



---

**Consumer Behavior Modeling:  
Fuzzy Logic Model for Air Purifiers Choosing**

OLEKSANDR DOROKHOV<sup>1</sup>, LIUDMYLA DOROKHOVA<sup>2</sup>, MILICA DELIBASIC<sup>3</sup>,  
and JUSTAS STREIMIKIS<sup>4</sup>

<sup>1</sup> Assoc. prof., Kharkiv National University of Economics, Kharkiv, Ukraine

<sup>2</sup> Assoc. prof., National Pharmaceutical University, Kharkiv, Ukraine, e-mail: aleks.dorokhov@meta.ua

<sup>3</sup> Assoc. prof., PIM University of Banja Luka, Bosnia and Herzegovina

<sup>4</sup> MSc, Lithuanian Institute of Agrarian Economics, V. Kudirkos g. 18, Vilnius 01113, Lithuania,  
e-mail: justas.streimikis@gmail.com

---

**ARTICLE INFO**

Received September 02, 2017

Revised from October 12, 2017

Accepted November 22, 2017

Available online December 15, 2017

---

**JEL classification:**

C69; C88; D11; D12; D81; D89.

**DOI:** 10.14254/1800-5845/2017.13-4.5

**Keywords:**

consumer behavior,  
fuzzy modeling,  
air purifiers choosing,  
buyer preferences,  
household products.

---

**ABSTRACT**

At the beginning, the article briefly describes the features of the marketing complex household goods. Also provides an overview of some aspects of the market for indoor air purifiers. The specific subject of the study was the process of consumer choice of household appliances for cleaning air in living quarters. The aim of the study was to substantiate and develop a computer model for evaluating by the potential buyers devices for air purification in conditions of vagueness and ambiguity of their consumer preferences. Accordingly, the main consumer criteria are identified, substantiated and described when buyers choose air purifiers. As methods of research, approaches based on fuzzy logic, fuzzy sets theory and fuzzy modeling were chosen. It was hypothesized that the fuzzy-multiple model allows rather accurately reflect consumer preferences and potential consumer choice in conditions of insufficient and undetermined information. Further, a computer model for estimating the consumer qualities of air cleaners by customers is developed. A proposed approach based on the application of fuzzy logic theory and practical modeling in the specialized computer software MATLAB. In this model, the necessary membership functions and their terms are constructed, as well as a set of rules for fuzzy inference to make decisions on the estimation of a specific air purifier. A numerical example of a comparative evaluation of air cleaners presented on the Ukrainian market is made and is given. Numerical simulation results confirmed the applicability of the proposed approach and the correctness of the hypothesis advanced about the possibility of modeling consumer behavior using fuzzy logic. The analysis of the obtained results is carried out and the prospects of application, development, and improvement of the developed model and the proposed approach are determined.

## INTRODUCTION

As is well known, mathematical and computer modeling of economic problems is a powerful tool for an objective study of the economic tasks of different levels and complexity of the analysis and make informed management decisions.

The methods of such modeling are actively developing both in the direction of expanding the range of problems available for study, and the rationale, development, and usage of a diverse methodological apparatus, mathematical tools, computer programs, and applications. One of these relatively new theoretical and methodological approaches for this is the theory of fuzzy sets and fuzzy modelling (Dorokhov et al., 2010).

At the same time, among various macro and microeconomic problems, the task of studying consumer preferences, consumer behavior in the most diverse markets for goods and services, is becoming particularly relevant in the context of globalization and competition (Barbarossa, Pelsmacker, 2016; Bushra, 2015; Ertz et al., 2016; Kurthakoti et al., 2016).

Therefore, in this article, the authors attempted to apply the methodology of fuzzy modeling and the practical development of an appropriate computer model for studying and modeling consumer choice of complex household products, namely, indoor air purifiers.

## 1. MARKETING APPROACHES TO CONSUMER BEHAVIOR RESEARCH FOR HOME APPLIANCES

As is well known, marketing research, among other things, is always aimed at finding the right ways of interacting with clients, customers, consumers, in order to adapt to the appropriate business environment. The ability to win in competition becomes one of the most important factors of the successful life of an enterprise in a market environment.

Despite the fact that the relevant marketing departments and structures have long existed, in this area, there are still tangible problems (pointed out by both practitioners and theorists), among them, in particular, studies of consumer behavior in the market (Bazargan et al., 2017; Moh-tasham et al., 2017; Pranav, Mokhtar, 2016; Sakkthivel, 2012). Considering, in general, the behavior of consumers in the marketing system, its essence, and basic concepts, it is necessary to pay attention to the following.

The center of modern marketing activities of enterprises in the home appliances market is always the buyer. After all, all producers of goods and services seek to influence the customer behavior, building their activities based on the concept of marketing. This concept asserts that the key to achieving the objectives of the enterprise is to determine the needs and preferences of customers and to provide the desired satisfaction more effective than that of competitors in ways. Customer satisfaction is the main reference point in this concept (Hakkak et al., 2015; Kavita, Shivani, 2016; Pachauri, 2002).

It is the consumer who determines the structure and content of the marketing complex (goods, price, distribution methods and promotion methods) and serves as a starting point for all marketing work of the trade organization. At present, in the conditions of growing competition, business exists to the extent that it meets the needs and desires of consumers. At present, the problem of marketing and consumption of manufactured goods comes to the fore. And the success of the enterprise in a competitive global market, the wages of workers began to depend not on how much the goods are produced, but how much they buy.

The growing practical value of customer behaviour theory is due to the fact that the economy has shifted from the production orientation to the product orientation and the fact that for sellers (in particular, household appliances and complex goods of the corresponding assortment) there was a constant basic problem: how to adapt to the requirements of buyers and the market, which

is now saturated with goods (Rambalak, & Govind, 2017; Richard & Chebat, 2016; Richard & Habibi, 2016; Rybanská, 2015).

In general, consumer behavior is an activity aimed at obtaining, consuming and disposing of products and services, including decision-making processes before and after the purchase. It should be noted that in most literary sources the term consumer behavior is used, but sometimes they speak not about the consumer, but about buying behavior. Of course, you can not determine the difference between these two concepts. However, some authors note that there are three main objectives of the purchase: satisfaction of one's own needs; satisfaction of the needs of other people (gifts or purchase of goods for the whole family); resale. Thus, the buyer can buy goods and services for their own use, and for use by other people. Then it is obvious that under certain conditions and circumstances a consumer may not participate in the buying process. From this and the differences in definitions of the concepts of the buyer and the consumer follow.

Along with these concepts, the concept of a client is often used in the literature. In some sources, a client is defined as a buyer who is an advocate of a particular brand or firm. That is, it is implied that this is the person making the decision to choose the manufacturer. For example, in the marketing of services, this concept is more often used than the consumer or the buyer. Consumption itself is the process of using the material or spiritual goods to meet needs, and the consumer is a market entity that uses material goods for its own purposes, but not for sale.

Considering the basic principles of working with the consumer in the market of complex equipment, it should be noted that today the behavior of consumers is studied wherever market research is conducted. And, first of all, consumers' behavior interests those who for various reasons want to influence this behavior or change it (Saulius et al, 2016; Suledo & Streimikiene, 2016; Vveinhardt & Andriukaitiene, 2016). In order to influence the behavior of consumers, it is necessary to follow certain principles of interaction with it and its perception (Scheibehenne et al., 2015; Sisi et al., 2017). For success, one must understand consumer motivation and behavior. That is, we need a deep understanding of the motives that drive the consumer, his behavior in general, and then their respective accounting when developing products and activities to promote them to the market. This is an urgent need for survival in the face of significant commodity competition (Armstrong, 1991; Anghelache et al., 2016; Haghnevis et al., 2016).

