Empowering customers to purchase insurance portfolios based on artificial intelligence

Abstract

The main goal of this research is to design a model for empowering customers to purchase insurance portfolios based on artificial intelligence. The research method used is objective, applied, and descriptive-survey in terms of the method of collecting field data and in terms of the control of variables, and also because of the presentation of the model, it is an exploratory research. In this research, the insurance assets purchased by insurers in the insurance industry were first identified by reviewing previous researches. In the second step, by using the Delphi method, the determination and weighting of insurance assets in the portfolios of insurers was discussed with the help of experts in the field. In the following, according to the available documents and information collected using artificial neural network, a suitable model was designed for the purchase of insurers' portfolios in the insurance industry. The findings showed that the amount of sales of cooperative insurance customers, as well as the highest sales amount and at what point of time. Also, it is possible to identify the best-selling and profitable products and the customers from whom the most profits of the cooperative insurance customers have been obtained, and apply the necessary policies in the desired cooperative insurance.

Key words: portfolio purchase, insurers' investment, artificial intelligence

Introduction

In the current world, service industries play an important and fundamental role in the economic growth and development of countries, among which the role and position of the insurance industry as a supporting industry is not hidden from anyone. On the other hand, the increase in competition in the market of the insurance industry has made most managers of this industry think of a solution for a lasting presence in the business arena. Therefore, they have to find ways to achieve more customer satisfaction and loyalty, one of the ways to achieve this is to improve the quality of insurance services. Improving the quality of the organization's internal services leads to an increase in the satisfaction of foreign customers. Customers who are more satisfied with the organization express their positive experiences to others and thus become a means of advertising for the organization, which reduces the cost of attracting new customers. This article is especially useful for professional service providers, because their reputation and the expression of their advantages and positive points by other customers are very important for new customers. The current period is a period of rapid changes, and

various companies and organizations invest a lot. They do a lot in attracting customers' opinions, attention and satisfaction, and they are facing the most difficult competitive conditions that have never been seen in the rapid change of customers' buying patterns and customers becoming more knowledgeable and expert. Considering the issues of uncertainty and the risk and threat to the income of households and companies due to uncertainty about the future, turning to the insurance industry is becoming more intense every day, so that this industry, in addition to ensuring the security of economic activities and reducing uncertainty through the provision of insurance services; It plays a very important role in the mobility and dynamism of financial markets and the provision of investable funds. The discussion about insurance and economic growth seems necessary since, on the one hand, insurance is a financial institution that has an effect on strengthening the economic base of the society, and on the other hand, by creating security and confidence, it provides the basis for the expansion of production and service activities. One of the main goals in explaining the objective function in insurance companies is to have the necessary liquidity to fulfill obligations. This issue is even effective in customer satisfaction and marketing of insurance companies. However, investing in assets with high liquidity causes a decrease in the expected return and on the other hand, it eliminates the risk of delay or non-fulfillment of obligations (Quijen and Yugo, 2017). As a result, an asset and liability management framework should be used to optimize the investment portfolio of insurance companies (Lee, 2010).

A fundamental problem in insurance is the investment of insurance customers according to their available income. Investment strategies of insurance consumers are chosen without using the information of the processes of the insurance agents, only using the past information about risky assets (Hatta and Shiv, 2018; Hatta, 2020). The purpose of predicting and providing related insurance products and services to customers is to provide the same return and investment for people in their portfolio. This can be done for both the main customers and potential customers. Customers are constantly changing the way they choose to purchase insurance, and it cannot be assumed that customers will always communicate with insurance agents and experts for this purpose. The different level of knowledge of each insurance agent to offer different products can affect the customer's experience in choosing. The information about the current insurance customer portfolio can be used to predict new products and services more fully or to make a better choice for the customer. For new customers, external data and recently collected data can be relied upon to predict a new set of products and services for the customer portfolio (Qazi et al., 2020). The diversity of different types of products and services in the insurance industry has made insurers face

many problems and issues in choosing the optimal type of investment. And another issue in Iran is that many insurers consider insurance payments as an expense and do not see it as a good investment. Therefore, providing a suitable model of the investment portfolio and presenting it to policyholders and managers of the insurance industry may solve many of the issues raised in this connection. As an important source of financing and investment, insurance plays an important role in the country's economy. Therefore, investing from capital and technical reserves is one of the important duties of the company.

The purpose of predicting and providing related insurance products and services to customers is to provide the same return and investment for people in their portfolio. This can be done for both the main customers and potential customers. Customers are constantly changing the way they choose to purchase insurance, and it cannot be assumed that customers will always communicate with insurance agents and experts for this purpose. The different level of knowledge of each insurance agent to offer different products can affect the customer's experience in choosing. The information about the current insurance customer portfolio can be used to predict new products and services more fully or to make a better choice for the customer. For new customers, external data and recently collected data can be relied upon to predict a new set of products and services for the customer portfolio (Qazi et al., 2020). The diversity of different types of products and services in the insurance industry has made insurers face many problems and issues in choosing the optimal type of investment. And another issue in Iran is that many insurers consider insurance payments as a cost and do not see it as a good investment. Therefore, providing a suitable model of the investment portfolio and presenting it to policyholders and managers of the insurance industry may solve many of the issues raised in this connection.). Insurance also plays an important role in the country's economy as an important source of financing and investment. Therefore, investing from capital and technical reserves is one of the important duties of insurance companies. Investment enables insurance companies to cover their probable committed losses and earn a considerable profit (Hao and Hao, 206). The insurance industry, apart from its special function of insurance and compensation, can play an important role in the economy as a source of financing and investment. In these institutions, choosing investment plans is very important; Because decision-making in the field of investment is subject to complex factors (Hatta and Shiv, 2018; Hatta, 2020.(

