Table 1: criteria related to duty and trading partner in trading partner selection

Duty criteria	Trading partner criteria
Financial recourses, access to capital	Past evaluation
Materials, natural recourses	Partner's status
Technology recourses	Partner's reputation
Market knowledge, local culture	Trust between superior management teams
Distribution channels, connection with wholesalers	Organizational culture
Product	Size and structure of the trading partner
Production processes knowledge	Trading partner's recourses
Access to manpower	Trading partner's marketing systems
Access to supervisory licenses	-

Source: ([Al-Khalifa, A. K., & Peterson, S. E. 1999](#); [Tatoglu, E. 2000](#); [Altinay, L., Brookes, M., & Aktas, G. 2013](#))

[Altinay, L. \(2006\)](#), despite the few numbers of scoring right researchers who used Geringer's typology, has commonly used the duty- and trading partner-related criteria. This researcher revealed that both two groups could be effective in the trading partner selection. The trading- partner criteria specify that whether the potential franchisees have the background and ability to the fulfilment of scoring goals or not. Meanwhile, the duty-related criteria specify that whether the franchisee can do a work as well ([Altinay, L., Brookes, M., & Aktas, G. 2013](#)).

The neural networks are regarded as the simple but powerful and flexible materials for the anticipation when they have sufficient data for test, sufficient options of input-output samples, specific number of latent units, and optimal calculating recourses. These networks have recognized advantages. For instance, every non-linear function can be estimated by them. Furthermore, these networks can solve the problems when the input-output relations have not been defined as well and they cannot be easily calculated; since the neural networks are data-centred. Especially, the multi-layer feedforward neural networks are proper for the prediction. They can estimate the non-linear functions as well for the latent layer and external layer respectively but using the Sigmund functions and linear functions ([Pousinho, H. M. I., Mendes, V. M. F., & Catalão, J. P. D. S. 2012](#); [Catalão, J. P. D. S., et al., 2007](#)).

Like the neural networks, the fuzzy logic system is non-linear planning from the input vector to the scalar output. However, this system can manage numerical amounts and linguistic knowledge. Generally, the fuzzy logic system includes four parts: fuzzification, fuzzy rule base, inference method, and defuzzification. The fuzzification is the process of converting a specific input variable to a fuzzy variable, while the membership function determines the variable's degree of dependence on an assumed property. The fuzzy rules have "IF-THEN" form can be derived from the numerical data or specialized linguistics. Mamdani and Sugeno's inference are two main inference mechanisms ([Shoorehdeli, M. A., et al., 2009](#)). Mamdani's inference relates the fuzzy input sets to the fuzzy output sets based on the fuzzy rules; while Sugeno's inference relates the fuzzy inputs and specific outputs to each other ([Pousinho, H. M. I., Mendes, V. M. F., & Catalão, J. P. D. S. 2012](#)).

The Adaptive Neuro-Fuzzy Inference System (ANFIS) has been formed from the combination of neural networks and fuzzy logic. Therefore, the properties of the two methods can be used in a framework. ANFIS usually uses Sugeno's

inference system for the inference. Indeed, ANFIS is a forerunner network structure that includes five layers (Soltani-Fesaghandis G, Pouya A, Kazemi M, Najj Azimi Z. 2016). Figure 1 represents a simple structure of ANFIS.

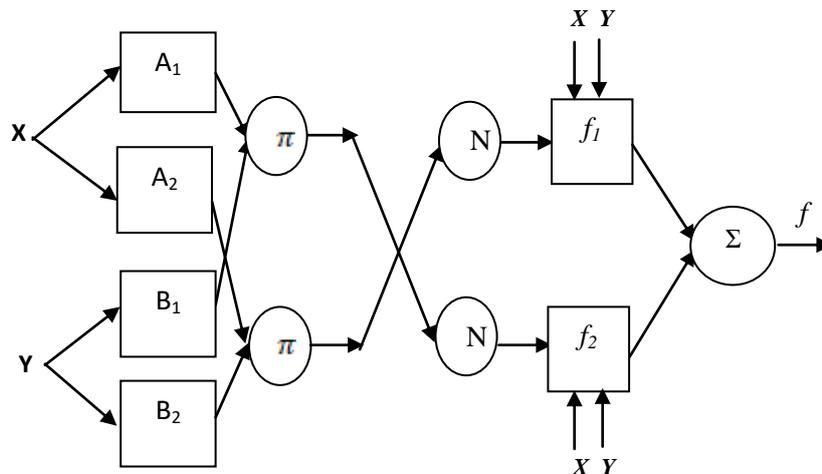


Figure 1: A simple structure of ANFIS with two inputs and one output

Source: (Soltani-Fesaghandis G, Pouya A, Kazemi M, Najj Azimi Z. 2016)