It must be borne in mind that consumer behavior is always influenced. Yes, indeed, despite the fact that the consumer is independent in his choice, marketing can affect his motivation and behavior if the proposed product or service is designed (and is capable of) maximizing the satisfaction of the needs and expectations of the consumer. Accordingly, any success in sales is provided due to the fact that the demand already exists or exists in the so-called hidden (or latent) form. The consumer can choose a particular product, or maybe not. However, this may depend not only on a successful combination of circumstances but also on the constant daily work of the company's employees who competently organize the work to promote goods and contacts with consumers (Abeer Abdelhamid, 2017; Urueña & Hidalgo, 2016; Villiers, 2015).

Not secondary are the requirements when interacting with the consumer to observe social legality and ethical sensitivity. Consumer needs are very real, and the supply of really useful products and services will bring profit. In reality, sometimes things are different. In the sphere of production and trade, fraud and various manipulations are sometimes present. Such fraud in relation to the consumer, poor quality of the offered goods, ignoring of legitimate complaints, pollution of the environment - all this is considered as a violation of the legitimate rights of consumers. Therefore, it is necessary to adhere to social legality and ethical sensitivity (Vatamanescu et al., 2017).

Considering the peculiarities of the home appliance market, it is useful to recall in general the main differences between the consumer market and the business market. By definition, the business market is a set of enterprises and organizations that buy goods: for uninterrupted functioning (all enterprises); for use in the production of other goods and services (production enterprises); for resale (wholesale and retail trade); for leasing (any company).

The consumer market has a number of specific features in comparison with the business market. This manifests itself in the peculiarities of the buyer, in the second case acts on behalf of the enterprise, in the specifics of making decisions about purchases, in the characteristics of the goods and the demand for the goods. The corresponding comparisons are given in Table 1.

**Table 1.** The main differences between the consumer and business markets

<i>Name of the characteristic</i>	<i>Consumer market</i>	<i>Business market</i>
1. Nature of demand	demand primary, more elastic	demand secondary or derived from demand in the consumer market has less elasticity in relation to the price
2. Consumption of goods	final	Intermediate
3. Number of buyers	more	Less
4. Geographic concentration	less	more
5. Qualification of buyers	dilettantes	Specialists
6. Order size	less	more, as the purchasing power of individual buyers is higher, and the one-time need is greater
7. Terms of orders fulfillment	less stringent	rigid, as there is a contractual relationship
8. Length of the goods movement channel	longer	Shorter

Source: author's generalization of the literature

It is clear that all of the above features should be carefully considered when developing and implementing marketing activities on the domestic market of home appliances, in particular, devices and equipment for improving and cleaning air in the home.

## 2. THE NEED FOR DEVICES TO IMPROVE AIR QUALITY IN LIVING QUARTERS AND THEIR MARKET

At present, environmental problems are becoming extremely important for many countries, megacities and simply industrial cities, industrial and infrastructure facilities. In particular, this is a matter of state and air pollution. It has already become apparent that the survival of mankind and the atmosphere are closely interrelated, air pollution becomes a common and serious problem that the international community is facing today. With the development of the globalized world of industry and consumption relentlessly deteriorating state of the environment, the problem of air pollution every day is becoming acuter. Viruses, allergens and other air pollutants are increasingly affecting the human environment. Experts on this issue state that air pollution has a decisive influence on the ecological situation, especially in terms of human survival in megacities. Therefore, immediate attention should be focused on this problem.

One of the possible solutions in this situation is the introduction and distribution, the maximum use of modern technologies for cleaning and improving both atmospheric and domestic air. Only this is able to completely solve the problem of polluted air, which a man has to breathe every second. The whole range of these problems allows us to successfully solve devices for working with air - air purifiers, humidifiers, dehumidifiers, etc., as well as climate complexes that provide all of the above functions.

Despite the sharp decline in the purchasing power of the population of Ukraine over the past three years, as a result of both a serious drop in the economy as a whole and a rapid depreciation of the domestic currency, the retail market for consumer electronics and sophisticated equipment retains certain positions. This applies to goods, devices, and equipment that are designed to improve the air in the home, in the premises, in cars, in other household appliances (furniture, refrigerators, cars, sanitary facilities, etc).

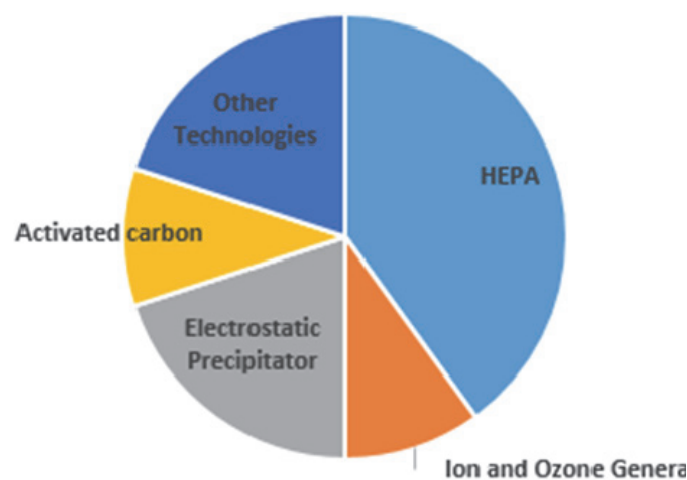
In general, the improvement and purification of air in the domestic sense provides a very wide range of direction, technology, price, operational and other consumer parameters of gamma devices. In particular, in retail establishments and online stores, separate categories are distinguished, such as ionizers, ozonizers, coal cleaners, photocatalytic, air-washing, HEPA cleaners, flavors and the like. It should be noted that there are not only air cleaners for living rooms, but also for refrigerators, cabinets with clothes, sanitary facilities, and kitchens, cars, clothes and shoes.

The most popular firms are well known and occupy a prominent place in the Ukrainian market is the internationally recognized manufacturers such as Electrolux, Sharp Corporation, BORK Electronic GmbH, Panasonic Corporation, Daikin Industries Ltd., Ballu Industrial Group and other lesser known Asian and European brands.

A detailed study of the domestic market of home air purification technology, as well as for any other markets in the Ukraine, faced with certain difficulties. Among them, the lack of reliable statistical information from manufacturers, suppliers, sellers, the mental difficulties of conducting consumer surveys, the inaccuracy of data in trade enterprises, the Internet, social networks, and the like. However, in the context of globalization, the main trends, patterns, prospects of the local market largely coincide with the global ones, so it is worth mentioning their trends and dependencies.

