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CONCEPTUAL MODEL OF DIGITAL MARKETING SYSTEM IN ECONOMIC FACILITIES MANAGEMENT

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Key words:
Big Data, marketing system, model, method, expert assessments

The article considers digital marketing systems, which are based on the use of the Internet with cloud technologies and Big Data. New types of business models are considered, the basis of which became the Internet itself and for which it plays a major role in B2B relationships. A number of requirements of digital marketing to the target market are investigated, which were analyzed from the standpoint of the possibility of their implementation in the enterprise. A conceptual model of a digital marketing system for managing economic objects has been built, which includes market research of goods and resources with the ability to analyze and forecast. This conceptual model uses a method of assessing consumer efficiency, which is based on the use of ratings obtained on the basis of ranking expert opinion on several scales. Experts can be both consumers and the company. The use of expert assessments is necessary in terms of information opacity of the target market data. The method of evaluation of the digital marketing system in the management of economic objects is built and used, which is based on the use of rating estimates obtained on the basis of ranking expert opinion with several scales of order. Experts can be both consumers and the company. The use of expert assessments is necessary in the conditions of information opacity of the target market data.

КОНЦЕПТУАЛЬНА МОДЕЛЬ ЦИФРОВОЇ МАРКЕТИНГОВОЇ СИСТЕМИ В УПРАВЛІННІ ЕКОНОМІЧНИМИ ОБ'ЄКТАМИ

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Ключові слова:
Великі Дані, маркетингова система, модель, метод, експертні оцінки

У статті розглянуто цифрові маркетингові системи, які засновані на застосуванні мережі Інтернет із хмарними технологіями і Великими Даними. Розглянуто нові види моделей бізнесу, основою яких став безпосередньо сам Інтернет і для яких він відіграє основну роль у взаєминах B2B. Досліджено ряд вимог цифрового маркетингу до цільового ринку, які були проаналізовані з позиції можливості їх виконання на підприємстві. Побудована концептуальна модель цифрової маркетингової системи управління економічними об'єктами яка включає дослідження ринку товарів і ресурсів з можливостями аналізу і прогнозування. У даній концептуальній моделі застосований метод оцінки споживчої ефективності, в основу якого покладено використання рейтингових оцінок, отриманих на основі ранжирування експертної думки з кількох шкалами порядку. Експертами можуть бути як споживачі, так і підприємство. Застосування експертних оцінок є необхідним в умовах інформаційної непрозорості даних цільового ринку. Побудовано та використано метод оцінки цифрової маркетингової системи в управлінні економічними об'єктами, який заснований на використанні рейтингових оцінок, отриманих на основі ранжирування експертної думки з кількох шкалами порядку. Експертами можуть бути як споживачі, так і підприємство. Застосування експертних оцінок є необхідним в умовах інформаційної непрозорості даних цільового ринку.

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Statement of the problem

Depending on the level of development of production and demand for the proposed products, the concept of marketing has undergone evolutionary development. Their changes were mainly determined and continue to be determined by the state and interaction in the market space of such entities as the producer (seller), consumer (buyer) and the state (government). Another important factor, the influence of which has grown especially recently, has been the development of technical means, the improvement of which is closely related to the development of society as a whole.

As a rule, depending on the level of development of market relations, the evolution of marketing in each country has certain specifics and features. However, the world experience of its formation and development of market relations shows the general trend of marketing – shifting attention from the production of goods to the consumer, his needs, and can be used as a guide in the formation of market relations and business in a particular country.

The traditional marketing concept [5] took shape around the mid-50s, while marketing itself emerged much earlier. The marketing concept is customer-oriented and supported by a set of measures aimed at meeting market needs. In this case, marketing activities begin with identifying real and potential buyers and their needs. According to this concept, the goals of the economic object, especially long-term, can be achieved only by studying the needs and desires of consumer groups to which the company directs and offers products and services that satisfy them in quality and content.