It is assumed that the studied system includes two x and y inputs and one z output and the rules of this system are (Soltani-Fesaghandis G, Pouya A, Kazemi M, Najj Azimi Z. 2016):

Rule1: if x is A_1 and y is B_1 then $f_1 = p_1x + q_1y + r_1$

Rule2: if x is A_2 and y is B_2 then $f_2 = p_2x + q_2y + r$

Layer 1: in this layer, the membership degree of input nodes to different fuzzy intervals as specified by the membership function.

$$O_{1,i} = \mu_{A_i}(X), i = 1, 2 \quad (1)$$

$$O_{1,i} = \mu_{B_{i-2}}(X), i = 3, 4 \quad (2)$$

Layer (2): in this layer, every node calculates the activity degree of every rule.

$$O_{2,i} = w_i = \mu_{A_i}(X) \times \mu_{B_i}(y), i = 1, 2 \quad (3)$$

Layer (3): in this layer, the activity degree of ith rule is normalized as following:

$$O_{3,i} = \bar{w}_i = \frac{w_i}{\sum_{i=1}^2 w_i}, i = 1, 2 \quad (4)$$

Layer (4): in this layer, the output of every node is equal to:

$$O_{4,i} = \bar{w}_i f_i = \bar{w}_i (p_i x + q_i y + r_i), i = 1, 2 \quad (5)$$

Layer (5): in this layer, the final output amount, which is the sum of outputs of layer nodes, is calculated as the following:

$$O_{5,i} = \sum_{i=1}^2 \bar{w}_i f_i \quad (6)$$

METHODOLOGY

The present research is an applied descriptive study. In this research, a pattern would be designed for the selection of trading partners (franchisee) in the deputization systems based on the adaptive neuro-fuzzy inference system. Finally, the best-designed system would be regarded as the pattern suggested for the trading partner selection. The statistic population of the research includes all the 98 agencies of Parsian Insurance Company of East Azarbayjan province based on the research subject, goals, and spatial domain. All these agencies would be studied. About the matter that the designed systems require the further number of samples to obtain the appropriate conclusion, the sample volume would be determined by using integer sampling. Accordingly, all the statistic population would be evaluated. With regard to the matter that the adaptive neuro-fuzzy system is a supervised system in which all the input and output data are required.

Therefore, concerning table 1, the input variables of this research are the duty- and trading partner-related criteria. For collecting the data of input variables, a questionnaire has been prepared and the managers of Parsian insurance company have been asked to evaluate every agency based on the factors related to every criterion by scoring them from 1 to 10. The mean score related to factors in every criterion is indicative of the score of that agency in terms of that criterion. The amount of sale of different policies has been used in the case of the output section and the amount of insurance sale as the success index of trading partner has been entered into the adaptive neuro-fuzzy system.

In this research, the indexes of Mean Square Error (MSE) and Root Mean Square Error (RMSE) in the form of relations (7) and (8) for evaluating the performance of every designed system (adaptive neuro-fuzzy inference system (ANFIS)).

$$MSE = \frac{\sum (y_i - \hat{y})^2}{n} \quad (7)$$

$$RMSE = \sqrt{\frac{\sum (y_i - \hat{y})^2}{n}} \quad (8)$$

In these relations, y_i is the amount of real data, \hat{y} is the value predicted by the model, and n is the number of data.

RESULTS

About the recognition of input and output variables, the ANFIS system was designed based on two input variables and one-output variables in MATLAB software. Based on different approaches of basic ANFIS system in MATLAB software, at first, the Grid Partition method (presumption method used in MATLAB for producing FIS (Fuzzy Inference System) has been used. This method creates a Sugeno kind FIS structure that is used as the primary condition (privatization of membership performance parameters). To continue, the Sub. A cluster (Clustering) approach has been used and the error of every model has been calculated based on the MSE and RMSE indexes in every stage. The structure of the primary network has been designed in the form of figure (2).