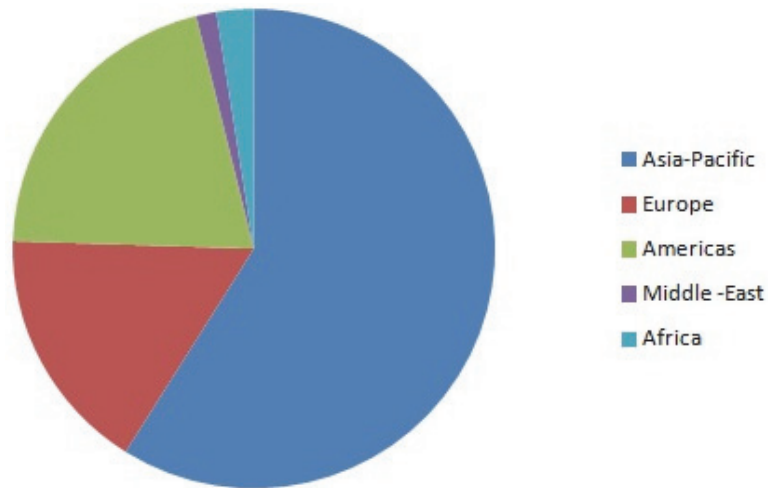
It is advisable to give some general illustrations of the state of the world market of air cleaners, the sensitive component of which is the domestic market. So, as a result of the analysis of literature sources and Internet offers on the market of household air purifiers, it is possible to ascertain, on the whole, an approximate distribution according to the types (operating principles) of devices, close to that shown in Fig. 1. It shows the practical dominance of modern technologies (HEPA filtration), which is due to their effectiveness and ability to delay the most dangerous pollutions.

**Figure 1.** Distribution of air purifiers according to the principle of operation



Source: author's generalization of the literature

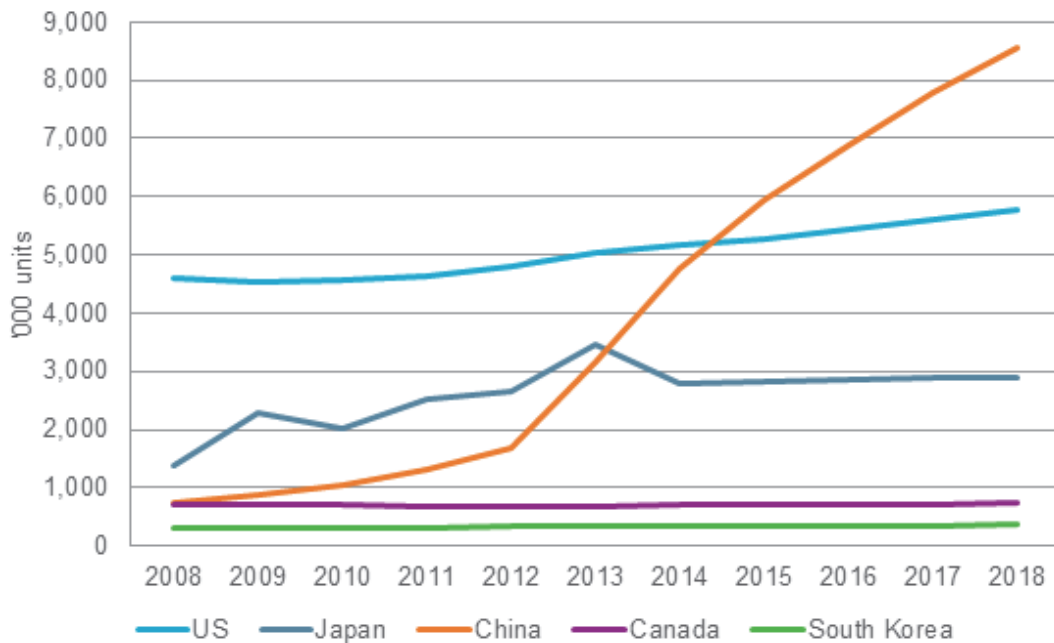
**Figure 2.** The world distribution of the market for air control systems by geography.



Source: author's generalization of the literature

According to the geographical distribution, the world market of air control systems in general looks as shown in Figure 2. A significant proportion of the Asia-Pacific region due to the presence of it as a highly developed markets (Japan, North Korea) and is rapidly progressing on the power markets of China, India, Philippines. This is also evident in the appearance of a significant number of new manufacturers of this equipment from these regions.

**Figure 3.** A number of air purification devices for domestic consumers



Source: author's generalization of the literature

The dynamics of the growth in the number of indoor air purifiers for the leading countries is shown in Figure 3. The data indicate the extremely rapid development of this market in China and a certain saturation of other major markets. In general, a detailed comprehensive analysis of both global and European (in particular, the East European region), the Asian, and closely related domestic market of air cleaning equipment is quite a complex and time-consuming task, requiring a separate detailed study.

### 3. CRITERIA FOR THE SELECTION OF HOUSEHOLD AIR PURIFIERS BY USERS

A very large offer of air purifiers (different in terms of technical level, brand, price, functionality, operating principles and other characteristics) in the Ukrainian market of home electronics requires from the buyer very carefully approach the issue of choosing a specific model of this device (taking into account its own financial capabilities, needs, preferences, special requirements for its use). Therefore, the definition and analysis of the main criteria for the selection of an air purifier become a rather important component of constructing a model of consumer decision making about its acquisition. The question arises as to how the consumer can choose an air purifier that will last for many years, purify the air in the room, solve all the problems associated with air pollution, and without breaking down and making a lot of noise.

On the market, today is such an amount of climatic technique that even a professional does not always immediately understand, what air purifier is better. It is even more difficult for a typical buyer to make the right and somehow justified decision. However, the choice can be guided by some of the main considerations that we outlined below.

First of all, it is necessary to take into account the size and function of the room where the device is planned to be used. In particular, it is advisable to determine the requirements for noise during device's activity. Also, it is necessary to understand what problems are planned to be solved with the help of air filtration, what functions are needed (the technical complexity of the device depends on this). In turn, from how many cleaning technologies the selected model will use, its cost will depend substantially. When making a choice, it is necessary to decide whether the consumer is ready to bear the additional running costs for servicing the device or wants to buy everything at once and in the future to spend a minimum of funds to maintain its operation.

When choosing, you should pay attention to how often and how long it will be possible to pay attention to the maintenance of the used air purifier. It is also necessary to decide who (from family members) will use the device. In general, it should be determined what it is desirable to get: the maximum availability of all sorts of functions, or ease of use and maintenance, a democratic price. Finally, it is not superfluous to take into account the aesthetic components when comparing and selecting the device, as well as possible functional requirements for its location in a certain way. Thus, if you need to select an air purifier, you should carefully define all their parameters (important for a particular customer), then inspect and compare the proposed relevant models (which have the necessary capabilities and characteristics).

Of course, other parameters and consumer qualities are also important factors, which are not directly related to the technical characteristics of the instruments and technologies that are implemented in them. In particular, this is the price, the brand, the image of the manufacturer, the guarantee, the availability of maintenance and consumables, etc. A more detailed and serious study of all these components, the parameters of the consumer choice of air cleaners, can be the subject of a separate scientific and practical study.

#### 4. DEVELOPMENT OF AIR CLEANER SELECTION MODEL BASED ON FUZZY-SET APPROACH

Given the general overview of air purifiers and the criteria by which household consumers usually choose a certain model of the device (mentioned earlier), we selected for the further consideration and comparison ten air cleaner models of the world's leading air conditioning and ventilation manufacturers on the Ukrainian market. Specific values of selected characteristics (for which a computer model for comparison and evaluation of these models will be built) are shown in Table 2. Recall that these characteristics were also examined and proved above.