In the current dynamic and competitive environment, the success of any organization in order to increase and maintain the market share and improve the competitive situation depends on identifying the factors that create a competitive advantage. Gaining competitive capabilities in today's world has become one of

the main challenges of various industries (Sedari and Les, 2001). Over the past few years, the insurance industry (in the world) has undergone a series of changes caused by financial reforms, advances in information and communication technology, globalization of financial services, and economic development. These changes have had a significant effect on the efficiency, productivity change, market structure and performance of the insurance industry. It is expected that the implementation of the policy of liberalization, privatization and increasing the number of insurance companies will increase the efficiency, increase the competitive power of economic enterprises, and finally, by increasing the economic efficiency and sustainable economic growth, it will cause the economic well-being of the general public. In such conditions, the competition in insurance companies to provide their services to customers has increased and it is necessary for these companies to reduce their costs and improve the quality of their services in order to retain and attract customers (Sahat et al., 2014). The insurance industry is also one of the industries that has not been far from paying attention to this issue. In order to gain more share of the target market, insurance companies are increasingly increasing their agencies. Therefore, the level of ability of agencies is very decisive in profitability. In order to promote this industry, insurance management has paid special attention to investing in various resources (Maskin Nawaz et al., 2016.(

The insurance industry is very important in maintaining the rights of policyholders and achieving economic growth and development of the country due to its potential power in providing suitable fields for investments. Currently, insurance companies are in a competitive and complex situation caused by the globalization of markets, customer orientation, introduction of new technologies, etc. (Fajelstad and Katlis, 2006). On the other hand, the pressure caused by globalization, the revolution of communication and information technology, the increase in the level of expectations of customers and the change in their behavior pattern when facing insurance companies, as well as the increase in the number of competitors in the current era, the concept of competitiveness and efforts to gain a competitive advantage for Insurance companies have become a necessary and vital issue (Kremer and Roeder, 2017). Therefore, insurance companies should find ways to adopt different strategies compared to others to provide services and investment to customers and gain a competitive advantage (Yasin et al., 2016). Based on the mentioned contents, the necessity of the current research is to design the purchasing model of insurers' portfolios in the insurance industry using artificial intelligence.

Many researches have been done in this field.

Khairi et al. (2016) in a research investigated the sudden fluctuations of stock value in the Tehran Stock Exchange market, relying on the preferences of investors and the quality of accounting information, and their research findings show that the quality of accounting information and investors' tendencies have a positive effect and They have significance on the sudden fluctuations of stock market value in Tehran Stock Exchange. Fallahpour et al. (2018), in a research for the active optimization of the stock portfolio using value at conditional risk, and the results of the research indicate that setting the total risk of the portfolio based on value at conditional risk leads to better efficiency in optimization. The stock portfolio is activated based on the post-test approach of reweighting and calculating the accumulated value of the stock portfolio.

Mazloumi and Natghi (2018) in a research entitled providing a model for the risks in Iran's insurance industry identified and presented a practical model of obstacles to the success of strategic management in Iran's insurance industry. Open coding of the interviews, 97 concepts were identified, and after classification, the strategic management risks of Iran's insurance industry in the form of: commercial (environmental) risks, organizational risks, operational (process) risks, technical risks, knowledge risks , human resource risks and event risks were identified. The validity of the designed model was confirmed through structural equation modeling.

Dang and Zheng (2019) conducted a study entitled "Optimal investment of pension plan under the constraints of short selling and portfolio insurance". The dual control method was used to solve the problem, and we derive the representations of the optimal wealth process and trading strategies in terms of the dual controlled process and the dual value function. We also perform numerical experiments and show how the S-shaped utility, short-selling constraints, and portfolio insurance affect the terminal's optimal wealth. Bridges et al. (2019) investigated and documented the annual perceived risk in life insurance and long-term health insurance in a research titled Insurance Risk: Choosing an Insurance Portfolio with Imperfect Markets. The results showed that non-payment risk significantly predicts insurance product ownership. If the products were considered risk-free, the value of annual insurance markets would almost double. Also, the risks significantly reduce the demand for insurance, and as a result, the costs of securities of the insurance subcategory are reduced.

Gerardi et al. (2021) conducted a research entitled "Portfolio similarity and liquidation of assets in the insurance industry". Our measure of portfolio similarity can be used by regulators to predict joint sales of any institution reporting property or securities holdings, making it a useful ex ante predictor of

divestment behavior during times of market stress. Baltotis et al. (2021) conducted a research titled "Energy Efficiency Insurance Risk Management in a Portfolio Context: A Statistically Diverse Approach". We show that energy efficiency insurance potentially replaces financial market instruments such as weather derivatives in diversifying property insurance portfolios. In summary, these three levels of diversification effects create an additional advantage for the introduction of energy efficiency insurances and may positively influence their market development.

