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MODELING OF COSMETOLOGY SERVICES ESTIMATIONS BY CONSUMERS

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Abstract

Introduction*. The computer modeling consumer behavior is very important in the context of a globalized market. More attention is paid to the consumption of manufactured goods and everyday items. Much less attention is paid to the service sector, in particular medical, recreational and physical. There is also a lack of application of mathematically grounded, computer methods and models for such modeling. Often the study of the behavior of consumers of goods and services, as well as their assessment of the level and components of the service, is reduced to conducting surveys of consumers and subsequent classical statistical processing of their results. At the same time, estimates, already at the initial stage, are inevitably converted into numerical form. We propose the use of an approach based on fuzzy logic, which makes it possible to combine criteria of different dimensions, including linguistic and verbal assessments.*

The aim *of the study is modeling of evaluation of cosmetology institutions.*

Results*. We proposed modeling the behavior of consumers of aesthetic cosmetology services as tasks of multi-criteria decision making on a variety of alternatives. The approach to the estimation of cosmetology service by clients based on fuzzy modeling is described. Specific features of cosmetology services, marketing, communication components are determined. The main consumer criteria for assessing cosmetology services are used. A computer model in the FuzzyTech, specialized software product for computer fuzzy modeling, was constructed. Integrated assessments for cosmetic institutions in Kharkiv have been calculated. Recommendations for improving the quality of cosmetology service, websites of cosmetology institutions, are suggested. The principles of the proposed approach, the described fuzzy model and its computer implementation can be applied to a wide range of tasks of multicriteria assessment of customer service in various social fields - retail stores, medicine, culture, health, physical education and training, public catering, other household and domestic services.*

Conclusions*. We have developed the model based on decision-making with the application of the fuzzy sets. It is shown the monitoring of the current level of the generalized assessment of the functioning and marketing interaction with the clients of the cosmetology company with the help of the developed model can be carried out more quickly, with less time spent at acceptable accuracy. Depending on the production situation or the set goals of consumers, individual evaluation criteria can be quickly clarified. In addition, the proposed model is generally aggregate and universal, is acceptable for multi-criteria assessment of the level of service and marketing components in providing various services to the population.*

Keywords: *modeling, fuzzy logic, consumer behaviour.*

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МОДЕЛЮВАННЯ ОЦІНОК ПОСЛУГ КОСМЕТОЛОГІЇ СПОЖИВАЧАМИ

Анотація

Вступ. *Моделювання поведінки споживачів є важливим в умовах глобалізованого ринку, зокрема щодо промислових товарів і предметів повсякденного користування. Однак мало уваги приділяється сектору послуг, зокрема медичному та рекреаційному. Бракує застосування математично обґрунтованих, комп'ютерних моделей для такого моделювання. Ми пропонуємо моделювати поведінку споживачів косметологічних послуг як завдання багатокритеріального прийняття рішень.*

Метою *статті є моделювання оцінки споживачами рівня косметологічних послуг.*

Результати*. Описано підхід до оцінки косметологічної послуги клієнтами засобами нечіткого моделювання. Визначено особливості косметологічних послуг, маркетингові, комунікаційні компоненти, споживчі критерії для їх оцінки. Побудована комп'ютерна модель у FuzzyTech, програмному продукті для нечіткого моделювання. Розраховані інтегровані оцінки для косметичних закладів Харкова. Запропоновано рекомендації з підвищення якості косметологічного сервісу. Наведений підхід, нечітка модель і її комп'ютерна реалізація можуть бути застосовані до широкого кола завдань багатокритеріальної оцінки обслуговування споживачів у різних сферах: торгівлі, медицині, культурі, охороні здоров'я, громадського харчування, побутових послуг.*

Висновки*. Розроблено модель на основі прийняття рішень із застосуванням нечітких множин. Показано, що моніторинг сучасного рівня узагальненої оцінки функціонування та маркетингової взаємодії з клієнтами косметологічної компанії за допомогою розробленої моделі може здійснюватися швидше, з меншими витратами часу та з прийнятною точністю для топ-менеджерів. Залежно від виробничої ситуації або встановлених цілей споживачів індивідуальні критерії оцінки можуть бути оперативно уточнені. До того ж запропонований підхід в цілому є агрегованим і універсальним, прийнятним для багатокритеріального оцінювання рівня сервісу й маркетингових компонентів при наданні різних послуг населенню.*