**Table 2.** Values of characteristics for models of air purifiers selected for comparison

No	Brand, producer country, model	Price (UAH)	Noise (dB)	Cleaning (points)	Functions (points)
1	Daikin (Japan) MC70LVM	13959	16	10	10
2	Panasonic (Korea) F-PXC50R	13127	18	7	5
3	Mitsubishi Heavy (Japan) CT456DE-S	11684	14	8	7
4	Sharp (Japan) KCA50EUW	12348	16	9	6
5	Electrolux (Sweden) EAP 450	12599	27	10	10
6	CooperHunter (Hong Kong) CH-804AV	6480	28	7	6
7	Idea (Hong Kong) XJ-3100A	2243	20	4	4
8	AirComfort (Italy) GH-2162	8592	20	7	6
9	AirInCom (China) AC 3022	7250	46	5	5
10	Meaco (England) AirVax	5040	34	6	6

Source: information on the market of Ukraine collected by the authors

For the specified parameters (price, minimum noise at work, quality of cleaning, the functionality of the device) we will build (according to the methodology of fuzzy modeling) sets of input membership functions for the corresponding linguistic variables and their terms. Assume that each of the selected input evaluation parameters can be represented by a linguistic variable with a set of three terms whose membership functions are piecewise linear and are constructed according to the data (obtained on the basis of expert judgments) given in Table 3.

**Table 3.** Data for constructing the membership functions of terms of linguistic variables

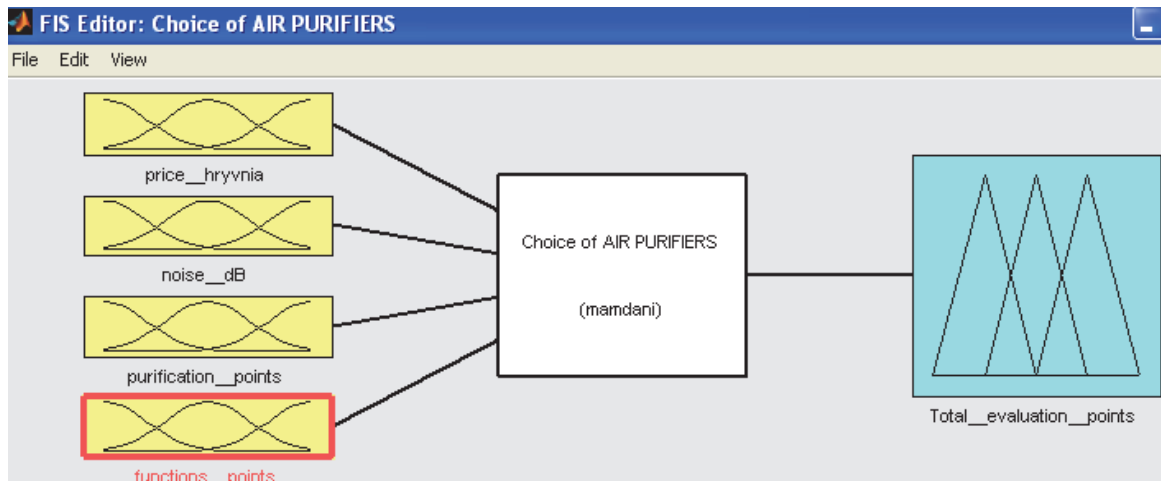
Variable	Term	Level 0	Increase from 0 to 1	Level 1	Decrease from 1 to 0	Level 0
price (1-15) 1000 hryvnia	cheap	-	-	1-2	2-6	6-15
	medium	1-3	3-7	7-9	9-12	12-15
	high	1-9	9-12	12-15	-	-
noise (10-50) dB	quiet	-	-	1-15	15-25	25-50
	acceptable	10-25	20-25	25-30	30-35	35-50
	loud	0-30	30-40	40-50	-	-
purification (1-10) points	weak	-	-	1	1-5	5-10
	satisfactory	1-3	3-5	5-6	6-8	8-10
	strong	1-6	6-10	10	-	-
functions (1-10) points	limited	-	-	1	1-4	4-10
	sufficient	1-2	2-5	5	5-8	8-10
	maximum	1-6	6-9	9-10	-	-

Source: expert surveys carried out by the authors



Wherein limit values and their linguistic terms are defined as the following: price (cheap, medium, high), 1000 hryvnia - 15000 hryvnia; noise (quiet, acceptable, loud), 10dB - 50dB; purification level (weak, satisfactory, strong), 1 point -10point, functions (limited, sufficient, maximum), 1 point - 10 point. It is clear that the cumulative scores for the last two modeling parameters are exposed on the basis of an integrated examination of groups of relevant criteria developed and cited in a number of sources (Dubovik et al., 2017; Oliveira et al., 2015; Owoc, Piasny, 2015). As noted above, we selected for modeling the MATLAB environment, in particular, the tool for creating fuzzy decision models named Fuzzy Logic Toolbox. The corresponding general structure of the model being created is shown in Figure 4 (the choice will be made using the Mamdani algorithm).

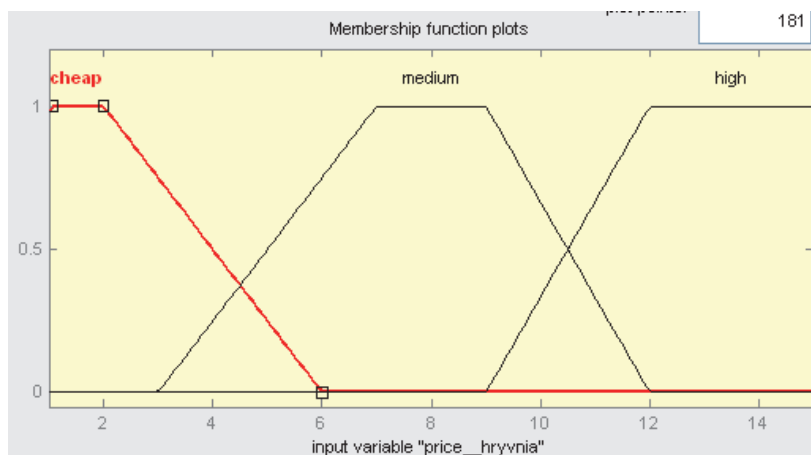
**Figure 4.** Structure of the air purification evaluation model in the MATLAB system

