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EXAMPLE OF USE OF VIRTUAL PROMOTION MAP

The paper presents an example of using new technology to solve the problem of promoting goods and services according to the 7P concept. The technology was called virtual promotion. The reason for its occurrence is a decrease in the effectiveness of the currently classical search engine optimization methodology on the Internet. The task of the latter is to bring the given corporate WEB resource to the first place in the search server's answers to the requests of potential buyers. Virtual promotion is based on two ideas. The first is based on marketing theory when to sell a product or service, you need to build a marketing channel. The second is that a search server is an intelligent machine. Then, to get the first position, we need to teach the virtual space, which consists of Internet nodes, to activate in such a way that the number of links to the WEB page with the desired product is maximum. To implement these ideas, two objects are synthesized as part of the virtual promotion: a semantic kernel and a promotion map. A semantic kernel is a description of a product or service or a training sequence of keywords. A map is a set of nodes on the Internet, where the semantic core should be placed to attract the maximum number of buyers of the product. The map is also a variant of marketing channels on the Internet. The paper considers an example of a situation where a semantic core and a minimal map have already been created using the classical approach (search optimization). In this case, the classic approach gave an increase in the number of visits to the WEB site, but there was not a single buyer of the product for six months. That is, the classical approach improved the key performance indicator, but it did not affect the sales performance in any way. The paper demonstrates how virtual promotion forms such a modification of the map that gives a given result in a given period. At the same time, it is not enough to synthesize a new map. It is necessary to apply a special mechanism for its implementation. For this purpose, the paper shows a real task of inter-functional coordination, which makes it possible to implement a promotion map. Real data for 2021, which was used to promote the product on the Ukrainian market, is given. The introduction of the new version of the map resulted in the first two orders within the first two weeks.

Keywords: virtual promotion map, coordination, semantic kernel.

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ПРИКЛАД ВИКОРИСТАННЯ КАРТИ ВІРТУАЛЬНОГО ПРОСУВАННЯ

У статті представлено приклад використання нової технології для вирішення задачі просування товарів та послуг згідно концепції 7P. Технологія отримала назву віртуальне просування. Причиною її виникнення є зменшення ефективності класичної на даний момент методології пошукової оптимізації в мережі Інтернет. Завдання останньої полягає в тому, щоб вивести заданий корпоративний WEB-ресурс на перше місце у відповідях пошукового серверу на запити потенційних покупців. В основі віртуального просування лежать дві ідеї. Перша базується на теорії маркетингу, коли щоб продати товар чи послугу треба побудувати маркетинговий канал. Друга полягає в тому, що пошуковим сервером є інтелектуальна машина. Тоді, щоб отримати першу позицію, нам треба навчити віртуальний простір, який складається з вузлів мережі Інтернет, активуватися таким чином, щоб кількість посилань на WEB-сторінку с потрібним товаром була максимальною. Для реалізації цих ідей у складі віртуального просування синтезується два об'єкти: семантичне ядро та карта просування. Семантичне ядро – це опис товару чи послуги, або навчаюча послідовність ключових слів. Карта – це множина вузлів мережі Інтернет, де семантичне ядро треба розміщувати, щоб залучити максимальну кількість покупців товару. Карта – це також варіанти маркетингових каналів в мережі Інтернет. В роботі розглянуто приклад ситуації, коли засобами класичного підходу (пошукова оптимізація) вже створено семантичне ядро та мінімальна карта. В цьому випадку класичний підхід дав приріст кількості візитів на WEB-сайт, але не було жодного покупця товару впродовж півроку. Тобто класичний підхід дав поліпшення ключового показника ефективності, але це ніяк не вплинуло на ефективність продажу. В роботі продемонстровано, як віртуальне просування формує таку модифікацію карти, яка дає заданий результат за заданий проміжок часу. При цьому не достатньо синтезувати нову карту. Треба застосовувати спеціальний механізм її впровадження. Для цього в роботі показано реальну задачу міжфункціональної координації, яка дає змогу впровадити карту просування. Наведено реальні дані на 2021 рік, які були застосовані для просування товару на ринку України. Впровадження нової версії карти дозволило отримати перші два замовлення вже впродовж перших двох тижнів.