Ключові слова: *моделювання, нечітка логіка, поведінка споживача.*

JEL classification: C51; C63; C88; D12

Introduction

In the conditions of the competitive market of medical (in particular, cosmetology) services and the beginning of insurance medicine in Ukraine, the issues of patients' interaction with healthcare institutions become very relevant. The existence of various providers of treatment services and other types of healthcare (including therapeutic and aesthetic cosmetology), the existence and operation of medical institutions of various forms of ownership create broad opportunities for patients to choose the place of medical care and a specific doctor. A visitor to the medical center (patient, client) should choose a specific cosmetology institution, where he will apply, in a variety of proposals with several criteria for quality, safety, price, an assortment of cosmetology services, other service parameters. That is, he faces a question of a multicriteria choice, for the solution of which it is expedient to apply appropriate scientific and practical approaches and methods. On the other hand, the cosmetic institutions themselves,

their managers, marketers, other leading specialists need reliable, scientifically sound, tools (that are not too difficult in practical daily use) for monitoring the quality of their work, and self-evaluation from the perspective of potential customers. It is necessary not only to evaluate themselves but also actual or potential competitors. Therefore, there is an urgent need to develop and use appropriate, modern methods and models for this.

The aim of the study

The aim of the study is modeling of evaluation of cosmetology institutions. We propose to develop a model based on decision-making with the application of the fuzzy sets.

The main research and model

The literature on the work of beauty parlors, salons, clinics, clients' behavior showed that these issues are highlighted very fragmentarily, selectively, clearly not enough. But computer modeling for solving corresponding problems are practically not offered. However, the market of these services is expanding rapidly. Therefore, for the beauty, health, well-being industry, decision-making models are needed by both producers and consumers, taking into account the image, perceived quality, basic marketing components [1].

One of the works that offer such models is paper [2]. It presents the results of Six Sigma integration, discrete modeling and multi-criteria methods for improving beauty services, obtaining compromise solutions about incomes, costs, use of resources and customer satisfaction. The ranking approach in accordance with the preferences of experts was used. In [3], the services quality, ways of assessing clients' expectations regarding the quality of care in health facilities, the perceived quality of cosmetology services were considered.

It is established that positive assessments of the customer service quality are related to the intentions to use it in the future, which ensures a high level of customer retention. If the cosmetic institution supports its clients on a lifelong basis, you can achieve a higher level of client retention and reduce the number of lost customers [4]. Approaches to budget allocation between various components of promotion (and marketing) of cosmetology services were offered [5]. Among the most important areas of research of cosmetology services are the relationships between clients and staff, the corporate loyalty of clients of beauty salons. It is noted that although positive interaction with staff and participation in the development of treatment options is very important, interaction with friends and family and associated activities also have a positive impact on the image of the beauty parlors [6].

Particular attention is paid to the study of the demand for medical cosmetology - for mainland China, Taiwan, Hong Kong, Macau [7]. The influence of demographic variables on the demand for cosmetology is studied. It is established that demographic variables and monthly income lead to significant differences in the most desired operation and acceptable costs. It should be noted that the expected improvement in beauty from these services is limited. Despite the attractiveness of the appearance, the economic efficiency of investments in improving the beauty is ambiguous. For the average consumer, the monetary benefits of plastic surgery, cosmetic procedures are sometimes not worth the cost.

In connection with discontent with one's own body and manifestations of aging, people resort to various cosmetic therapies, including plastic surgery. Often, customers tend to imitate the appearance of celebrities. It is necessary to minimize the negative effects of plastic surgery and reduce the wrong motives. In [8] Bayesian models are proposed, which help to avoid the unforeseen consequences of plastic surgery in the health care system.

The literature discusses the possibility for trade-offs between the clinical nature and other elements of customer service necessary to provide the service. It is noted that cosmetology clinics often do not provide the right balance between comfort and procedural possibilities. This is necessary to create loyalty and repeated calls for services [9].

Wellness cosmetic centers have become a real force that affects health. As the interest in physical well-being increased, this type of therapy became popular among clients and medical

specialists. The centers of cosmetology treatment have become attractive for a growing number of clients. As a result of the development of various applications (treatment of diseases, improvement of appearance), cosmetology centers have become an integral part of the healthcare industry. Health tourism has started and has begun to thrive [10].