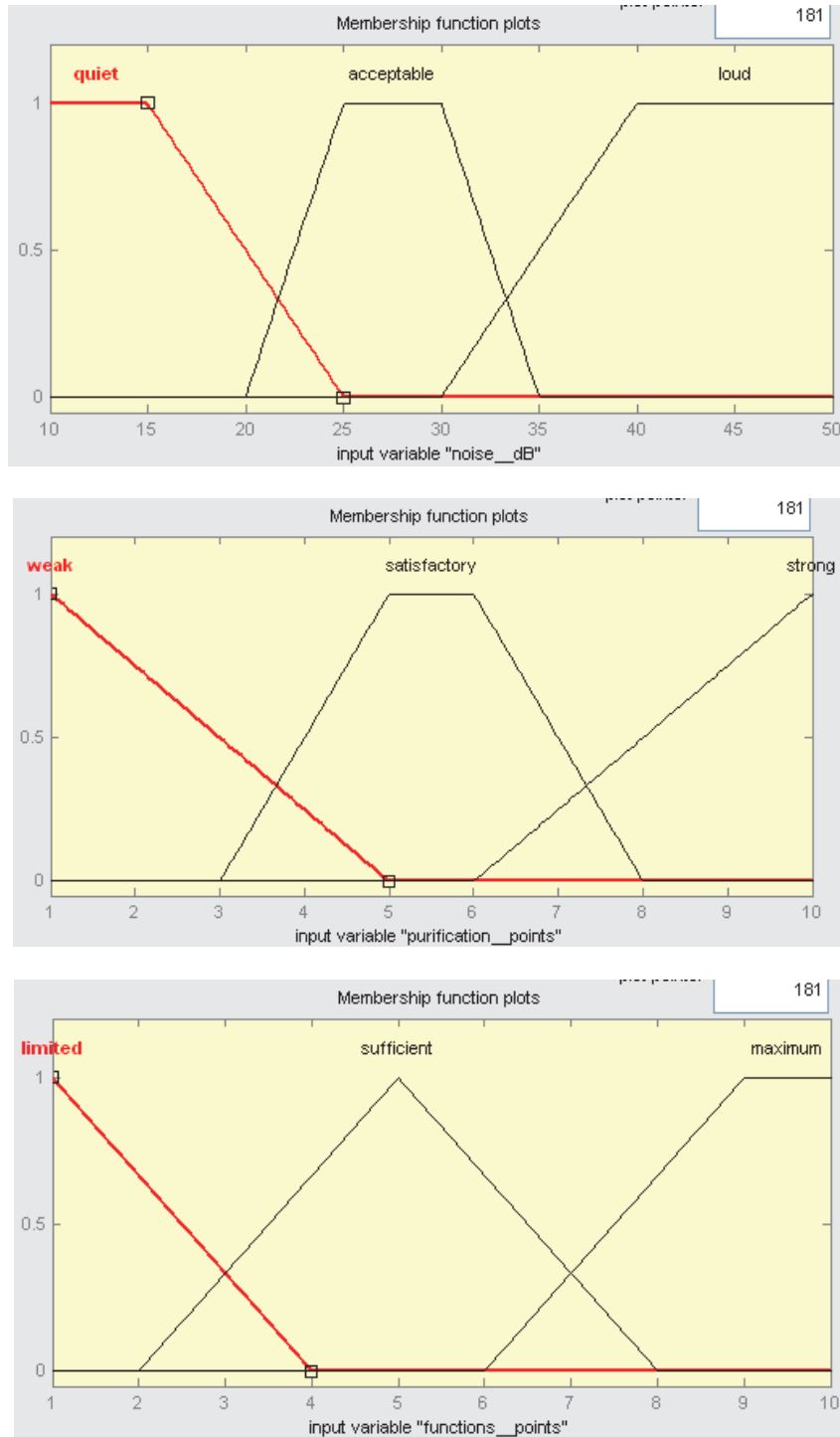


Source: model, proposed and developed by the authors

According to the Table 2, sets of membership functions for the belonging of linguistic terms for all input variables are created in the model. Their appearance is presented in Figure 5 (price, noise, purification, functions).

**Figure 5.** Membership functions for the input parameters

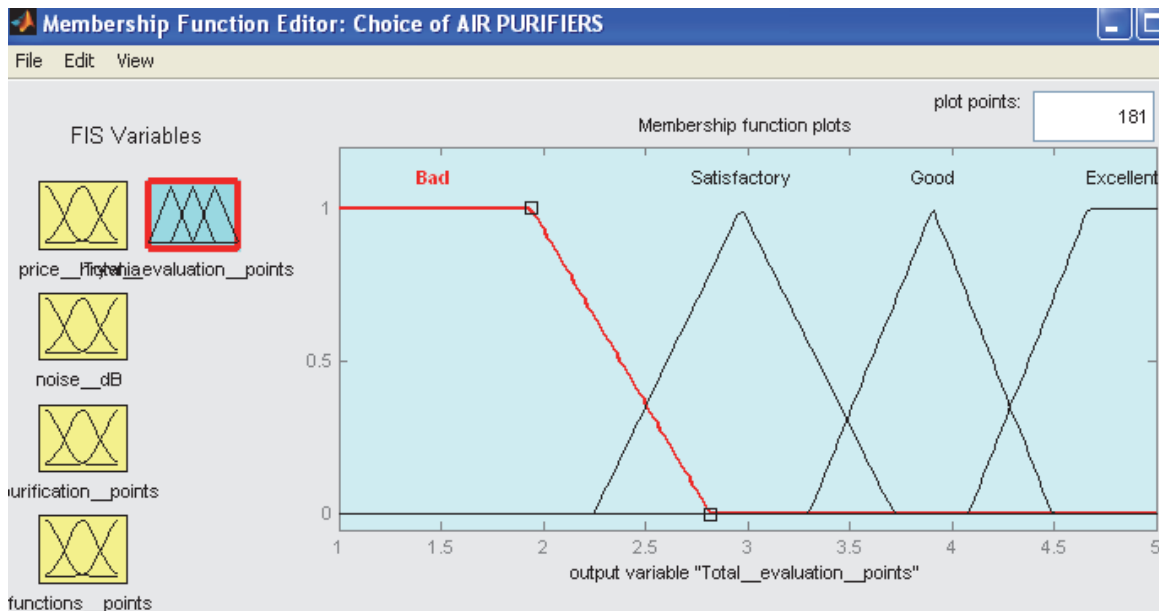




Source: expert surveys, processed and formalized by the authors

Also, taking into account the opinions of consumers, experts, and specialists, the output membership functions for the final resulting variable (which is called the Evaluation) are constructed. It will be measured (obtained as a result of calculations performed with the proposed model) in points from one to five, with four linguistic terms (Bad, Satisfactory, Good, Excellent), represented (that does not cause simplification of the problem) by triangular piecewise linear membership functions, the set of which is shown in Figure 6.

**Figure 6.** Membership functions for the output parameter (result)



Source: expert surveys, processed and formalized by the authors

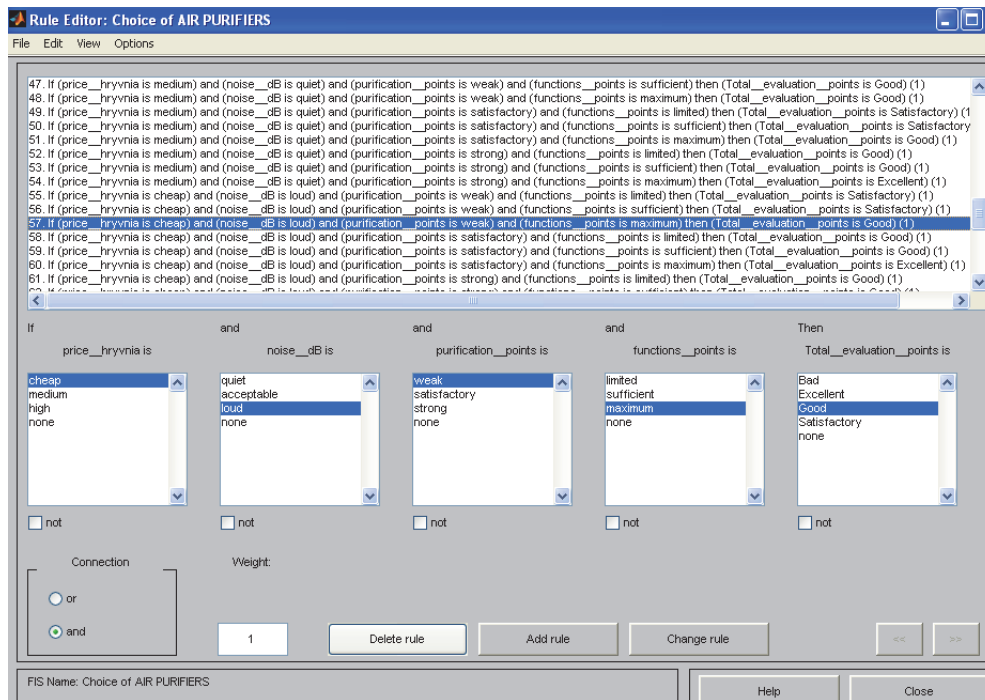
The next step in creating a multi-criteria evaluation system based on fuzzy logic in MATLAB is to create a base of decision rules for final estimation based on fuzzy logic inference. Such a database contains conditional expressions, the input part of which is a certain ratio of the estimation parameters, and the output is an integral indicator (estimate) with just such a ratio of the mentioned parameters. It is clear that all the components of the corresponding rules are certain fuzzy linguistic terms (which are inherent in the input and output parameters of the constructed model). In general, the rules are compiled on the basis of surveys or expert assessments, but under certain circumstances, it can be the formalization of an individual algorithm for evaluating alternatives by an individual decision-maker (expert, client, buyer, marketer, the staff of a pharmaceutical institution, etc.).