Research implementation method

The research method used is objective, applied, and descriptive-survey in terms of the method of collecting field data and in terms of the control of variables, and also because of the presentation of the model, it is an exploratory research. In this research, the insurance assets purchased by insurers in the insurance industry will be identified by reviewing previous researches. In the second step, by using the Delphi method, the determination and weighting of the insurance assets in the portfolio of insurers will be done with the help of experts in the field. The Delphi method seeks to reach a general agreement in the opinions of experts. When applied to multi-dimensional, multi-objective and complex decision-making problems, the frequent repetition of time-consuming question-and-answer steps to reach a relative consensus of opinions is considered a major problem. The Delphi method was invented in the 1980s by Kaufman and Gupta to overcome existing shortcomings. The feature of this method is providing a flexible framework that covers many obstacles related to the lack of accuracy and clarity. In the following, according to the available documents and information collected using artificial neural network, a suitable model will be designed to purchase the portfolio of insurers in the insurance industry.

The statistical population of the research is for the analysis of experts and experts in the field of insurance who have studies and records in the field of disclosure. A sample of experts was selected to obtain a measurement tool that had the following characteristics:

A- Having experience in the field of insurance education and research

B - Having a history of insurance management

T- Having a long-term expert experience in insurance.

Sampling method in this research is sampling with maximum diversity of the type of theoretical or goal-based sampling. In this study, 20 people were selected as a sample in the initial interview.

The artificial neural network is similar to the human brain in two aspects:

-Information acquisition is done through the learning process by the network from the environment.

-Storage of acquired information through communication resistances within the unit, which are known as synaptic weights, is done by the neural network.

It is very clear that a neural network derives its computing power from two main sources: first, massive parallel distribution structure and second, the ability to learn and the ability to generalize as a result of learning (Hickin, 1999, p. 2). The procedure that is used to implement the learning process is called the learning algorithm, and in fact, it is a function in which the synaptic weights of the network are modified in order to achieve the desired goal.

Non-linearity

A neuron can be linear or non-linear, but the neural network, which is formed based on the internal connections of non-linear neurons, is non-linear. Also, the nonlinearity of the network can be caused by a certain type of distribution within the network. Boone's nonlinearity is a very important property, especially, if the physical mechanism that generates the input signals of the network is nonlinear in nature.

-Input-output mapping

One of the dominant paradigms in the field of learning is learning under the supervision of a teacher or supervised learning. In this way of learning, the synaptic weights of the network are reviewed and modified based on a set of educational examples and working examples. Examples include an input signal and a desired response.

-Adaptability

Neural networks have a structural ability to adjust their weights against environmental changes around them. In particular, networks that have been trained to operate in a specific environment will easily be able to retrain themselves to operate in changing operational environmental conditions. In addition, in unstable operational environments, the neural network can be designed in such a way that it adjusts its synaptic weights in a timely manner.

-Documented answer

In the field of data classification, a neural network can be designed in such a way that, in addition to selecting the desired model, it also obtains the necessary information about the validity of the decision taken. This recent information can

be used to reject ambiguous patterns and improve the classification performance of the network.

-contextual information (depends on clues)

Knowledge is created by the macro structure and active state of a neural network. Each neuron in the network is potentially affected by the activity of other neurons in the network. As a result, contextual information is intrinsically related to the neural network.

-Fault tolerance

A neural network has the ability to withstand errors and is still able to perform powerful calculations when its performance is degraded under adverse operating conditions. For example, if a neuron or set of connections is damaged, the network is able to remember the damaged pattern. However, due to the distributed nature of the information stored in the network, damage will be able to affect the performance of the network and degrade it if it is of a high extent.

-Ability to implement VLSI

The parallel nature of a neural network leads to an increase in the speed of network calculations in certain activities. This feature enables the neural network to implement very large-scale integrated technology. One of the major advantages of VLSI is providing tools for acquiring complex behaviors in highly hierarchical situations.

-Sameness of analysis and design

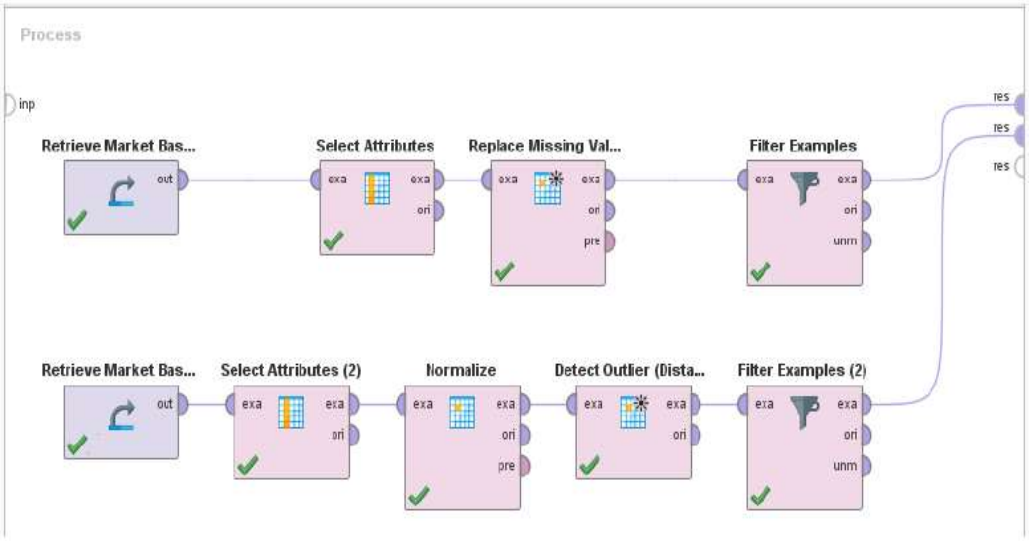
Neural networks are mainly used as information processors. In this case, the same principles and symptoms are used in all the application areas of the neural network.