Aesthetic medicine has become one of the fastest growing segments of health tourism. To date, however, scientific research on this market is clearly not enough. Services in the field of aesthetic medicine are usually only discussed descriptively, as a subcategory of medical tourism [11]. It is noted that the quality of cosmetology services, the organizational characteristics of the cosmetology facilities, the relationship with specialists and service personnel, has a strong influence on the assessments of consumers, especially for the elderly [12]. However, there are no quantitative models for evaluation cosmetogic services by consumers of aesthetic medicine [13].

Interesting is the comparative analysis of health tourism in Hungary and Austria, in particular, wellness services. This market is globalized and competition is intensifying, which requires higher standards of service and uniqueness. It is shown that in a dynamic market for a cosmetology establishment a unique profile is needed that combines directly cosmetology services with other various accompanying service products and various similar offers [7].

Modern cosmetology centers offer clients an increasing number of services. They are very diverse, and include a variety of medicines, cosmetic specialists, aesthetics and hairdressing procedures, offered to clients as samples of products, profiled specialized medical and preventive packages of services, various health programs [14].

An trend in recent years is that more and more often different organizations realize the importance of organizing measures to improve the health of their employees, including using wellness and cosmetology procedures [15]. There is a growing awareness of the need for health programs in general, as a means leading to the creation of a culture of health in organizations. The notion of a culture of health is becoming increasingly important for companies. Statistics show that the number of health problems is steadily increasing.

As a result, labor costs are systematically increasing. To solve this problem, many companies have begun to implement health programs to improve the psycho-physical health of their employees. In particular, studies confirm the usefulness (in certain cases) of health-improving cosmetology programs in the process of forming a corporate culture of health. There are factors that limit the usability of such programs [16].

It is necessary to note the problems of the safety of services and protection of patients' personal data, these services received. All formal and technical rules that directly or indirectly affect safety standards in cosmetological health centers determine the overall safety of cosmetology services. Its level is an important competitive advantage in running a business, security is becoming increasingly important in marketing a health-oriented business.

Because of the specifics of cosmetology services, there are many different segments of such security. Among them are medical aspects as well as personal information security. It is this last element that allows customers to trust a certain beauty establishment. Only careful protection of personal information ensures the ethics and confidentiality of the provision of cosmetology services, which is extremely important for their recipients [17].

The problem of transparency in the market of cosmetology services in the context of official rules has not been solved in general. This refers to the standards of services provided (not covering some relatively new forms of cosmetology services), the interrelationships of different quality components and specific service providers [18]. There is a lack of transparency in the market of cosmetology services, caused by information asymmetry. It arises from the uncertainties regarding the comprehensive assessment of the quality of cosmetology service due to the lack (or insufficient use) of formalized models (including mathematically substantiated, implemented by computer) for multi-criteria evaluation of cosmetology services by both consumers and organizations, providing such services.

Some popular cosmetology centers in Kharkiv are represented in Table 1. The vast majority of cosmetic institutions are located in the center which can be explained by the places of primary residence and the work of potential clients who need such services.

Table 1. Kharkiv's cosmetic institutions

№	Name	Website	№	Name	Website
1	Lumenis	lumenis.com.ua/xarkov.html	9	Institute Hyalual	clinic-hyalual.com.ua
2	Esthetic Cosmetology	aest-cosmetology.com.ua	10	Lazer House	www.laserhouse.com.ua
3	Proper Cosmetology	sbahhlsephekjrcbds2aw5rqcm.com	11	Nucu Cosmetic	nucu.com.ua
4	Continent	continentdayspa.com	12	Kharkiv Cosmetology Hospital	old-clinic.com.ua
5	Feskov Clinic	beauty.feskov.com	13	Gold Clinic	gold-clinic.com
6	Cosmetologist	-	14	Magnifique Beauty School	magnifique.com.ua
7	Oxford Medical	kharkiv.oxford-med.com.ua	15	ARLI	arli-beauty.com.ua
8	Stylus Studio	stylus-studio.com.ua			

Further, the work of these cosmetic institutions was studied in more detail, relying on field observations with direct visits to institutions, accessible information on their websites and feedback from visitors in social networks and the Internet as a whole. This allowed us to propose criteria (according to which the consumer, the client of cosmetology services can preliminary assess the relevant center, hospital, cabinets) and break them into three large groups. Each of them contains its own set of subcriteria, the implementation of which is proposed to be assessed with the corresponding scores, which are given in Table 2. For each of three generalized criteria, an evaluation of the listed cosmetology institutions (according to sites, visitor reviews, own observations) was carried out. Results are given in Tables 3-5.