Thus, in our case, it is necessary to enter into the computer model all possible variants (combinations of the relations of the input parameters) with the corresponding conclusion (statement) about a certain final evaluation of the device with this combination. Recall that we have such input parameters (with their terms) Price (expensive, medium, cheap), Noise (loud, acceptable, quiet), Cleaning (weak, satisfactory, strong), Functions (limited, sufficient, maximum).

For the convenience of modeling, the order of introduction of the first two parameters is changed to the opposite one, which reflects the consumer's attitude to the dynamics of changes in these parameters. The resulting parameter is Evaluation (Bad, Satisfactory, Good, Excellent). Then the necessary set of rules can look, as shown in Appendix 1.

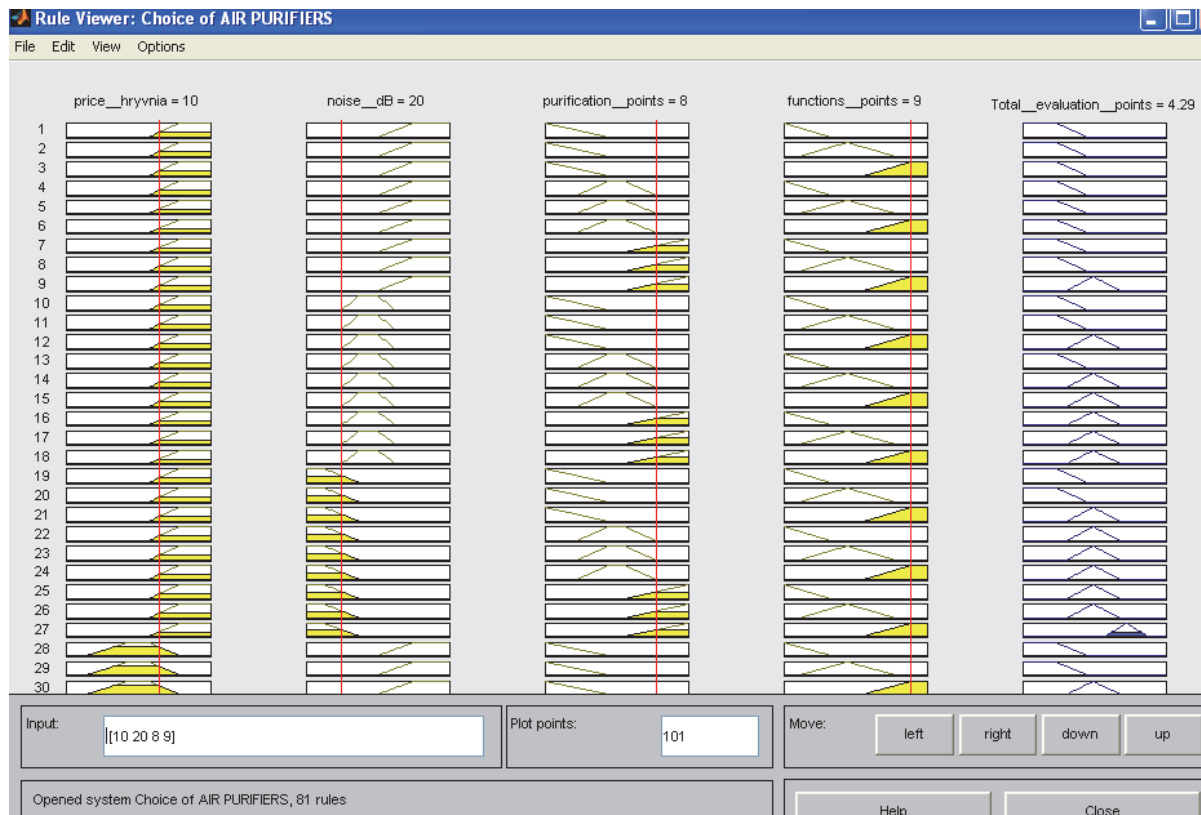
The image of this information, which has already been entered into the MATLAB system on the computer, is shown in Figure 7 (an enlarged fragment). In total, 81 rules were defined and introduced (all variants of combinations of input parameters). The corresponding fields are located at the bottom of the interface, where the combination of parameters is selected, followed by the reflection of already defined relationships in the upper part of the displayed window of fuzzy logic inference rules.

Figure 7. Fragment of fuzzy decision-making rules



Source: expert surveys, processed and formalized by the authors

Figure 8. The window for the operation of the rules, the data input, and the result output.

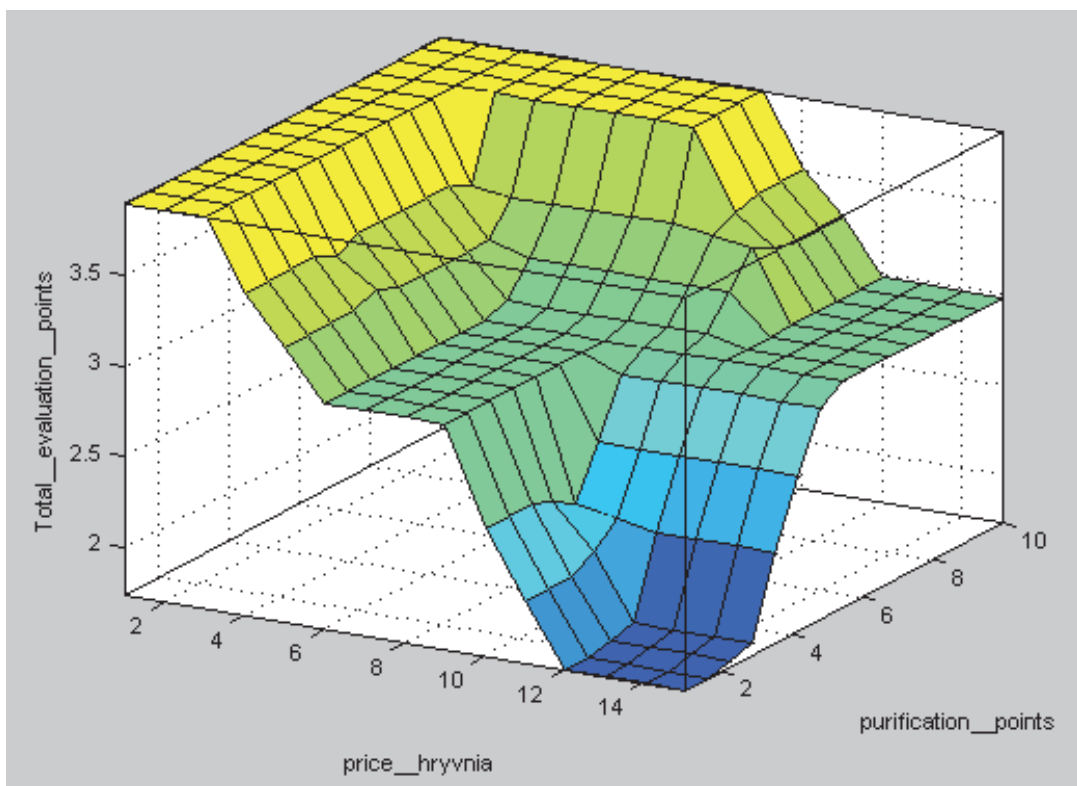


Source: model, proposed and developed by the authors

The generated and entered fuzzy inference rules work as shown in Figure 8. In this case, in the lower left corner of the window, there is a data input field for the particular estimated concrete air cleaner model (the specified values are displayed in the headers of the first four columns of the membership functions images). The integral estimated score (result in scores) is displayed in the upper right corner of the screen. This form also allows you to visualize (and, if necessary, to analyze) the operation of each separate rule of fuzzy inference (the interaction of the corresponding membership functions) with the parameters entered.

