MATHEMATICAL METHODS, MODELS AND INFORMATION TECHNOLOGIES IN ECONOMICS

INTEGRAL EVALUATION OF SERVICE MARKETING OBJECTS

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Introduction. The past few decades has seen unprecedented growth of service industry. The gamut of services that make up for the significant contribution towards the GDP of the economy are numerous ranging from financial services, insurance, health care, hospitality, travel, information services, retail, utilities, information technology enabled services and media services etc.

In the present times, doing business has become an extremely competitive game. This is true not only for the product industry but to the service industries as well. In case of service industry, the competition to be at the top and be the market leader is tougher simply because of the fact that service is all about intangibles unlike the product industry that sells a tangible product.

A service company needs to create that edge by doing things differently from the others, while continuing to strive for operational excellence and efficiency from within. While competition can easily duplicate the service offering, maintaining leadership calls for a different mindset and thinking in terms of continuous innovation and providing enhanced value of customer experience and service.

Overview of the latest sources of research and publications. When services marketing emerged as a separate sub-branch within the marketing discipline, it was largely a protest against the dominance product-centric view [13]. Scholars soon began to recognise that services were important in their own right, rather than as some residual category left over after goods were taken into account. This recognition triggered a change in the way services were defined. By the mid twentieth century, scholars began defining services in terms of their own unique characteristics, rather than by comparison with products [3, 5]. The following set of definitions shows how scholars were grappling with the distinctive aspects of service products and developing new definitions of service [7, 15]. "Services are processes (economic activities) that provide time, place, form, problem-solving or experiential value to the recipient." [10]. "The term 'service'... is synonymous with value. A supplier has a value proposition, but value actualization takes place during the customer's usage and consumption process." [6].

In order to win the competition, a service company needs to have more opportunities (scope of activities). The scope of activities is the degree to which the system is able to provide the services in which it specializes [8]. Let's define the concept of scope of activities and difficulties associated with its evaluation. The volume of activity of a manufacturing enterprise is determined by the maximum level of productivity [8, 9]. This simple definition, however, obscures internal difficulties, namely the assessment of service performance [2]. As you know, two characteristics of services are that the result of the service is intangible,

and that it is non-standard and can vary greatly. The third reason for the difficulty is that service firms rarely offer a single, standard service. There are seven main components of business: human resources, buildings, equipment, tools, consumer participation and alternative sources of business [1, 7]. There is a need for a comprehensive assessment of competing service companies by different characteristics.

Purpose of the article: to offer a method of integrated assessment of objects of marketing services for a set of components that characterize the scope of activities.

Basic material and results. We will present a method of integrated assessment of objects of marketing services on the example of determining the competitiveness of the company "Nova Poshta" in the market of postal services [4]. Nova Poshta is a Ukrainian company that provides express delivery of documents, cargo and parcels for individuals and businesses. The company was founded in 2001 in the city of Poltava and carried out transportation on the route Kyiv – Poltava – Kharkiv. Now the company is a leader in the Ukrainian market in the field of express delivery services. There are more than 1,200 branches to use the services. On December 14, 2009 the company's work was awarded one of the awards of the international academic rating "Golden Fortune" in the nomination "Quality of the third millennium". In 2010, Nova Poshta received the People's Recognition award in the Express Delivery category in the All-Ukrainian Brand of the Year rating. In July 2014, Nova Poshta launched a social project that enabled volunteer organizations and initiative groups to send and receive humanitarian goods free of charge at any branch of the company throughout Ukraine. Currently, it is volunteer organizations and individual volunteers who play a key role in providing the necessary assistance to the affected residents of the eastern region of the country and soldiers of the Ukrainian army. The company's mission is to make delivery easy for life and business, to simplify life for customers. To do this, the Nova Poshta team introduces new products and services, focusing on international standards and the best world experience.

We use the method of integrated assessment to determine the competitiveness of the company "Nova Poshta" in the market of postal services. To solve this problem, it is necessary to collect factual data that will determine the list of characteristics of the objects of marketing services and their numerical values. In our case, we must determine the competitiveness of companies that provide postal services. The main competitors in the domestic market of postal services are Nova Poshta, Ukrposhta and Autolux. Characteristics by which competitiveness will be assessed are: monthly income in thousands of hryvnias, quantitative and qualitative composition of staff, points, level of logistics in percent, image in points, quality of services in points, profitability of services in percent, number of clients per month, man, price level in points. Let's form a matrix of natural values.