Ключові слова: карта віртуального просування, координація, семантичне ядро.

Introduction. The paper examines the process of verification of the already existing classic process of search engine optimization, which was implemented over six months for a real WEB resource. Classical approaches include optimization of HyperText Markup Language (HTML) code and online advertising. Indeed, the implementation of these methodologies made it possible to improve the value of the WEB metric (traffic) three times from the initial value (Fig. 1). But the conversion rate of these visits was zero (Fig. 2), that is, the number of orders during six months was zero. Thus, we have a problematic situation when the promotion customer does not receive the desired result, namely a large number of online orders.

To improve the conversion rate, it was proposed to use virtual promotion technology [1–2]. Its application is based on two objects: the semantic kernel and the virtual promotion map. In this project, the semantic kernel was generated. However, the methods and directions of its implementation were wrong. To do this, we proposed to synthesize a new promotion map and implement it. The process of implementing the map is based on solving the problem of cross-functional coordination [3–5]. Consider the results of the implementation of the card through the coordination of providers on the Internet.

Problem statement. This test project became an example of a situation where the map and the semantic kernel were synthesized thanks to classical methods of search optimization [6–7], but the result they provided did not satisfy the customer. Such a case occurs because the task of functional coordination has not been resolved.

Proposed approach. Let's consider the use of the coordination method to improve the promotion result

achieved by classical methods of search engine optimization. The semantic kernel has already been used in online advertising (Fig. 3). But the map of virtual promotion was not synthesized. That is, only the kernel, the maximally simplified promotion map, and HTML optimization of the e-content of this WEB resource were implemented.

The virtual promotion map was proposed in the work. The main idea of the map was to create it as an alliance of providers. Two groups of Limited Liability Partnership (LLP) providers were formed: marketplaces and social networks (Fig. 4). That is, there are only LLP providers on the map, but of two groups: Facebook, Instagram, OLX.UA, Prom.UA, Rozetka.UA, and Google Ads. This configuration of the virtual promotion map is quite common nowadays because it allows you to effectively manage the promotion process. In addition, each such LLP provider has its own promotion budget but works only thanks to the financial resource provided by our union, that is, the marketing department of the enterprise.

Consider the setting of a new map based on solving problem (1)–(4). Let's write down the specified formulas taking into account the requirements within the test project (Fig. 1–4):

$$\sum_{m\in M_3}\sum_{s=1}^{4} b_s X^{sm}\frac{(x^4-(x^0-\Delta x^s))^2}{(x^4-x^0)^2}\to \min, \qquad (1)$$

$$\delta\sum_{s=1}^{4}\sum_{m=1}^{6} X^{sm}-\sum_{s=1}^{4}\sum_{m=1}^{6} Y^{sm}=0, \qquad (2)$$

$$X^{sm}\le 1,\ X^{sm}\in\{0,1\},\ s=\overline{1,4},\ m\in M_3, \qquad (3)$$

where X^{sm} is boolean variable that includes or excludes the m-th node of the map from the coordination process for the