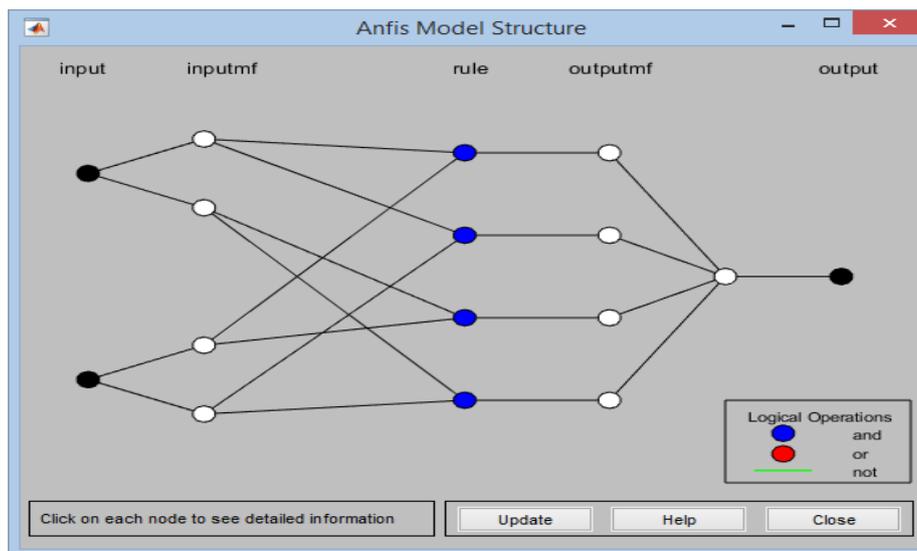


Figure 2: primary structure of network for trading partner selection

Source: (Author computation)

With regard to this matter that there is no confirmed relation in the network slicing method for determining the kind of membership functions and their number in every input, so the trial and error method has been used in this section for determining the membership functions kind, their number in every input and appropriate repetition number to achieve the answer. Five membership functions in triangular, trapezoidal, bell-shaped, Gaussian, and pi-shaped shapes have been used based on two parameters of membership function number and number of repetition for the trading partner selection. In the beginning, different membership functions have been implemented in every input and ten repetitions. In the research, 70% were allocated to the train and 30 percent to test the system.

The results related to the performance of ANFIS system for triangular membership functions in every input and 10 repetitions in two groups of test and train data based on the error indexes have been represented in figures (3) and (4).

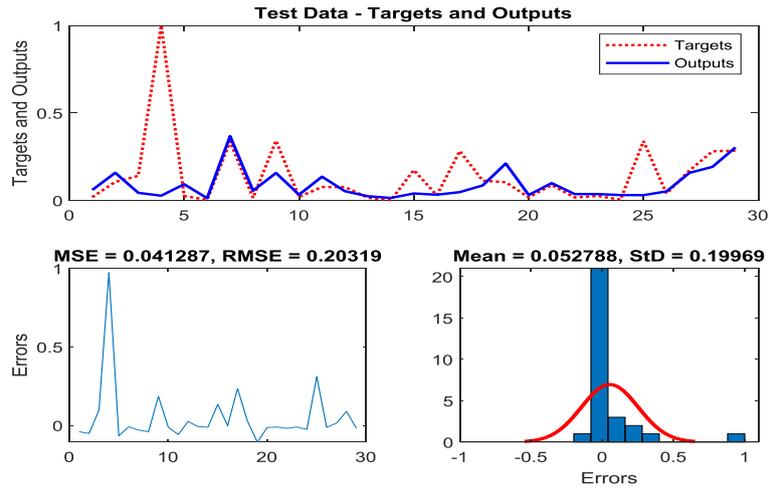


Figure 3: Results related to errors of test data in triangular membership functions with 2 membership functions and 10 repetitions

Source: (Author computation)