The marketing concept obliges the economic object [2] to produce what can be sold, instead of trying to sell what can be done, not to sell goods, but to meet needs, to study not production capacity but market needs and develop plans to meet them, link the goals, requirements of consumers and resource capabilities of the firm, adapt to changes in the structure and characteristics of consumers, assess the effects of competition, government regulation and other external influences on the firm and focus on the long term and consider consumer needs in general.

According to the traditional marketing concept, sales are a means of communication, communication and study of consumers, and if they remain dissatisfied, then it is necessary to change the general policy, not the sales process.

The economic entity plans and coordinates the development of marketing programs aimed at meeting the identified needs. The enterprise (industrial complexes, firms and others) makes a profit by meeting the needs of customers. In this situation, the decision of what to do is not made by the economic entity, but by consumers.

A new concept of marketing management in the markets of goods and services was proposed in the 80's and was called marketing interaction [3]. Factors that stimulate the development of a new system of views have been the constant growth of the service sector and the comprehensive development of information technology.

The reflection of the first factor is the development of the service business. Abroad, the future society is called service, as it is estimated that more than half of the national product in the world will be produced in the service sector. The transition to a service society means that, as in the era of the industrial revolution, will require new management and organizational solutions in marketing, new methods of managing relationships between people: employees and customers, customers.

In the conditions of development of service competition there is a necessity of new organizational logic of business in comparison with an industrial society. Services become a source of competitive advantage, regardless of where they are found: in industry (maintenance and repair, staff training, consulting, materials) or in the traditional service sector (banks, tourism, hotels, restaurants and others).

In this situation, there is a need for a new approach to the management of the economic object. Therefore, marketing cannot remain a separate function, unique to specialists in this field. Its role and importance is expanding, that is, along with research, planning, sales promotion and distribution, there is a function of interaction with the buyer. Such interaction, long-term relationship with the customer is much cheaper than the marketing costs required to increase interest in the product or service of the company to a new customer.

A reflection of the growing importance of the second factor is the selection of the stage of evolution of the subject, called information marketing. In the era of information marketing, the success of an economic object depends not only on its capabilities in production and marketing, but also on innovation, knowledge, information resources, the ability to use these resources to increase the competitive advantages of the economic object.

Analysis of recent studies and publications

Digital marketing systems are a new direction in marketing. In many sources [2; 3; 4] this area is also called digital marketing, which solves the main functions of marketing [5], namely: analytical – the study of the market, consumers, product structure, competitors; production – the organization of production and logistics, the introduction of new technologies, ensuring high quality and competitiveness of products; distribution – sales – organization of sales channels, transportation and storage systems, product and price policy, advertising; managerial – planning at the tactical and strategic levels, information support of marketing, control in the Internet environment. All these features are united by the fact that they are implemented on the Internet using cloud and Big Data technologies. These technologies provide ample opportunities for interaction between consumers and producers, from the simple exchange of information to the implementation of financial transactions, transactions and delivery of goods.

The second direction is related to the emergence of new types of business models, which are based directly on the Internet itself and for which it plays a major role in B2B relationships. For these areas, the Internet plays not only the role of a new tool for service systems [7], which aims to increase the efficiency of business processes and reduce costs, its task – to make a profit.

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But the modeling of the digital marketing system as a system of solutions and management of marketing functions, through which organize and manage a set of actions related to assessing the purchasing power of consumers, with its transformation into real demand for goods or services, and bringing these goods and services closer to Insufficient attention is paid to consumers to make the maximum possible profit through the Internet.

Objectives of the article

Formulation of the goals of the article: to build a conceptual model of the digital marketing system in the management of economic objects.

The main material of the research

The emergence of a new function of marketing – the function of interaction management allowed from other, communicative, positions to look at marketing technology. Therefore, marketing technology should be seen as a process of profitably establishing, maintaining and improving relationships with customers and other entities to meet the goals of all parties involved in the transaction.