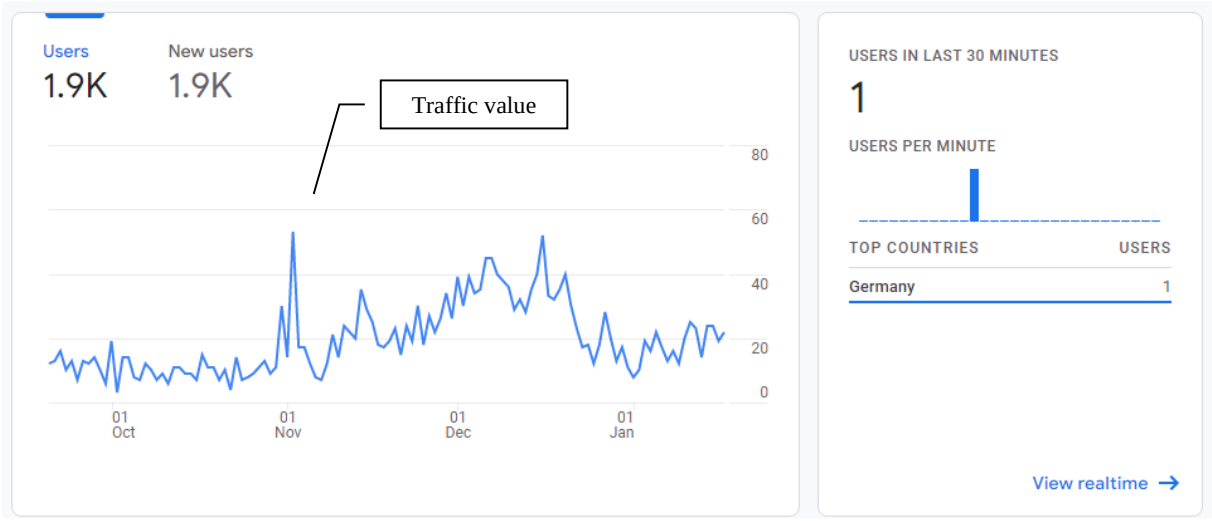

Fig. 1. WEB statistics of testing WEB resource

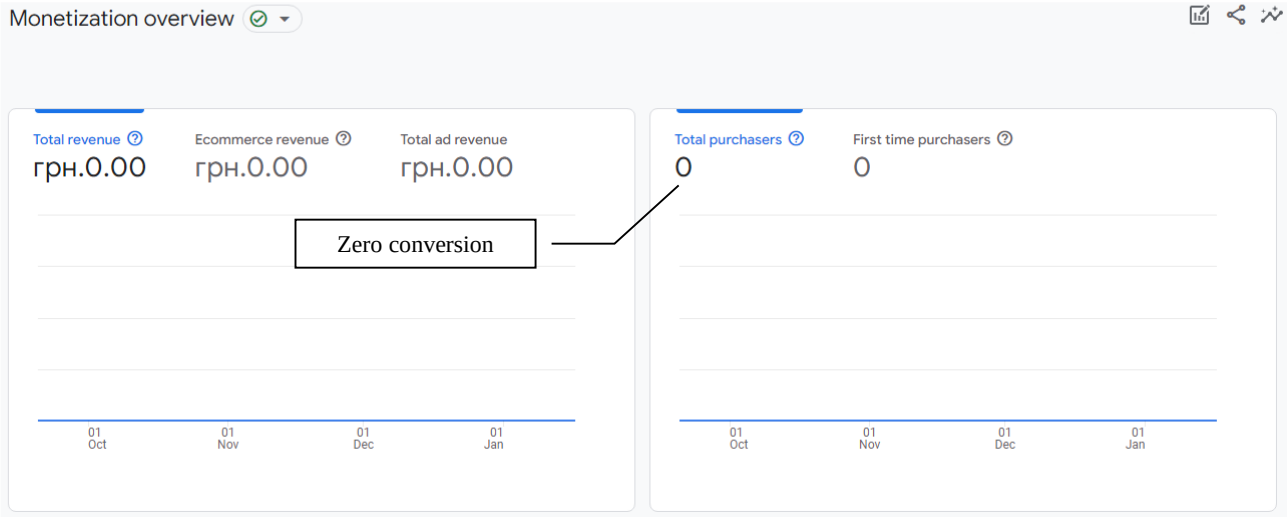

Fig. 2. Conversion of testing WEB resource

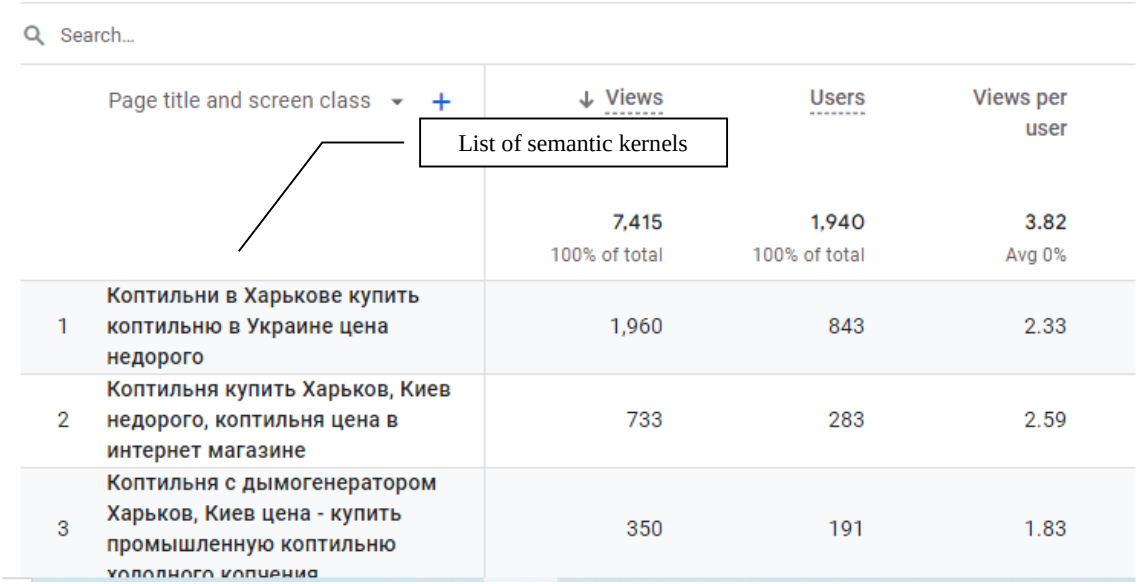

Fig. 3. Examples of semantic kernels of testing WEB resource

time interval s; b_s and δ are weights (prices of node rent); M_3 is a set of providers (nodes of a map); Y^{sm} is a budget for semantic kernel placement in m-th node of the map for the time interval s; x^0 is starting value of conversion rate; x^4 is an objective value of conversion rate.

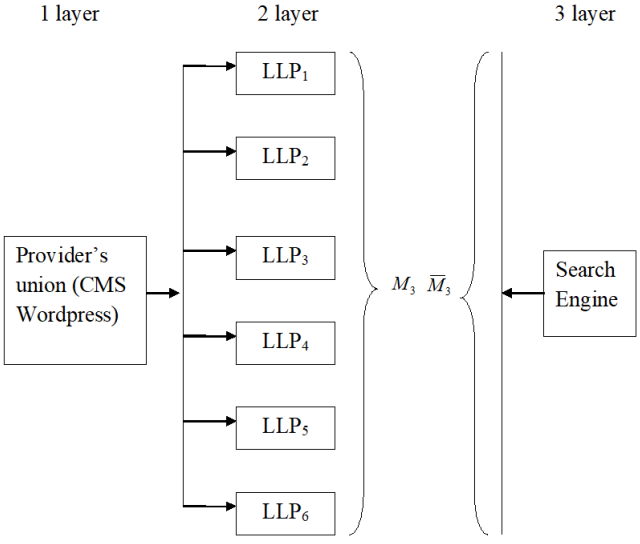

Fig. 4. Example of virtual promotion map

According to the conditions schematically depicted in Fig. 4, we have one set of nodes of the promotion map ($m \in M_3$). According to Fig. 4, the period of virtual promotion lasted approximately four months ($s = \overline{1,4}$). The key indicator of the project's effectiveness was the number of online orders in the node, that is, we have only one key indicator. We also take into account the fact that we have only one main operation of processing the semantic core, namely its storage in the node. That is, at this step of virtual advancement, the core remains unchanged. In addition, according to the