-Neurobiological similarity

The design of a neural network is inspired by the human brain, which is actually a biological evidence for the claim that not only is error-tolerant parallel processing possible, but it is also fast and powerful. Neuroscientists use (artificial) neural networks as a research tool to interpret the phenomenon of the brain and nerves (neuro-biological) and on the other hand, engineers and specialists in applied sciences use the epistemological field of neurology to create ideas. They examine new ways to solve very complex problems that traditional technologies are unable to solve.

The information used in this research work includes 4245 exchanges and 860 samples from the shopping basket of cooperative insurance customers. . By

providing high-quality methods of data algorithms in order to predict and recognize hidden rules or patterns in the shopping cart, in order to formulate consumer behavior strategies, k-Means and k-Medoid clustering algorithms have been used due to data clustering. and then Apriori and Fp-growth algorithms were used to identify association rules in data analysis and to identify the relationship between the purchase of clustered products. Rapidminer software was used to implement the data mining process in this research. In this section, the process of pre-processing the information is finished and the information set is available, cleaned and used to implement the algorithms of association rules.



k-Means and k-Medoid can be mentioned as the most important unsupervised algorithms that can be used to classify products. Therefore, after the data pre-processing stage, the operators of these two algorithms are used to categorize the cooperative insurance products so that the clustering of the products can be done more accurately. These algorithms are looking for which insurances of the cooperative insurance products are related and the dependence between the products can be visually visible. The work process is shown in Figure (3.(

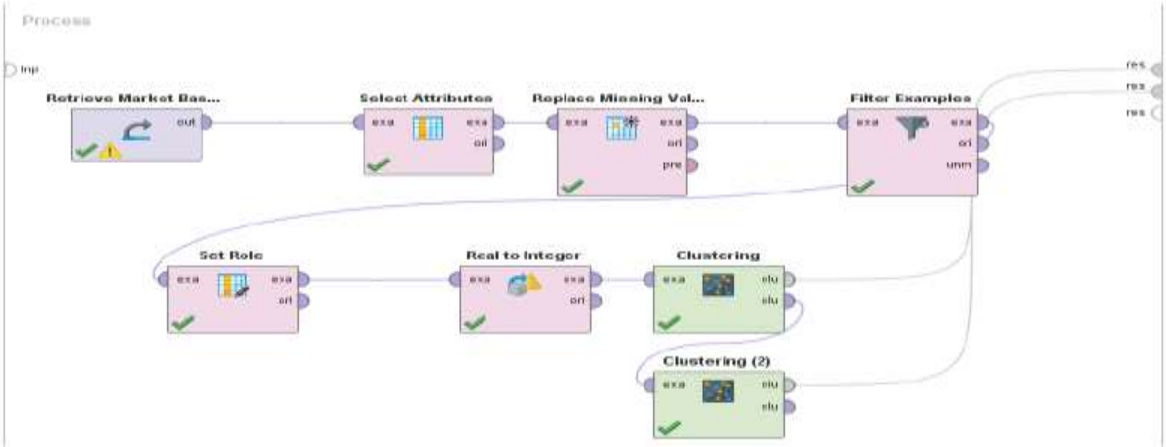


Figure 3- k-Means and k-Medoid clustering algorithm

By determining the value of K, the number of clusters desired by the researcher was determined, which was divided into multiple clusters based on the K value of the selected feature, the output of which can be seen in Figure (4).