Interaction marketing views communications in a broader sense – as any relationship between a company and its partners that contributes to the withdrawal of income. The basic idea of interaction marketing is that the object of management is the overall solution, and the relationship – communication with the buyer and other participants in the buying and selling process. The progressiveness of the concept of interaction marketing is confirmed by the fact that products are becoming more standardized and services are unified, which leads to the formation of repetitive marketing decisions. Therefore, the only way to retain a consumer is to individualize the relationship with him, which is possible through the development of long-term interaction of partners. In this context, the relationship becomes the most important resource that the company has, along with material, financial, informational, human and other resources. Relationships, as a result of effective interaction, become a product in which integrated intellectual and information resources – the main factors of continuity of market relations.

The concept of building digital marketing systems is developed on the theory and practice of segmentation, which takes into account the factors of distribution of goods and their substitutes. The unifying factor that forms the similarity in consumption and normative values is the microenvironment. Both economists and statisticians have noticed that such a connection exists and manifests itself in many cases. This phenomenon is sometimes called the «principle of intimacy». Proximity somehow «makes» the elements similar or «attracts» in something similar elements. This fully applies to goods and services that can be considered as a target market.

This target market in general corresponds to the classical definition, but has a number of features, in particular, it is not limited to the contingent of consumers and goods (resources).

Goods and services sold in this market have a number of specific economic and social characteristics. First, they have lower prices [4]. Secondly, the range of products is limited by the specifics of the economic object.

In known segmentation approaches and techniques, the segment size estimation step is mandatory. In this case, when using a digital marketing system, this approach is illegal.

Digital marketing puts forward a number of requirements for the target market, which were analyzed from the standpoint of the possibility of their implementation in the enterprise (Table 1).

The choice of the target market is based on the task of increasing sales. In this case, it is necessary to talk about a special type of market, which also has a geographical component. This is due to the fact that consumers, who have been united in a single target market of the global Internet, need a number of goods and services, regardless of geographical location.

The main factors of product attractiveness and its competitiveness can be represented in the form of a chain: price – quality – service – marketing environment. The «price» factor characterizes the ratio of the price level with the prices of the main competitors, the development of the system of price differentiation depending on the ratio of supply and demand, as well as the policy of competitors, the attractiveness of discounts for consumers; «Quality» – product characteristics (functionality, reliability, ease of operation and others); «Service» – the quality and delivery time of the goods, the level of service, the availability of spare materials and service centers; «Marketing environment» – the level of marketing logistics, the effectiveness of advertising activities, the level of design and content of packaging, the level of warranty service to customers before and after purchasing goods, the ability to purchase goods using modern means of communication (Internet, mobile and others).

In modern conditions, the state, along with other functions, monitors compliance with certain norms and standards.

These standards in essence set the lower limit of enterprise development. Therefore, the conceptual model of digital marketing management system of economic objects (Fig. 1) includes not only market research of goods, but also resources with the ability to analyze and forecast [7].

Table 1 – Requirements for the target market in segmentation

Requirements for the target market	Limitation
Profitability	The level of profitability is limited
Sales volume	Sales are limited
The presence of competitors	The number of competitors is limited
Availability of substitute products	The volume of substitute products present in the target market is limited
High purchasing power of consumers	The level of income of employees of the economic object is limited
Lack of "strong" position of consumers	Consumers are closely connected