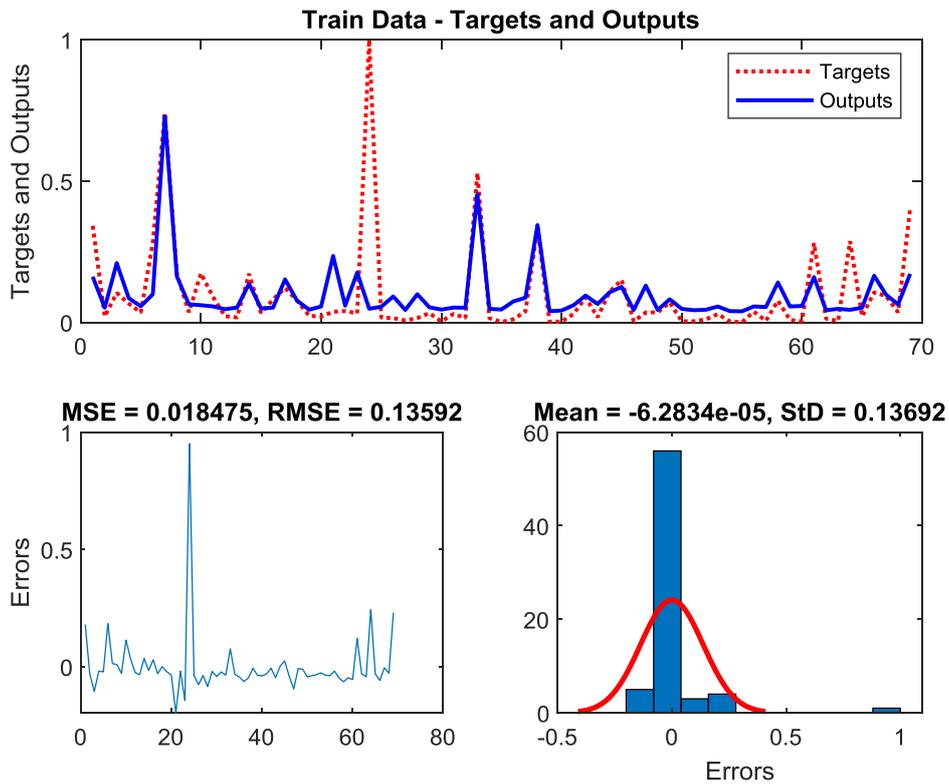


Figure 4: Results related to errors of train data in triangular membership functions with 2 membership functions and 10 repetitions

Source: (Author computation)

The results related to these findings have been summarized in the table (2).

Table 2: Summary of results of ANFIS system for triangular membership functions

Membership function type	MSE		RMSE	
	Train	Test	Train	Test
Triangular	0.01847	0.04128	0.13592	0.20319

Source: (Author computation)

The results of system designed for the selection of trading partner based on the triangular membership functions reveal that the mean square error (MSE) for the test data is 0.13127 with root mean square error (EMSE) of 0.36232. To continue, this has been done by the trapezoidal, bell shaped, Gaussian and pi- shaped membership functions with 2 membership functions in every input and 10 repetitions in the case of both two groups of test and train data. The results of system designed for the selection of trading partner based on the pi- shaped membership functions reveal that the mean square error (MSE) for the test data is 0.91555 with root mean square error (EMSE) of 0.12469 that has had better performance in comparison to the past membership functions. The results related to all the membership functions have been summarized in the table (3).

Table 3: Summary of results of ANFIS system based on different membership functions (2 functions and 10 repetitions)

Membership function type	MSE		RMSE	
	Train	Test	Train	Test
Triangular	0.01847	0.04128	0.13592	0.20319
Trapezoidal	0.04524	0.06852	0.21269	0.26176
Bell shaped	0.03897	0.04255	0.19740	0.20627
Gaussian	0.01725	0.02145	0.13133	0.14645
Pi- shaped	0.01025	0.01555	0.10124	0.12469

Source: (Author computation)

The results of the table (3) reveal that the best membership function is the pi- shaped one with 0.03716 MSE and 0.19279 RMSE. In figure (5), for instance, the membership functions obtained for the inference system of trading partner selection have been represented in one of the inputs.

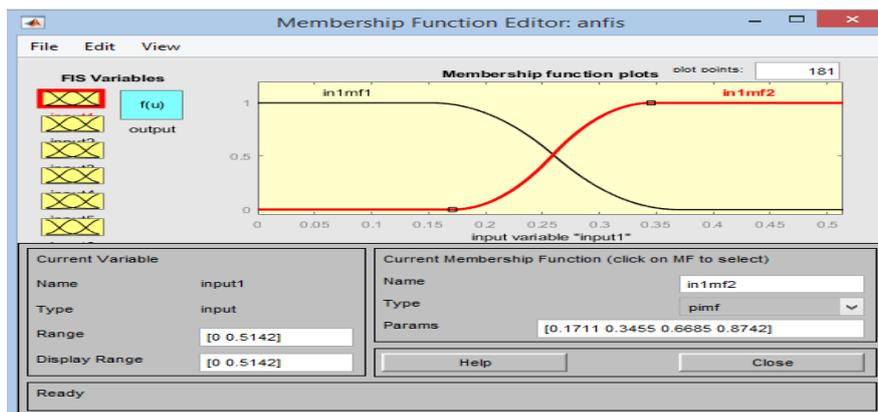


Figure 5: pi- shaped membership functions for inference system of trading partner selection

Source: (Author computation)

With regard to the results that the pi- shaped membership function is the most appropriate function, so, in the next stage, at first, the number of repetition was increased to obtain the answer with the same functions. The table (4) represents different numbers of repetition to obtain the answer based on the pi- shaped membership functions and two membership's functions in every input.