It is clear that there can be additional, exclusive, unique opportunities (offers, services, procedures) that are not of a mass character, provided by only one cosmetology clinic. But at this stage of the preliminary comparison, they should not be taken into account, since clients of such services find them not through a simple comparison and choice in the market of cosmetology services, but in other, specific ways.

For computer implementation was chosen a specialized software FuzzyTech. The general theoretical and methodological foundations for constructing similar models are presented in sufficient detail and processed in a number of previous authors' articles [19 - 24]. According to the above justifications and numerical data, the input variables of the model are three generalized parameters, namely: Communications (the sum of the assessment for individual sub-criteria may range 0 - 19 points; verbal estimates - weak, average, excellent), ServicesPrices (range 0 - 15 points; verbal estimates - low, medium, high), StaffEquipment (range 0 - 11 points; verbal estimates – bad, satisfactory, good).

Table 2. The criteria for assessment of cosmetology institutions (points)

Internet communications and features	Services and prices	Personnel and equipment
Online Consultant (1)	Services breadth of (2)	Premises (2)
Online Registration (1)	Prices level (2)	Specialists number (2)
Online question (1)	Working time (2)	Personnel qualification (2)
Call back (1)	Work on weekends (1)	Equipment level (2)
Overall website quality (2)	Additional services (2)	The term of work in the market (2)
Information, prices (2)	Services information (2)	Exclusive services (1)
Information, discounts (2)	Location (2)	
Social networks (2)	Transport accessibility (2)	
Blogs (1)		
Comments, website (2)		
Comments, media (1)		
Photo, video materials (2)		
Online payment (1)		

Table 3. Internet-communications and features evaluation (points, total 19 max)

Horizontally - clinic from Table 1 (№) Vertically - assessment criterion (points)	1	2	3	4	5	7	8	9	10	11	12	13	15
Online Consultant (1)	1	0	0	0	1	1	1	1	1	0	0	0	0
Online Registration (1)	1	0	1	1	1	1	0	1	1	0	0	0	0
Online question (1)	1	0	1	1	1	1	1	1	1	1	0	1	1
Call back (1)	1	0	1	0	0	1	0	0	1	0	0	0	1
Overall website quality (2)	2	0	2	1	1	1	2	1	2	1	1	1	1
Information, prices (2)	2	1	2	0	2	1	2	2	2	2	2	2	0
Information, discounts (2)	2	0	2	0	1	2	2	2	2	1	1	0	0
Social networks (2)	2	0	2	2	1	1	2	0	2	1	0	1	0
Blogs (1)	0	0	0	0	0	0	0	0	1	0	0	0	1
Comments, website (2)	2	0	2	0	1	0	0	0	2	0	2	0	0
Comments, media (1)	0	0	0	0	0	0	0	0	0	0	1	0	0
Photo, video materials (2)	2	0	2	0	0	1	2	2	2	1	2	1	1
Online payment (1)	0	0	0	0	0	0	0	0	1	0	0	0	0

Table 4. Evaluation of services and prices (points, total 15 max)

Horizontally - clinic from Table 1 (№) Vertically - assessment criterion (points)	1	2	3	4	5	7	8	9	10	11	12	13	15
Services breadth (2)	0	0	1	2	2	1	0	0	0	1	2	2	1
Prices level (2)	0	1	0	0	1	1	1	1	0	1	2	2	0
Working time (2)	2	0	1	0	0	1	1	2	2	2	1	0	0
Work on weekends (1)	1	0	1	0	0	0	1	1	1	0	0	0	0
Additional services (2)	2	0	1	1	0	0	0	0	0	0	0	1	0
Information about services (2)	1	0	2	1	1	1	2	2	2	1	2	2	1
Location (2)	2	2	2	2	1	2	2	0	2	2	0	0	0
Transport accessibility (2)	2	2	2	2	2	2	1	0	2	2	0	0	1

Table 5. Evaluation of personnel and equipment (points, total 11 max)