request of the customer, we had only one option of using financial resources to influence the value of the key performance indicator, namely the payment of an advertisement in the customization node. Then condition (2) reflects the fact that at least one node had, during each time interval, an advertisement to increase traffic.

Following the average values of prices for advertising services in the nodes that existed at the end of 2021, we finally obtained the following problem:

$$(32{,}4\sum_{m=1}^{6} X^{1m} + 25{,}6\sum_{m=1}^{6} X^{2m} + 19{,}6\sum_{m=1}^{6} X^{3m} + \\ + 14{,}4\sum_{m=1}^{6} X^{4m}) \to \min, \tag{4}$$

$$\sum_{s=1}^{4}(180X^{s1} + 180X^{s2} + 40X^{s3} + \\ + 250X^{s4} + 250X^{s5} + 900X^{s6}) = 5000, \tag{5}$$

$$X^{sm} \le 1,\ X^{sm} \in \{0,1\},\ s = \overline{1,4},\ m \in M_3. \tag{6}$$

Solving problem (4)–(6) shows that at the end of the third month of virtual promotion, the desired result can be obtained with this map configuration under the given input conditions (Table 1). At the same time, condition (5) guarantees that the budget of the union will be used in full. In addition, all providers will function according to their initial conditions regarding the use of financial resources of the union or our enterprise.