Table 4: Results of ANFIS system based on pi- shaped membership functions and different numbers of repetition (two functions)

Number of repetition	MSE		RMSE	
	Train	Test	Train	Test
10	0.01025	0.01555	0.10124	0.12469
20	0.00985	0.01425	0.09924	0.11937
30	0.00633	0.01375	0.07959	0.11726
40	0.02158	0.03240	0.14690	0.18002
50	0.02157	0.03139	0.14689	0.17717
60	0.02159	0.03855	0.14696	0.19635
70	0.02169	0.03938	0.14706	0.19845
80	0.02161	0.03976	0.14700	0.19941
90	0.01795	0.04405	0.13397	0.20989
100	0.01944	0.04507	0.13942	0.21231

Source: (Author computation)

The results of the table (4) reveal that the best performance of ANFIS system has been observed for the sogmoidal membership functions with 0.03139 MSE and 0.17717 RMSE in 30 times repetitions. After that, the amount of error has been increased by the increase of number of repetitions. The figures (6) and (7) represent the output of these results for the train and test data of the network.

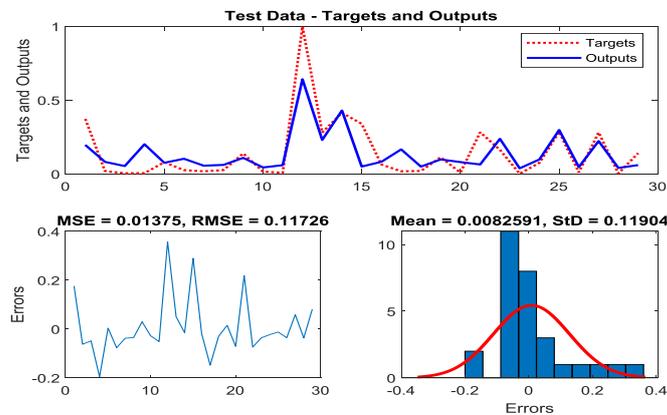


Figure 6: Results related to test data error in pi-shaped membership functions with 30 times repetition

Source: (Author computation)

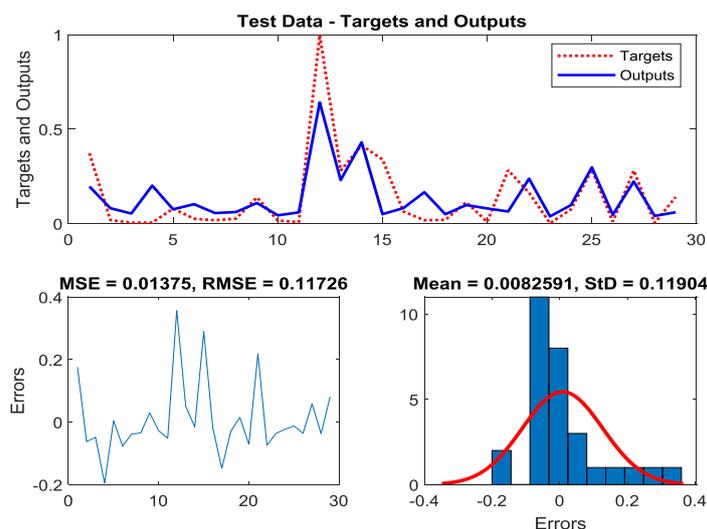


Figure 7: Results related to train data error in pi-shaped membership functions with 30 times repetition

Source: (Author computation)

In continue, the number of membership functions has been increased in every input. The results related to this section have been represented in the table (5).

Table 5: Results of ANFIS system based on pi-shaped membership functions and different numbers of repetition (two functions)

Number of repetition	MSE		RMSE	
	Train	Test	Train	Test
2	0.00633	0.01375	0.07959	0.11726
3	0.020891	0.05124	0.14454	0.22637
4	0.019282	0.09924	0.13886	0.31503
5	0.01555	0.28187	0.12473	0.53092
6	0.01237	0.70181	0.11121	0.83774

Source: (Author computation)

The results of table (5) indicate that the system error is increased and its performance is worsened by the increase of number of membership functions in every input, in such a way that the mean square error for test data in six membership functions is 0.70181. Accordingly, the system with pi-shaped membership function, 30 times repetition and two

membership functions in very input can be regarded as the best adaptive neuro- fuzzy inference system (ANFIS) with a network slicing approach in the trading partner selection.