Table 1

Evaluation objects characteristics natural values matrix [14]

characteristics / objects	Income per month, thousand UAH	Quantitative and qualitative composition of staff, points	The level of logistics,%	Image, points	Quality of service, points	Profitability of services,%	Number of clients per day, thousand people	Price level, points
Нова пошта	49670	4	98	9,7	9,5	14,9	543	7
Укр. пошта	52010	3	100	9,1	7,1	9,0	528	5
Автолюкс	43480	2	78	7,2	5,4	17,1	421	8

In this matrix, characteristics numerical values have different measurement units, so mathematical actions with them are not possible. Perform output elements transformation matrix in one of the following ways [14]:

- If the best value of the characteristic is minimal, then the formula is used:

$$X_{IJ} = \frac{X_{IJ\,(min)}}{X_{IJ}}$$

, (1)

where X_{IJ} is natural value characteristics;

$X_{IJ(min)}$ is minimum natural value characteristics [14].

– If the best characteristic value is maximal, then the formula is used:

$$X_{IJ} = \frac{X_{IJ}}{X_{IJ(\max)}} \ , \qquad (2)$$

where $X_{IJ(\max)}$ is maximum natural value characteristics.

By calculations results reduced values matrix is obtained [14].

Table 2

Evaluation objects characteristics given values matrix

i \ j	1	2	3	4	5	6	7	8
1	0,96	1	0,98	1	1	0,87	1	0,88
2	1	0,75	1	0,94	0,75	0,54	0,97	0,63
3	0,84	0,5	0,78	0,74	0,57	1	0,76	1

Internal functional characteristics significance calculation. The estimation uses determining entropy method, by this method, first find each matrix column total amount [Xij], then define fraction Pij every element in total sum by formula [14]:

$$P_{IJ} = \frac{\overline{X_{IJ}}}{\sum_{i=1}^{n} X_{IJ}}, \qquad (3)$$

Where $\overline{Xij}$ is characteristics given value;
Pij is every element fraction.

Table 3

Auxiliary matrix for calculating entropy | Pij |

i \ j	1	2	3	4	5	6	7	8
1	0,34	0,44	0,36	0,37	0,43	0,36	0,37	0,35
2	0,36	0,33	0,36	0,35	0,32	0,22	0,36	0,25
3	0,30	0,22	0,28	0,28	0,25	0,41	0,28	0,40

Determine the entropy value for each matrix column by the formula [14]:

$$E_J = -\frac{1}{\ln N} \times \sum_{i=1}^{n} (P_{IJ} \times \ln P_{IJ}) \,, \qquad (4)$$

where Ej is entropy;
N is object quantity.

The values of entropy are:
$E_1 = 0,997;$
$E_2 = 0,965;$
$E_3 = 0,993;$
$E_4 = 0,993;$
$E_5 = 0,977;$
$E_6 = 0,970;$
$E_7 = 0,993;$
$E_8 = 0,983.$
Internal functional significance is calculated by the formula [14]:

$$d_J = 1 - E_J,$$ (5)

Internal functional significance values are:
$d_1 = 1 - 0,997 = 0,003;$
$d_2 = 1 - 0,965 = 0,035;$
$d_3 = 1 - 0,993 = 0,007;$
$d_4 = 1 - 0,993 = 0,007;$
$d_5 = 1 - 0,977 = 0,023;$
$d_6 = 1 - 0,970 = 0,030;$
$d_7 = 1 - 0,993 = 0,007;$
$d_8 = 1 - 0,983 = 0,017.$

Internal functional significance value is given [14]:

$$\overline{d_J} = \frac{d_J}{\sum\limits_{i=1}^{n} d_J},$$ (6)

where d_J is given internal functional significance value.

Determine the given internal functional significance values:
$\overline{d_1} = 0,02;$
$\overline{d_2} = 0,27;$
$\overline{d_3} = 0,05;$
$\overline{d_4} = 0,05;$
$\overline{d_5} = 0,18;$
$\overline{d_6} = 0,23;$
$\overline{d_7} = 0,05;$
$\overline{d_8} = 0,13.$
External (subjective) significance determination.
Construct pairwise comparisons matrix. In the matrix, the rows and columns have characteristics. It is compared the characteristics significance [14].

Table 4

Object characteristics pairwise comparisons matrix

i \ j	1	2	3	4	5	6	7	8	$\sum\limits_{j=1}^{m}$	$\overline{q}_i$	$\overline{d}_i$	k_i	$\overline{k}_i$
1	■	3	3	2	2	2	3	3	18	0,16	0,02	0,02	0,05
2	1	■	2	1	1	1	1	1	8	0,07	0,27	0,06	0,15
3	1	2	■	1	1	1	1	2	9	0,08	0,05	0,03	0,07
4	2	3	3	■	2	2	3	3	18	0,16	0,05	0,04	0,10
5	2	3	3	2	■	2	3	3	18	0,16	0,18	0,08	0,20
6	2	3	3	2	2	■	3	3	18	0,16	0,23	0,09	0,22
7	1	3	3	1	1	1	■	2	12	0,11	0,05	0,03	0,07
8	1	3	2	1	1	1	2	■	11	0,10	0,13	0,06	0,15

$$\sum_{j=1}^{m}\sum_{i=1}^{m} 112$$

Determine goods comprehensive assessment competitiveness:

$Q_1 = 0,96 \times 0,05 + 1 \times 0,15 + 0,98 \times 0,07 + 1 \times 0,1 + 1 \times 0,2 + 0,87 \times 0,22 + 1 \times 0,07 + 0,88 \times 0,15 = 0,96$

$Q_2 = 1x0,05 + 0,75 \ x \ 0,15 + 1x0,07 + 0,94x0,1 + 0,75x0,2 + 0,54x0,22 + 0,97x0,07 + 0,6x0,15 = 0,75$

$Q_3 = 0,84x0,05 + 0,5 \ x \ 0,15 + 0,78x0,07 + 0,74x0,1 + 0,57x0,2 + 1x0,22 + 0,76x0,07 + 1x0,15 = 0,78$

The performed calculation shows that the complex assessment of Nova Poshta's competitiveness is significantly higher than the main competitors.

Conclusions and prospects for the further research. Thus, the used method of integrated evaluation makes it possible to assess the competitiveness of companies, the quality of customer service and other objects of marketing in the service sector on a set of indicators. The methodology takes into account both the objective and subjective significance of the indicators from the point of view of experts or respondents. An additional advantage of this technique is that the indicators can have different units of measurement, and the best value can be both maximum and minimum.

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Добрянська Вікторія Вікторівна, кандидат технічних наук, доцент. Національний університет «Полтавська політехніка імені Юрія Кондратюка». **Інтегральна оцінка об'єктів маркетингу сфери послуг.**
За останні кілька десятиліть у найбільш економічно розвинутих країнах спостерігається інтенсивне зростання сфери послуг. У цих країнах наразі остання складає більшу частину економіки. Галузі послуг на розвинутих ринках численні, починаючи від фінансових послуг, страхування,

охорони здоров'я, готельно-ресторанної справи, туризму, інформаційних послуг, роздрібної торгівлі, комунальних послуг, медіа тощо. У наш час конкуренція у будь-якому бізнесі різко загострилася. Це стосується тим більше сфери послуг. Щоб перемогти у конкурентній боротьбі, сервісній компанії потрібно мати більші можливості (обсяг діяльності). Обсяг діяльності – це ступінь можливості системи надати послуги, на яких вона спеціалізується. Обсяг діяльності виробничого підприємства визначається максимальним рівнем продуктивності. Виникає необхідність комплексного оцінювання конкуруючих компаній сфери послуг за різними характеристиками. Мета статті – запропонувати методику інтегрального оцінювання об'єктів маркетингу послуг за комплексом складових, які характеризують обсяг діяльності. Використано методику інтегрального оцінювання об'єктів маркетингу послуг для визначення конкурентоспроможності компанії «Нова пошта». Застосована методика інтегрального оцінювання дає можливість визначити конкурентоспроможність компаній, якість обслуговування клієнтів та інші об'єкти маркетингу сфери послуг, використовуючи комплекс показників. За результатами експертного опитування характеристиками, за якими оцінювалася конкурентоспроможність компанії «Нова пошта», обрано: дохід за місяць (у тисячах гривень), кількісно-якісний склад персоналу (у балах), рівень матеріально-технічного забезпечення (в процентах), імідж (у балах), якість надання послуг (у балах), рентабельність послуг (у процентах), кількість клієнтів за місяць (осіб), рівень (доступність) цін (у балах). При цьому методика враховує як об'єктивну, так і суб'єктивну значимість показників з точки зору експертів або опитаних респондентів. Додаткова перевага цієї методики полягає в тому, що показники можуть мати різні одиниці виміру, а краще значення може бути і максимальним, і мінімальним.

Ключові слова: інтегральна оцінка, конкурентоспроможність, маркетинг сфери послуг.

Dobrianska Viktoriia, PhD (Technical Sciences), Associate Professor. National University «Yuri Kondratyuk Poltava Polytechnic». **Integral Evaluation of Service Marketing Objects.** There is unprecedented growth of service industry in the past few decades. In order to win the competition, a service company needs to have more opportunities (scope of activities). There is a need for a comprehensive assessment of competing service companies by different characteristics. Purpose of the article is to offer a method of integrated assessment of objects of marketing services for a set of components that characterize the scope of activities. The used method of integrated evaluation makes it possible to assess the competitiveness of companies, the quality of customer service and other objects of marketing in the service sector on a set of indicators.

Key words: integrated assessment, competitiveness, marketing of services.