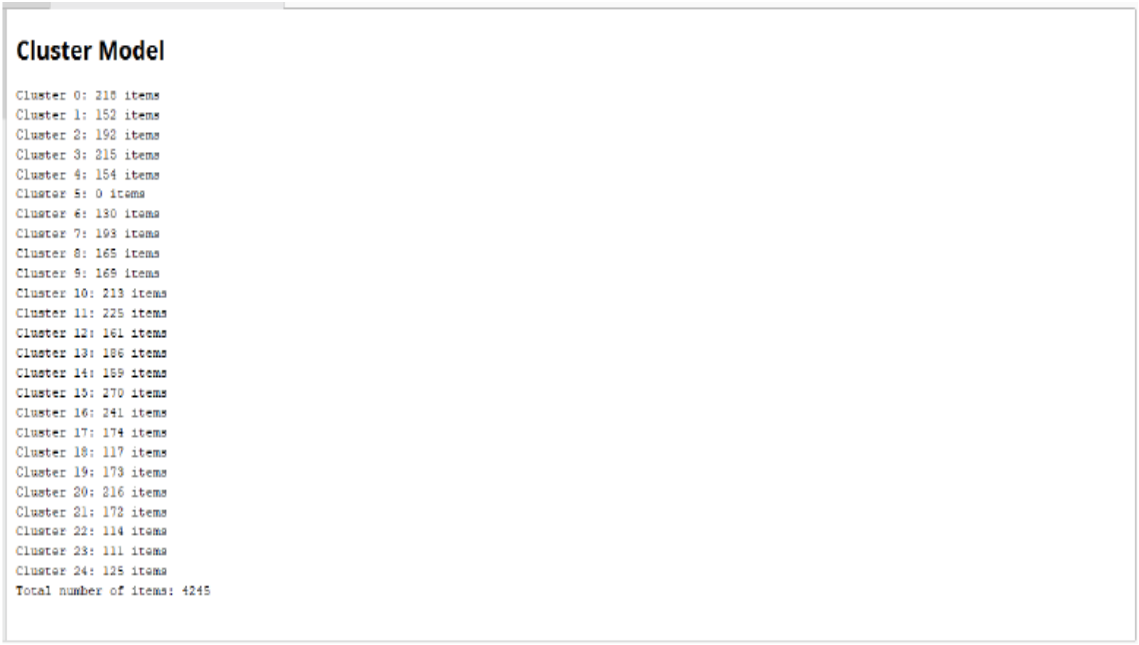


Figure 4. Defined clusters in the k-Medoid algorithm

In the output obtained from this model, the obtained clusters can be seen in more detail and the details related to cooperative insurance products can be seen. Figure (5) also shows the clustering of cooperative insurance products in the form of a diagram, where you can see the products in each of the selected clusters on the right side of this window.

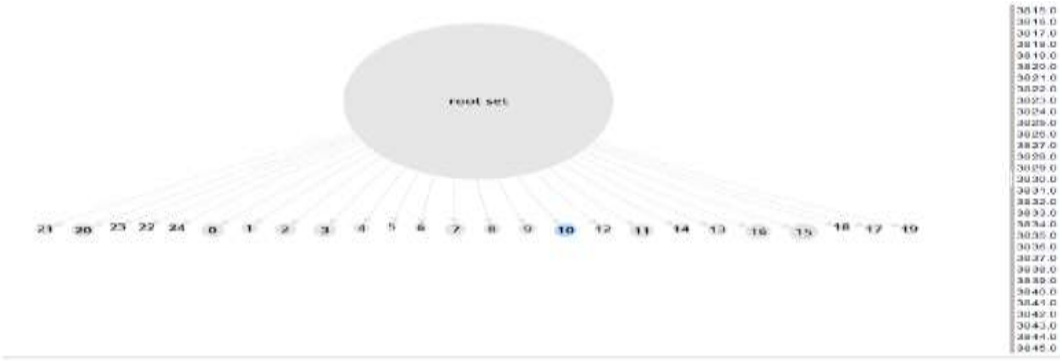


Figure 5. The resulting graph of k-Medoid

In this part of the research, the classification operation was done using the decision tree, and also to calculate the support values of the products, you can use the Naive Bayes algorithm, and in order to display the rules, you can use the rule introduction algorithm. In order to perform this different operation, we have used

the model presented in Figure (6). Hence, it is possible to obtain the relationship, dependence of products and customers and other information.

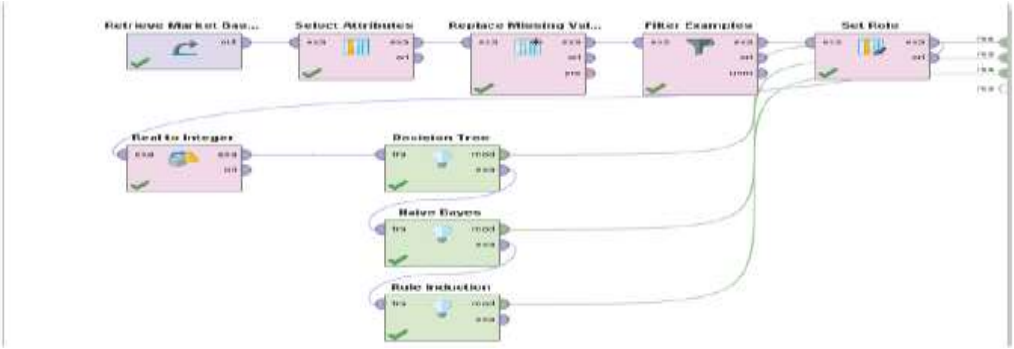
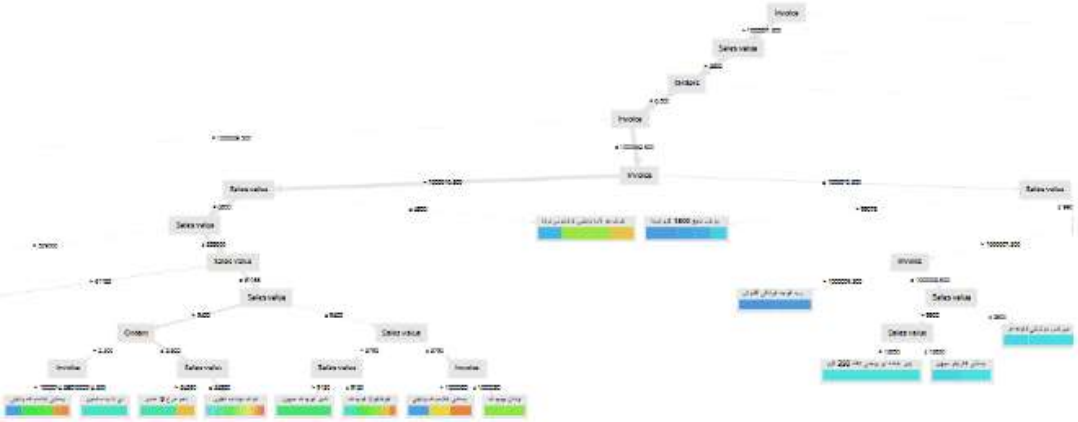