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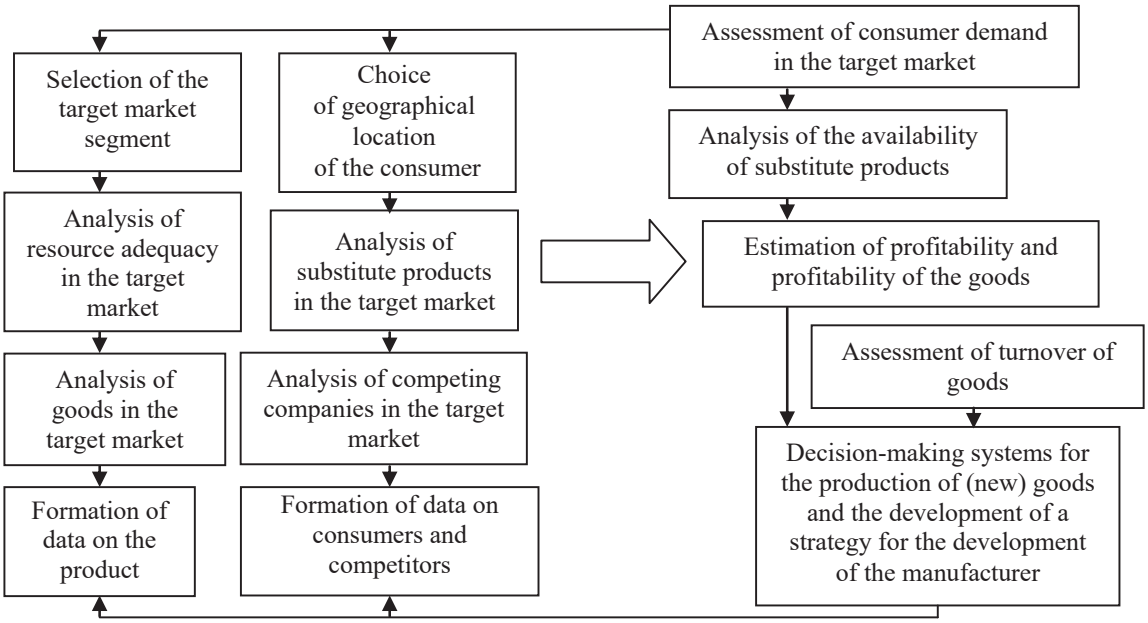

Fig. 1 – Conceptual model of digital marketing system in the management of economic objects

To describe the set of sets of source information in the economic-mathematical model of consumer efficiency assessment, defined sets $P = \left\{ P_i, i = \overline{1, N} \right\}$ – expert assessments of the usefulness of the product.

Then the correction factor for the value of the usefulness of the goods can be written:

$$K = \left\{ K_i = \left(k1, k2, k3 \right) \in \left[0,1 \right] \right\}, i = \overline{1, N}, \quad (1)$$

where *k1, k2, k3* – signs of the consumer willing to pay for the utility additionally, interest and the consumer will not pay for the utility.

The model for determining the usefulness and consumer effect of goods in the target market is as follows:

$$\begin{cases} E = E_{ji} = \left\{ \prod_{i=1}^{N} X_{ji} Y_{ji} \,/\, \sum_{i=1, j=1}^{N,9} \left(\prod_{i=1}^{N} X_{ji} Y_{ji} \right) \in \left[0,1 \right] \right\}, \\ \qquad i = \overline{1, N}, j = \overline{1, N}; \\ B = B_{ji} = \left\{ \prod_{i=1}^{N} X_{ji} Y_{ji} \,/\, \sum_{i=1, j=1}^{N,9} \left(\prod_{i=1}^{N} X_{ji} Y_{ji}^{max} \right) \in \left[0,1 \right] \right\} \end{cases}, \quad (2)$$

where X_{ji} – relative rating of the usefulness of the product; Y_{ji} – assessment of the force of influence *j* goods on *i* profit.

This conceptual model uses a method of assessing consumer efficiency, which is based on the use of ratings obtained on the basis of ranking expert opinion on several scales. Experts can be both consumers and the company. The use of expert assessments is necessary in the conditions of information opacity of the target market data.

The structure of the method of assessing consumer efficiency in the target market [10] is presented in Fig. 2.