Finally, there is the possibility of two-dimensional visualization of the interaction of input parameters and their effect on the final result by means of so-called fuzzy output surfaces, one of which is shown in Fig. 9.

**Figure 9.** The fuzzy surface, shown the dependence of the final evaluation on Price and Quality of cleaning



Source: model, proposed and developed by the authors

User can get different types of these surfaces (including those in 2D), which allows to further analyze the adequacy of the model, the correctness of the construction of the functions of belonging to individual variables and their linguistic terms, the relationship between their importance, the dynamics of the result change depending on the change those or other input parameters etc.

## 5. RESULTS AND CONCLUSIONS

With the help of the developed model, we estimated the group of air purifiers, the characteristics for evaluation of which are given above (see Table 2). The obtained results are presented in Table 4.

**Table 4.** The results of the assessment of air purifiers

<i>No</i>	<i>Model</i>	<i>General score (points)</i>	<i>Place</i>
1	Daikin MC70LVM	3,9	1-2
2	Panasonic F-PXC50R	3,0	7-8
3	Mitsubishi Heavy CT456DE-S	3,7	3
4	Sharp KCA50EUW	2,9	9-10
5	Electrolux EAP 450	3,0	7-8
6	CooperHunter CH-804AV	3,3	4-6
7	Idea XJ-3100A	3,9	1-2
8	AirComfort GH-2162	3,3	4-6
9	AirInCom AC 3022	2,9	9-10
10	Meaco AirVax	3,3	4-6

Source: numerical calculations in the MATLAB program for the model proposed by the authors

The analysis of the obtained results testifies to the significant influence of the price parameter on the final evaluation. It is because of it (especially after a sharp increase in the exchange rate of foreign currencies, which led to a rapid rise in the cost of imported medical equipment, which includes almost all air cleaners in the Ukrainian market), no model has received an excellent rating or close to it.

However, certain conclusions and comparison of models can still be done. So, the same high ratings were found for both the most expensive model Daikin (but with all the other extremely high technical characteristics) and for the cheapest model Idea (in which all the characteristics are very bad, but the main, very powerful motivating consumer to purchase factor is extremely).

It can be assumed that this objectively reflects the practical level of purchasing power of buyers at the present time. But on the other hand, there is a clear awareness and focus of the consumer on the need (if possible) to purchase the most high-quality and multifunctional device. Models with intermediate ratings are competitors among themselves for separate groups of consumers (with special requirements to certain, separate parameters).

It is clear that in the case of model correction (by membership functions, rules, their weights), another picture of the estimates will be obtained. Therefore, further development of the model can be directed precisely at its clarification for such users and situations.

Also, the proposed model and its computer realization can be used to evaluate new offers (models) of air cleaners when they appear in trade, to study the effect of price and basic technical parameters on the place in a competitive market, and the similar tasks of consumer behavior modeling.

## REFERENCES

- Abeer, M., Abdelhamid, A. (2017), "Antecedents of participation in online brand communities and their purchasing behavior consequences", *Service Business*, Vol. 11, No. 2, pp. 229-251.
- Anghelache, C. Anghel, M., Diaconu, A. (2016), "Risk Aversion and Individual Preferences Modelling", *Romanian Statistical Review*, Vol. 64, No. 1, pp. 77-82.
- Armstrong, J. (1991), "Prediction of Consumer Behavior by Experts and Novices", *Journal of Consumer Research*, Vol. 18, No. 2, pp. 251-256.
- Barbarossa, C. Pelsmacker, P. (2016), "Positive and Negative Antecedents of Purchasing Eco-friendly Products: A Comparison Between Green and Non-green Consumers", *Journal of Business Ethics*, Vol. 134, No. 2, pp. 229-247.
- Bazargan, A., Karray, S., Zolfaghari, S. (2017), "Modeling reward expiry for loyalty programs in a competitive market", *International Journal of Production Economics*, Vol. 193(C), pp. 352-364.
- Bushra, A. (2015), "Consumer culture and post-purchase behavior", *Journal of Developing Areas*, Vol. 49, No. 6, pp. 15-24.
- Dorokhov, O., Dorokhova, L., Zorina, E. (2010), "A fuzzy approach and modelling of service estimations for drugs freight transportation", *Transport and Telecommunication*, Vol. 11, No. 1, pp. 19-25.
- Dubovik, M., Timiryanova, V., Zimin, A. (2017), "Modeling of the Deferred Demand on the Market of Household Appliances", *European Research Studies Journal*, Vol. 20(2B), pp. 149-161.
- Ertz, M., Karakas, F., Sarigöllü, E. (2016), "Exploring pro-environmental behaviors of consumers: An analysis of contextual factors, attitude, and behaviors", *Journal of Business Research*, Vol. 69, No. 10, pp. 3971-3980.
- Haghnevis, M., Askin, R., Armbruster, D. (2016), "An agent-based modeling optimization approach for understanding behavior of engineered complex adaptive systems", *Socio-Economic Planning Sciences*, Vol. 56(C), pp. 67-87.
- Hakkak, M., Vahdati, H., Nejad, S. (2015), "Study the Role of Customer-Based Brand Equity in the Brand Personality Effect on Purchase Intention", *International Journal of Asian Social Science*, Vol. 5, No. 7, pp. 369-381.
- Kavita, S., Shivani, G. (2016), "An Investigation into Consumer Search and Evaluation Behaviour: Effect of Brand Name and Price Perceptions", *Vision*, Vol. 20, No. 1, pp. 24-36.
- Kurthakoti, R., Balasubramanian, S., Summey, J. (2016), "Understanding Consumer Attitudes Toward Web-based Communication Tools", *International Journal of Marketing Studies*, Vol. 8, No. 3, p. 1-11.
- Mohtasham, S., Sarollahi, S., Hamirazavi, D. (2017), "The effect of service quality and innovation on word of mouth marketing success", *Eurasian Business Review*, Vol. 7, No. 2, pp. 229-245.
- Oliveira, M., Schmitt, S., Luce, F. (2015), "Brand equity estimation model", *Journal of Business Research*, Vol. 68, No. 12, pp. 2560-2568.
- Owoc, M., Piasny, L. (2015), "Adaptive Agent Systems in Contemporary e-Commerce Environment", *Problemy Zarzadzania*, Vol. 13, No. 52, pp. 88-100.
- Pachauri, M. (2002), "Consumer Behaviour: a Literature Review", *Marketing Review*, Vol. 22, pp. 319-355.
- Pranav, K., Mokhtar, S. (2016), "Ethical Marketing Practices viewed through Consumer Spectacles", *Tržište/Market*, Vol. 28, No. 1, pp. 29-45.
- Rambalak, Y. Govind, P. (2017), "Determinants of Consumers' Green Purchase Behavior in a Developing Nation: Applying and Extending the Theory of Behavior", *Ecological Economics*, Vol. 134(C), pp. 114-122.
- Richard, M., Chebat, J. (2016), "Modeling online consumer behavior: Preeminence of emotions and moderating influences of need for optimal stimulation level", *Journal of Business Research*, Vol. 69, No. 2, pp. 541-553.