Figure 6- Performing the desired process in the field of shopping cart analysis

The output of the modeling implemented in Figure (6) can be seen in Images (7)



The model used in the data set is highly accurate and shows the useful rules resulting from this research.

Analysis of customers' shopping carts

At this stage of the research, the goal is to convert the transactions in the database into individual shopping carts of each person, so that it is possible to analyze the shopping carts associated with each customer. In RapidMiner's software environment, to do this, a wider analysis can be provided, in the first place, we determine how many insurance products are purchased in the shopping basket associated with each customer and how much each customer purchased from the product. or in other words, how much is the profit obtained in the total purchases made by the customer. It is also possible to determine what products are available in each customer's shopping cart, in line with which the rules of the association and the hidden patterns of customers and purchased products can be understood.

The implementation of this model in the Rapidminer software can be seen in Figure 8. .

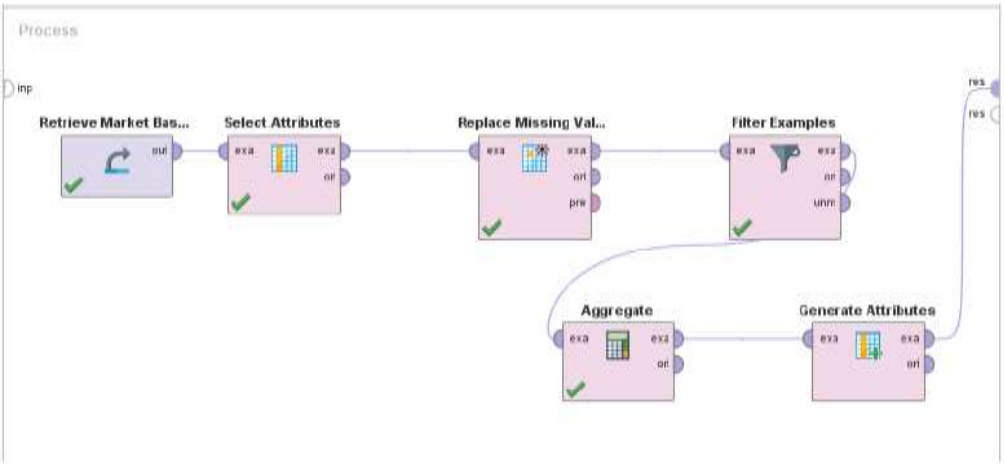


Figure 8. Customer shopping cart analysis model

In this stage of data analysis, from the Rapidminer software, we define the features on which we intend to create rules, and by using the Generate Aggregate operator, rules and policies can be created. Determined the necessary to identify profitable customers.

By using the information collection of Cooperative Insurance customers, in addition to the surveys, we have conducted broader analyzes in order to improve Cooperative Insurance customers and have achieved useful and very appropriate results. Among other things, we have identified and checked the best-selling and profitable products for cooperative insurance, the amount of profit obtained from each shopping basket in specific time ranges. Examples of the analyzes resulting from the shopping cart review can be seen in the form of a chart.

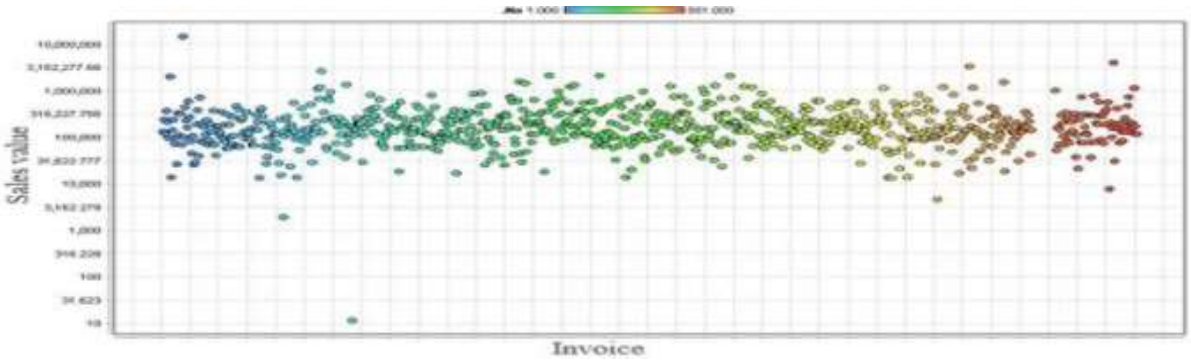


Figure 9. Checking the amount of sales and profitable customers in cooperative insurance