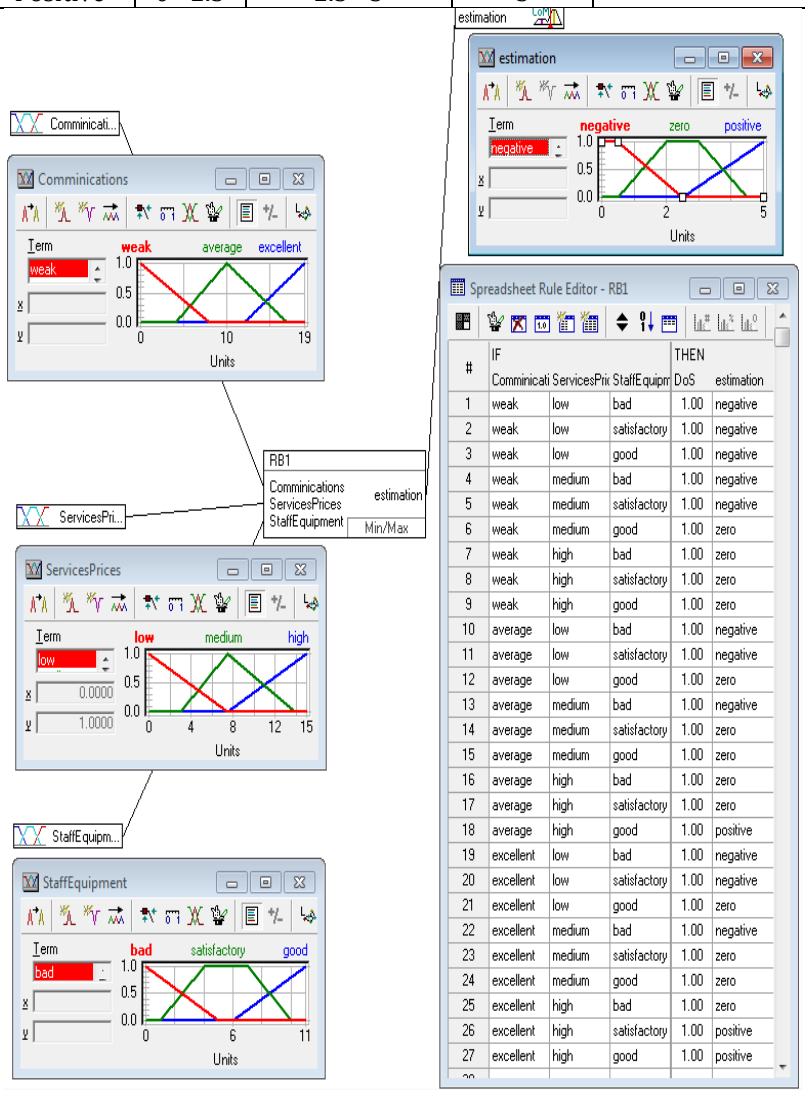
Horizontally - clinic from Table 1 (№) Vertically - assessment criterion (points)	1	2	3	4	5	7	8	9	10	11	12	13	15
Premises (2)	1	0	2	2	2	1	1	0	1	1	0	0	0
Specialists number of (2)	1	0	1	1	1	2	0	1	2	2	2	2	0
Personnel qualification (2)	0	2	2	1	1	1	2	1	2	2	2	1	1
Equipment level (2)	2	0	2	1	0	0	2	0	2	2	1	1	1
Work term at the market (2)	2	2	1	2	0	2	2	1	0	1	2	0	0
Exclusive services (1)	0	0	1	1	0	0	0	1	0	0	0	1	1

According to the requirements of the chosen computer algorithm for constructing the model, we will represent each of the parameters (that is, the evaluation criteria) in the form of a so-called linguistic variable with three terms. They can be represented graphically by the corresponding piecewise-linear membership functions. Similarly, the output parameter (resulting estimate) will be obtained on a five-point scale: Estimation (range 0 - 5 points; verbal estimates – negative, zero, positive). Parameters for constructing the input and output membership functions described above are presented in Table 6. The view of the model as a whole is shown in Fig. 1.

In addition to the input variables (represented by the membership functions), the model contains a set of decision rules (estimations). It is a complete search of variants of combinations of all possible linguistic values (terms) and a corresponding conclusion on the evaluation (i.e. one of the terms of the output variable). In our case, there are 27 such rules. The applied software product provides many different settings and presentation forms for the model built. One of the most interesting and useful for further analysis is the possibility of obtaining so-called fuzzy inference surfaces. They are two-dimensional graphic images reflecting the dependence of the final result (final evaluation) on any pairs of two input parameters (variables) of the model.