The implementation of the method begins with the formation of initial data. Then each product is assigned an expert assessment (P_i) on the following five-point scale:

5 – very high utility;
4 – high utility;
3 – average utility;
2 – low utility;
1 – very low utility.

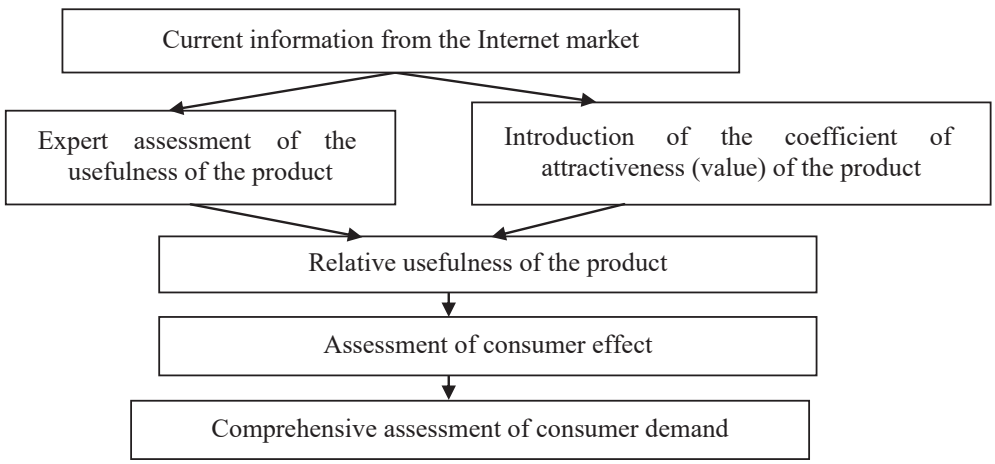

Fig. 2 – Method of assessing consumer efficiency

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Additionally, the cost-effectiveness ratio is introduced to account for price and costs (k_i), which takes the following values:

1.5 – the consumer is willing to pay extra for utility;

1,2 – the consumer is interested in usefulness, but will be interested in the price;

1.0 – the consumer will not pay for the utility.

Absolute rating indicators of the usefulness of the product are not very informative and can be poorly compared for different products, so then use the relative indicator (usefulness index), which is calculated by the following expression:

$$x_i = \frac{P_i k_i}{\sum_{i=1}^{n} P_i k_i}, \quad (3)$$

where P_i - rating assessment of the *i*-th utility (1 … 5, goals); k_i – coefficient that takes into account the cost of utility; *n* – the number of benefits of the product; $i = \overline{1,n}$.

The formation of utility indices is the next step in measuring the consumer effect of individual market segments. The following consumer benefits have been identified for the product in question: product quality, delivery time, pricing policy, form of payment.

The proposed list of benefits can be expanded and specified.

The next stage in the implementation of the method is the formation of matrix columns, which form innovations – both available in the arsenal of the company, and expected: organizational, technical, service and others. This list may include innovations described qualitatively, and innovations expressed in terms of technical and economic indicators. In principle, this method can be used to synthesize innovations. In this case, the activity of the trading platform is based on the principle «what can be done (change, improve, supplement and others) to form a specific utility.»

The elements of the matrix with volume n x m, where m is the number of considered innovations, are filled with rating estimates of the strength of the impact of the j-th innovation on the i-th benefit of the product. The rating of influence is established on the following ten-point scale of the order: 9 – strong influence; 3 – average impact; 1 – weak influence; 0 – innovation does not affect the individual benefit of the product.

Using the notation *yji* to assess the strength of the impact of the j-th product on the i-th benefit, you can calculate the conditional and unconditional indices of the consumer effect of each product. Then the conditional index can be written as follows:

$$E_{ji} = \frac{\sum_{i=1}^{n} x_i y_{ji}}{\sum_{j=1}^{m} \sum_{i=1}^{m} x_i y_{ji}}. \quad (4)$$

Conditional index is useful for comparative evaluation of the product by the degree of its impact on its overall value.