- Richard, M., Habibi, M. (2016), "Advanced modeling of online consumer behavior: The moderating roles of hedonism and culture", *Journal of Business Research*, Vol. 69, No. 3, pp. 1103-1119.
- Rybanská, J. (2015), "Selected Personality Characteristics as Predictors of Emotional Consumer Behaviour", *European Journal of Business Science and Technology*, Vol. 1, No. 2, pp. 128-136.
- Sakkthivel, A. (2012), "Modelling consumer choice (buying) and switching behaviour in a restricted marketing environment", *International Journal of Electronic Finance*, Vol. 6, No. 1, pp. 35-48.
- Scheibehenne, B., Helversen, B., Rieskamp, J. (2015), "Different strategies for evaluating consumer products: Attribute- and exemplar-based approaches compared", *Journal of Economic Psychology*, Vol. 46(C), pp. 39-50.
- Sisi, J., Hossein, R., Vinayak, D. (2017), "An analysis of carsharing vehicle choice and utilization patterns using discrete-continuous extreme value models", *Transportation Research*, Vol. 103(C), pp. 362-376.
- Sueldo, M., Streimikiene, D. (2016). "Organizational Rituals as Tools of Organizational Culture Creation and Transformation: A Communicative Approach", *Transformations in Business & Economics*, Vol. 15, No. 2 (38), pp. 89-110.
- Urueña, A., Hidalgo, A. (2016), "Successful loyalty in e-complaints: FsQCA and structural equation modeling analyses", *Journal of Business Research*, Vol. 69, No. 4, pp 1384-1389.
- Vatamanescu, E., Nistoreanu, B., Mitan, A. (2017), "Competition and Consumer Behavior in the Context of the Digital Economy", *Amfiteatru Economic*, Vol. 19, No. 45, pp. 354-354.
- Villiers, R. (2015), "Consumer brand enmeshment: Typography and complexity modeling of consumer brand engagement and brand loyalty enactments", *Journal of Business Research*, Vol. 68, No. 9, pp. 1953-1963.
- Vveinhardt, J., Andriukaitiene R. (2016), "Model of Establishment of the Level of Management Culture for Managerial Decision Making with the Aim of Implementing Corporate Social Responsibility", *Transformations in Business & Economics*, Vol. 15, No. 2B (38B), pp. 615-629.

**Appendix 1.** Complete set of rules for system of fuzzy logical conclusion

Nº	Linguistic terms of input variables				Conclusion
1	high	loud	weak	limited	Bad
2	high	loud	weak	sufficient	Bad
3	high	loud	weak	maximum	Bad
4	high	loud	satisfactory	limited	Bad
5	high	loud	satisfactory	sufficient	Bad
6	high	loud	satisfactory	maximum	Bad
7	high	loud	strong	limited	Bad
8	high	loud	strong	sufficient	Bad
9	high	loud	strong	maximum	Satisfactory
10	high	acceptable	weak	limited	Bad
11	high	acceptable	weak	sufficient	Bad
12	high	acceptable	weak	maximum	Satisfactory
13	high	acceptable	satisfactory	limited	Bad
14	high	acceptable	satisfactory	sufficient	Satisfactory
15	high	acceptable	satisfactory	maximum	Satisfactory
16	high	acceptable	strong	limited	Satisfactory
17	high	acceptable	strong	sufficient	Satisfactory
18	high	acceptable	strong	maximum	Satisfactory
19	high	quiet	weak	limited	Bad
20	high	quiet	weak	sufficient	Bad
21	high	quiet	weak	maximum	Satisfactory
22	high	quiet	satisfactory	limited	Satisfactory
23	high	quiet	satisfactory	sufficient	Satisfactory
24	high	quiet	satisfactory	maximum	Satisfactory
25	high	quiet	strong	limited	Satisfactory
26	high	quiet	strong	sufficient	Satisfactory



27	high	quiet	strong	maximum	Good
28	medium	loud	weak	limited	Bad
29	medium	loud	weak	sufficient	Bad
30	medium	loud	weak	maximum	Satisfactory
31	medium	loud	satisfactory	limited	Bad
32	medium	loud	satisfactory	sufficient	Satisfactory
33	medium	loud	satisfactory	maximum	Satisfactory
34	medium	loud	strong	limited	Satisfactory
35	medium	loud	strong	sufficient	Good
36	medium	loud	strong	maximum	Good
37	medium	acceptable	weak	limited	Bad
38	medium	acceptable	weak	sufficient	Satisfactory
39	medium	acceptable	weak	maximum	Good
40	medium	acceptable	satisfactory	limited	Bad
41	medium	acceptable	satisfactory	sufficient	Satisfactory
42	medium	acceptable	satisfactory	maximum	Good
43	medium	acceptable	strong	limited	Satisfactory
44	medium	acceptable	strong	sufficient	Good
45	medium	acceptable	strong	maximum	Good
46	medium	quiet	weak	limited	Good
47	medium	quiet	weak	sufficient	Good
48	medium	quiet	weak	maximum	Good
49	medium	quiet	satisfactory	limited	Satisfactory
50	medium	quiet	satisfactory	sufficient	Satisfactory
51	medium	quiet	satisfactory	maximum	Good
52	medium	quiet	strong	limited	Good
53	medium	quiet	strong	sufficient	Good
54	medium	quiet	strong	maximum	Excellent
55	cheap	loud	weak	limited	Satisfactory
56	cheap	loud	weak	sufficient	Satisfactory
57	cheap	loud	weak	maximum	Good
58	cheap	loud	satisfactory	limited	Good
59	cheap	loud	satisfactory	sufficient	Good
60	cheap	loud	satisfactory	maximum	Excellent
61	cheap	loud	strong	limited	Good
62	cheap	loud	strong	sufficient	Good
63	cheap	loud	strong	maximum	Excellent
64	cheap	acceptable	weak	limited	Good
65	cheap	acceptable	weak	sufficient	Good
66	cheap	acceptable	weak	maximum	Excellent
67	cheap	acceptable	satisfactory	limited	Good
68	cheap	acceptable	satisfactory	sufficient	Good
69	cheap	acceptable	satisfactory	maximum	Excellent
70	cheap	acceptable	strong	limited	Good
71	cheap	acceptable	strong	sufficient	Good
72	cheap	acceptable	strong	maximum	Excellent
73	cheap	quiet	weak	limited	Good
74	cheap	quiet	weak	sufficient	Good
75	cheap	quiet	weak	maximum	Excellent
76	cheap	quiet	satisfactory	limited	Good
77	cheap	quiet	satisfactory	sufficient	Good
78	cheap	quiet	satisfactory	maximum	Excellent
79	cheap	quiet	strong	limited	Excellent
80	cheap	quiet	strong	sufficient	Excellent
81	cheap	quiet	strong	maximum	Excellent