Table 6. Numerical values for membership functions (input, output variables)

Variable	Term	level 0	Increase from 0 to 1	level 1	Decrease from 1 to 0	level 0
Comminications (0-19) points	Weak	-	-	-	0 - 8	8 – 19
	Average	0 - 4	4 - 10	10	10 - 17	17 – 19
	Excellent	0 - 12	12 - 19	19	-	-
Services Prices (0-15) points	Low	-	-	-	0 - 7	7 -15
	Medium	0 - 3	3 - 8	8	8 - 14	14 –15
	High	0 - 8	8-15	15	-	-
Staff Equipment (0-11) points	Bad	-	-	-	0 - 5	5 – 11
	Satisfactory	0 - 4	1 - 4	4 – 7	7 - 10	10 – 11
	Good	0 - 6	6 - 11	11	-	-
Estimation (0-5) points	Negative	-	-	0 - 0.5	0.5 - 2.5	2.5 – 5
	Zero	0 - 0.5	0.5 - 2	2 – 3	3 - 4.5	4.4 – 5
	Positive	0 - 2.5	2.5 - 5	5	-	-



#	IF Comminicati	ServicesPric	StaffEquipm	THEN DoS	estimation
1	weak	low	bad	1.00	negative
2	weak	low	satisfactory	1.00	negative
3	weak	low	good	1.00	negative
4	weak	medium	bad	1.00	negative
5	weak	medium	satisfactory	1.00	negative
6	weak	medium	good	1.00	zero
7	weak	high	bad	1.00	zero
8	weak	high	satisfactory	1.00	zero
9	weak	high	good	1.00	zero
10	average	low	bad	1.00	negative
11	average	low	satisfactory	1.00	negative
12	average	low	good	1.00	zero
13	average	medium	bad	1.00	negative
14	average	medium	satisfactory	1.00	zero
15	average	medium	good	1.00	zero
16	average	high	bad	1.00	zero
17	average	high	satisfactory	1.00	zero
18	average	high	good	1.00	positive
19	excellent	low	bad	1.00	negative
20	excellent	low	satisfactory	1.00	negative
21	excellent	low	good	1.00	zero
22	excellent	medium	bad	1.00	negative
23	excellent	medium	satisfactory	1.00	zero
24	excellent	medium	good	1.00	zero
25	excellent	high	bad	1.00	zero
26	excellent	high	satisfactory	1.00	positive
27	excellent	high	good	1.00	positive

Fig. 1. Model in FuzzyTech (membership functions, applied fuzzy inference rules)

Source: authors own research and modeling

These surfaces clearly depict the dependence of the results on the input data. It is possible to establish areas of strong influence of a sharp change in an individual input parameter on a generalized estimate. Such surfaces for our model are shown in Fig. 2 (pairs of input variables: *Communications* and *ServicesPrices*, *Communications* and *StaffEquipment*, *ServicesPrices* and *StaffEquipment*).

The developed model was applied to calculate the integrated assessment of the cosmetic institutions of the city of Kharkov based on the criteria defined above and divided into three main groups. An example of input of initial data and obtaining the result (calculated for the center for laser cosmetology and laser hair removal Stylus Studio) is shown in Fig. 3. The input data can be entered either from the keyboard (in the numeric input field) or from the slider value control at the bottom of the window. There is also a set of buttons for activating various additional service capabilities of the software itself (FuzzyTECH program).

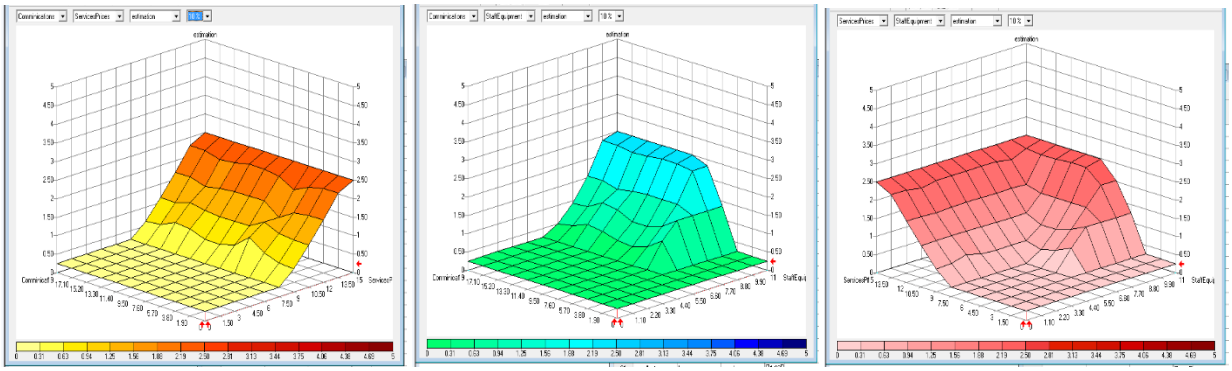


Fig. 2. Obtained fuzzy inference surfaces for generalized cosmetology institutions estimation (for all three pairs of input variables)