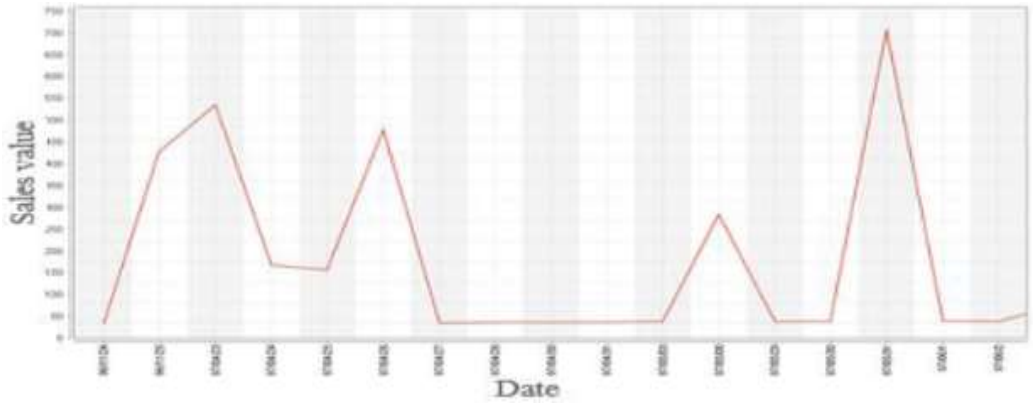


Figure 10. Checking the amount of sales in different time periods in cooperative insurance

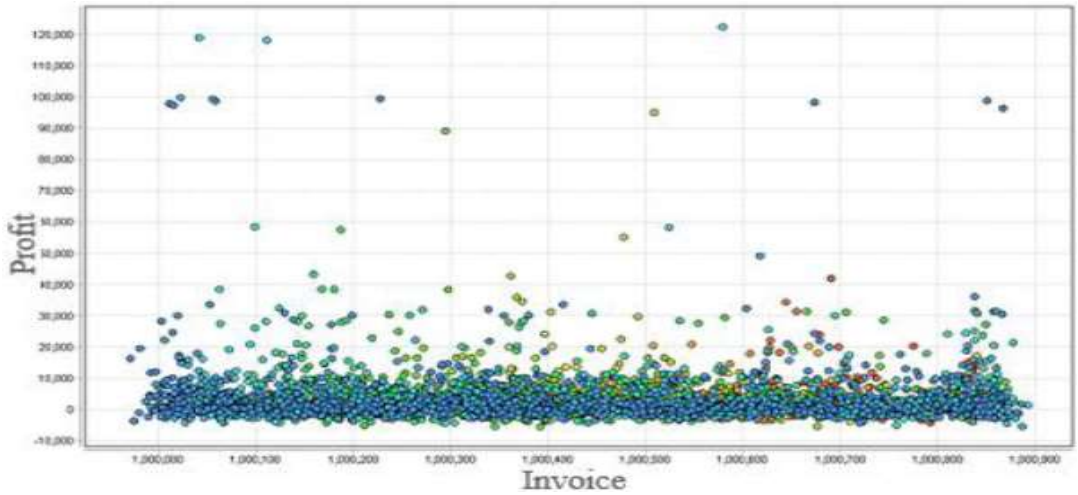


Figure 11. Investigating the amount of profit of customers in cooperative insurance

According to the results obtained, it has been determined that the amount of sales of cooperative insurance customers and also the highest sales amount and at what point of time. It is also possible to identify the best-selling and profitable products and the customers from whom the most profit of the cooperative insurance customers has been obtained, and apply the necessary policies and policies in the desired cooperative insurance.

Discussion and conclusion

Insurance, as one of the important and basic tools in today's civilized world, plays a significant role in reducing risk and providing financial and mental security. The insurance industry is one of the main sectors in the field of financial institutions and its penetration rate is one of the economic development indicators of any society. Insurance is one of the useful tools of risk management to provide peace and comfort to the people of the society. The insurance sector has its own special place as a factor for development in every country. The collected financial

funds have their own purpose and can be reserved for a certain period of time to realize and fulfill their real goals. With the fact that these funds accumulate from the impact of regular monetary circulation. Insurance is one of the most important tools invented to prepare for facing threats. Undoubtedly, insurance is one of the greatest achievements of developed human life, which has proven its efficiency in many ways. The insurance industry is also one of the most important sectors providing long-term financial resources and also due to its risk distribution role. It can play an important role in the development of the business environment of each country. Every business is exposed to risks that may impose heavy costs on it. The insurance industry can contribute to the sustainability of businesses through risk coverage. Insurance companies are considered one of the most important service companies in any country, which play a significant role in the economy of each country. Therefore, the development of market share by insurance companies is vital in the country's economy. However, the weakness in providing insurance services in the past few years has caused a frequent decrease in customer satisfaction and loyalty, as well as an increase in customer complaints. Customers facing poor service has caused the loss of customers who are above the average level of dissatisfaction, and this issue has caused damage to the performance of insurance companies in the market.