However, the conditional index depends on the total volume of the product and shows the relative contribution of the individual product in the formation of benefits and therefore can not be used to quantify the consumer effect.

An unconditional consumer effect index is used to measure the consumer effect, which depends on the total amount.

When building it, the value of the consumer effect is used as a base, which has the maximum impact on each consumer utility. Then, according to expression (1.4), the unconditional index can be written as follows:

$$B_{ji} = \frac{\sum_{i=1}^{n} x_i y_{ji}}{\sum_{i=1}^{n} x_i y_{jimax}}. \quad (5)$$

Given that in the above dependence $y_{jimax} = 9$ (according to the accepted score scale), the expression in the denominator also takes a value equal to 9, ie $\sum_{i=1}^{n} x_i y_{ji} = 9$, and the assessment of the consumer effect of the j-th product is relative to the absolute value. The obtained data will allow the management system to support decision-making to choose a promising direction of production of goods.

For these products in table 2 the list of the basic indicators is used, the matrix is formed and on the above dependences conditional and unconditional indices of consumer effect are defined.

The results of calculations (table 2) show a stable demand (logistics system 0.82, demand 0.86) trading platform (Rozetka.com.ua).

Conclusions

In the article analyzed the concept of digital marketing systems as a new direction in marketing. Taking into account digital marketing, a number of requirements for the target market were identified, which were analyzed from the standpoint of their ability to perform in the enterprise: profitability, sales, competitors, availability of substitutes, high purchasing power of consumers, lack of «strong»

Table 2 – Formation of conditional and unconditional indices of consumer effect for the trading platform (Rozetka.com.ua)

Consumer	xi	Volume of goods	Demand	Range of trading platform	Logistics system	Dealer connections
quality	0,36	8	9	9	7	5
1. Product quality	0,19	7	6	9	8	7
2. Delivery time	0,25	7	8	–	7	4
3. Pricing policy	0,2	5	7	–	8	9
	1,0	6,96	7,78	4,95	7,39	5,93
		0,21	0,24	0,15	0,22	0,18
		0,77	0,86	0,55	0,82	0,66

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position of consumers. The following restrictions were identified for these requirements: the level of profitability is limited, sales are limited, the number of competitors is limited, the volume of substitutes present in the target market is limited, the level of income of employees of the economic object is limited, consumers are closely related.

The conceptual model of the digital marketing system in the management of economic objects was built in the work, which includes not only the research of the goods market, but also the resources with the possibilities of analysis and forecasting.

On the basis of the developed model the method of estimation of consumer efficiency which consists of 5 stages is constructed. The method was used to calculate the indices of consumer effect for the trading platform (Rozetka.com.ua). The obtained data will allow the decision support management system to choose a promising direction of sale and production of goods.

References

1. Kotler, Ph., Keller, K. (2012) Marketing Management. *Pearson Global Edition*. Boston.
2. Gaikwad, M., Kate, P.H. (2016) E-marketing: A modern approach of business at the door of consumer clear. *International Journal of Research in Commerce & Management*. № 7(9). P. 56–61.
3. Longo, D. (2016) Why Strategy Must Come First in Digital Marketing. *Convenience Store News*. № 52(5). P. 57–60.
4. Kingsnorth, S. (2016) Digital marketing strategy. *CPI Group.* Philadelphia.
5. Ivanov, S. (2019) Modeling Company Sales Based on the Use of SWOT Analysis and Ishikawa Charts. *Modeling & Management of Emergent Economy* : Proceedings of the Selected Papers of the 8th International Conference on Monitoring. P. 385–394.
6. Ivanov, S.M. (2018) Modeljuvannja kooperacijnykh zvjazkiv v cyfrovij ekonomici [Modeling of cooperative connections in the digital economy]. *Modeling and Information Systems in Economics*. No. 96. P. 108–117.