Source: authors own research and modeling

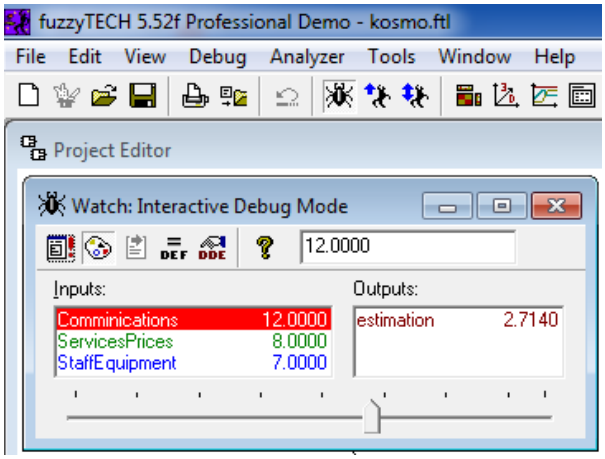


Fig. 3. View of input window and output of the result (data for Stylus Studio)

Source: authors own research and modeling

The numerical results of calculations (generalizing scores in points on a five-point system) for all the cosmetological institutions selected for consideration are given in Table 7.

Table 7. Calculated generalized assessments for Kharkiv cosmetic centers

Name	Scores
Proper Cosmetology	3,6
Lumenis	3,4
Lazer House	3,1
Nucu Cosmetic	2,8
Stylus Studio	2,7
Oxford Medical	2,3
Kharkiv City Cosmetology Hospital	2,3
Feskov Clinic	2,1
Institute Hyalual	2,0
Gold Clinic	2,0
Continent	1,7
Esthetic Cosmetology	0,3
ARLI	0,3

The table shows the distribution to four main groups: leaders in the market of cosmetology services (green color grades), close to the leaders (yellow), middle (orange) and explicit outsiders (red).

It should be noted that not high (at first glance) assessments of leaders are due to the fact that even for them there are certain significant drawbacks from the point of view of the visitor, patient, client (high prices, insufficient comprehensive list of services, lack of communication with consumers). At the same time, no one is using new, modern marketing communications capabilities (for example, QR codes for mobile devices, special versions of smartphone websites, electronic payment through bank cards). A common drawback is also a weak reflection of customer feedback. In particular, the reviews give the impression of artificial, false, irrelevant, do not inspire confidence because of the lack of specifics, time-binding and the like.

Conclusions and perspectives for further research

The offered model can be used both for comparison of the cosmetic institutions operating in the market of cosmetology services and in the process of self-analysis of the work of a separate cosmetic institution. It allows to identify the strengths and weaknesses of your and competitors, determine which improvements in the individual components of service, marketing communications, the quality of the services themselves are necessary. Corresponding actions to address the identified shortcomings may lead to an increase in the assessment of the institution by the public, patients, visitors, potential clients.

Monitoring of the current level of the generalized assessment of the functioning and marketing interaction with the clients of the cosmetology company with the help of the developed model can be carried out more quickly, with less time spent at acceptable accuracy (both market experts and top managers of cosmetic institutions).

It is clear that the model can be significantly improved and refined due to the concretization and expert-analytical justification of the type and parameters of the functions of linguistic terms, as well as the correction of the rules for accepting fuzzy inference and their relative importance. Also, depending on the situation (set research objectives), individual criteria for evaluation can be adjusted (supplemented, limited or rearranged).

Moreover, the proposed approach as a whole (and the model itself, with its appropriate adjustment) are quite generalized. Therefore, they can be successfully used for a wide range of tasks of multi-criteria evaluation of the level of service, service, marketing components in the provision of various services by the relevant enterprises (and institutions) to the population. Such institutions include, in particular, pharmacies, medical institutions (in the context of the introduction of insurance medicine), other enterprises providing various servicing, domestic and commercial services.

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