During the last few years, with the increase in the number of private insurance companies, the competition in the insurance industry has increased significantly. Considering the spending of advertising expenses to grow the market share by the insurance companies, many of them have been unsuccessful in this field. Weakness in providing insurance services in the past few years has caused a frequent decrease in customer satisfaction and loyalty, as well as an increase in customer complaints. Customers facing poor service has caused the loss of customers who are above the average level of dissatisfaction, and this has caused damage to the performance of insurance companies in the market. Receiving high premiums, lack of public awareness of the functions Insurance, the inadequacy of supplies provided by insurance companies, the imposition of unilateral conditions and the provision of traditional insurance to people, the existence of cumbersome bylaws and regulations requiring compliance with fixed rates and avoiding discounts based on the approvals of the Supreme Council of Insurance. , are among the challenges that have led to a decrease in insurance sales. Although the insurance industry in Iran has grown appreciably over the past decade, it still hasn't taken a deep look at the basic needs of its customers as it should.

The insurance industry can play an important role in the economic development of the country with a wide range of human resources and a wide network of branches, agencies and other insurance agencies. This industry is one of the sub-

sectors of the financial market, which has extensive side effects in other markets and must guarantee the health and survival of economic movements. Services are among the fastest growing sectors in developing countries, with However, in these countries, less attention is paid to issues related to services. In fact, due to the superiority of the seller's market conditions in the developing economy, studies related to the service category have been neglected. Although the insurance industry in Iran has grown appreciably over the past decade, it still has not paid enough attention to the basic needs of its customers, and with the increase in the number of insurance companies, the competition between them has also increased significantly, and consequences such as a decrease It has resulted in sales and market share for these companies.

Based on this, two roles can be considered for the insurance industry in the development of the business environment. The insurance industry has a very important role in creating the required safe environment, but the proper performance of this role requires the further development of the insurance industry and the increasing number of insurers. . On the other hand, one of the main factors affecting the decision to buy an insurance policy is its price (premium). Therefore, determining the appropriate insurance premium in such a way that both significant customers in terms of number tend to buy insurance policies and justify the activity of the insurance company from an economic point of view; The most important issue in the insurance markets. In a situation where there is (perfect) competition among the insurance companies in the market, demanding insurance premiums at a level beyond the equilibrium amount will cause the loss of customers of the insurance company. On the other hand, if the insurance company, the right If he adjusts his received insurance at a level lower than the equilibrium premium, he will incur losses in the initial stages of the activity and will leave the market. Therefore, trying to calculate the appropriate premium should be at the top of the goals of the insurance company officials.

The cost of compensating some of these risks is not so high compared to the financial capabilities of individuals and institutions, and they themselves can bear such damage when it occurs, but a significant part of these accidents are so damaging that the normal course of life and The usual flow of economic and social activities is faced with serious disruption and sometimes subversive women. If a mechanism is not thought of to deal with this phenomenon, while it disrupts the normal life of families and employees of institutions active in the field of production and service to the society, it can cause fundamental damage to economic growth and development at micro and macro levels. and the social of the countries as well. The insurance industry provides a suitable mechanism to resolve these instabilities and disruptions in people's lives and economic and

social activities, while in this way, it also plays a very decisive role in equipping investment resources for the economy of countries. plays Therefore, insurance leaves an undeniable and decisive impact on the economic growth and development of societies by creating peace, confidence and life expectancy and low-risk activity for citizens and economic activists on the one hand and equipping investment resources on the other hand. Insurance is a solution that transfers risk to a party that has a relative advantage in risk. In the typical example of insurance, the risk-taker is willing to pay a fixed price to a less risk-averse insurer or a risk-diversified insurer, who is willing to accept the risk at that price. Since both parties agree on the contract, the situation of both will be better. The insurance industry as a service sector has a compensatory and supportive role in the economy of any country. The success of this industry is a motivation and stimulus for other industries and increases the efficiency of companies, and in fact it can be claimed that in the shadow of competition and drastic changes in the economic field, the presence of efficient supporting industries in that field is one of the most important competitive advantages of countries. is considered It is suggested that cooperative insurance managers always take into account the changing tastes of customers in order to provide new services, so that new services are provided according to the tastes of customers in such a way that the services received by customers are at the same level or higher than customer expectations. , to increase customers' perception of service quality. In order to strengthen the mental image of the customers, it is suggested that the cooperative insurance managers consider progressive discounts for the customers who use more insurance services than other customers and buy various insurances, and if the customers' purchases in one period exceed the limit. If it goes beyond that, consider other benefits such as free third party insurance for one year.

 It is suggested that Cooperative Insurance should be as careful as possible in providing flawless services, so as not to disturb the trust of the customers, because due to the intense competition in this industry, the smallest mistake in this case will cause the customer to turn away and lose loyalty. Customers will decrease. Therefore, if insurance companies pay enough attention to this category, this factor can strengthen word-of-mouth advertising among customers.

Resources

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