DISCUSSION

The deputization in the insurance (agent or scorer) companies and especially the selection of trading partner (franchisee) is so important in this industry that all these companies (agent or scorer) have different branches around the country that have been supported by the agent (scorer). The business of insurance branches has dependent form due to dependence to the central insurance and it has been partially separated from the bigger set and the business expenditure has been divided among the under the coverage businesses and all the supports are accomplished by the central (agent or scorer) insurance that means the deputization. Accordingly, this knowledge gap and shortage increasingly necessitates the study of trading partner (franchisee) selection to take into account the trading partner selection for the recognition and study of the reciprocal relationship between the structures, dimensions and mapping the relations. It seems necessary to research the presence of a model for the trading partner selection by regarding its comprehensiveness and integration that ultimately paves the way for applying the trading partner in the scoring systems based on the comprehensive recognition of structures and dimensions of deputization systems.

The investigation of the trend of the researches done in the scientific information bases and international articles on the selection of business partner (license holder) in the agency-granting systems shows that the researches on the granting of the agency have been commenced with an intensity higher than that during early 1990; according to [Fernández-Monroy et al \(2018\)](#), the research on the granting of agency has been extensive and it is currently enumerated amongst the most important and most frequently referred research subjects. This is reflective of the scientific importance of the present study based on the trend information and statistics of the study subject.

Thus, [according to the scales of the proper selection ([Jambulingam and Nevin, 1999](#)), the evaluation of the financial stability, attitude and personal properties of the license-receivers ([Doherty and Alexander, 2004](#)), paying of attention to the attitude and personality ([Clarkin and Swavely, 2006](#)), consideration of the traditional scales ([Jambulingam and Nevin, 1999](#)), paying of attention to the financial power, access to the landed properties and estates as well as local knowledge ([Clarkin and Swavely, 2007](#)), financial and business ability ([Hsu and Chen, 2008](#)), selection of a common investing partner ([Geringer, 1991](#))], it can be concluded that the results and subject discussed in the aforementioned researches point to the agency-granting systems and no work has considered the details of selecting an appropriate business partner (license receiver) and designed a pattern for the selection of the business partner (license receiver). This research codifies the scales related to business partners as well as the criteria pertinent to duty with an approach to network division in the selection of the business partner with the least error in the selection of business partner in the agency-granting systems.

CONCLUSION

Most of the insurance companies so far did not evaluate exactly the franchisee in the trading partner selection due to the lack of appropriate indexes of franchisee evaluation. One of the main aims of the present research is to recognize the indexes of a selection of franchisee for the insurance companies to be able to provide the local indexes for the insurance companies especially the private ones. The managers of these companies can present the exact evaluation of the companies by regarding these indexes, accordingly select the trading partner and franchisee, and ultimately prevent the resource waste, which can cause the dissatisfaction of customers and decrease of brand credit. In this respect, the researcher, by regarding this subject and importance of deputization, has aimed to design a pattern for the selection of trading partner (franchisee) in the deputization systems based on the artificial intelligence methods. The results of this research compiled a model with minimum error for the selection of trading partner in the deputization systems. The mentioned model can help the managers in their decision-making as the decision support system.

LIMITATION AND STUDY FORWARD

Every research's performance is accompanied by certain problems and limitations that can be investigated from various perspectives. In the present study, as well, the researcher was faced with the common constraints, including 1) scarcity of the resources (books and articles) related to the study subject; 2) insufficient access to the insurance company's information; and, 3) non-familiarity of some managers with some concepts with the last constraint being expected to be lowered by the explanation of the concepts to some extent. The future researchers are suggested to investigate in their future studies the selection of the business partner in the other business and economic activities. It is also suggested that the other insurance companies should be studied in the further studies and other metaheuristic algorithms can be utilized in doing so. The future researchers are suggested to perform this research on Parsian Insurance Company in a periodical manner and compare the results with what has been found herein.

AUTHORS CONTRIBUTION

SeyedSina Sharifi, Alireza Pooya, Mostafa Kazemi, Azar Kaffashpoor.

S.Sh; collected the data, A.P; analyzed the results, M.K; wrote the paper, A.K; wrote the paper.

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