Results. In the case of a decrease in the number of providers, for example, without the functioning of online advertising, the period of virtual promotion should be increased to exhaust the entire promotion budget.

Therefore, if the union wants to reduce costs, then this fact should be reflected in condition (5).

Table 1 – Input values

Node	δ ,UAH	Node name	Comment
1	180	Facebook	Social network
2	180	Instagram	Social network
3	40	OLX	Marketplace
4	250	Prom	Marketplace
5	250	Rozetka	Marketplace
6	900	Google Ads	Online advertisement

Thus, the implementation of the second level of the virtual promotion map makes it possible to evaluate the effectiveness of the map and the number of financial resources to achieve the desired value of the key performance indicator for a given period. In addition, the selection of weighting coefficients and the size of the financial resource, as well as the desired value of the work efficiency indicator, was carried out based on trained neural networks. They gave the predictive value of each node based on available WEB statistics.

The main conclusion to be drawn from the results of the test project is the fact that the methodology proposed in the paper can work both separately and in connection with classic methods of search engine optimization on the Internet. The main difference of the new methodology is that it provides an opportunity to manage the promotion process itself, so to speak, from the remote control within the enterprise. The enterprise manages the promotion process by coordinating the nodes of the Internet network, which were chosen by the enterprise itself according to key performance indicators and their predictive values, which were obtained thanks to neural networks.

Summary. The example of real WEB projects given in the paper confirmed the effectiveness of methods, algorithms, and technology of virtual promotion [1–2]. The given example also really demonstrates the presence of a new methodology that has better results compared to the classical methods of the theory of search engine optimization on the Internet [6–7]. Let's consider the analysis of these results in detail.

The first conclusion is related to the methodology of checking the scientific materials presented in the paper. It is proposed to perform this verification using the classic methodology of high-level verification of information technology, which is currently the most modern and widespread [8–10]. As is known, in experimental modeling, it is advisable to compare the results with classical methodologies already known at this time. Therefore, in the work, all experimental data were compared with WEB statistics, which were also obtained thanks to classical methods of search optimization on the Internet. The main representative of classic promotion technologies is a set of Google services.

According to the results of the test project, it is also shown that the proposed technology can be used both in parallel with Google's methods and in connection with them. In both cases, the implementation of our technology increases the efficiency of the result tenfold. Thus, the proposed technology of virtual promotion can be considered as a reengineering of already existing classical methodologies [11–13].

The second conclusion can be made through a methodological comparison of classical approaches to search engine optimization on the Internet and the new technology of virtual promotion. The following points can be highlighted here.

First, in the classical approach, there is no model for assessing the quality or effectiveness of the specified tools and the duration of their use. Such an assessment is the most important for the customer because it minimizes financial costs and guarantees a given promotion period. This fact is important, because "...in the market, it is not big or small that die, but the slow ones" [14].

Secondly, for the implementation of the classic approach, a high qualification is required on the part of the customer at the level of a programmer or content manager, who knows one or more programming languages, has experience in working with WEB services, for example, from the Google API (Application Programming Interface), of varying complexity. This leads to a misunderstanding between the customer and the contractor.

Thirdly, to achieve the result, it is necessary to mount or consistently execute certain algorithms for using WEB services. This requires experience on the part of both the customer and the contractor. The description of such algorithms is not widely available or is limited. Therefore, it is clear that the complexity of such algorithms leads to errors, ambiguity, and misunderstandings.

These considerations can be demonstrated by an example. The main element of the classic methodology of search optimization is also the semantic kernel [15]. But in practice, there are no metrics for determining its quality, nor stable algorithms for its synthesis and use. There is only a definition as a set of keywords, which can be built based on search server services, for example, Google Trends [7].

Current methods of search engine optimization generally boil down to placing advertisements based on the semantic kernel in services such as Google Ads, or to correcting the HTML code to more accurately reflect the kernel in the responses of search services such as Google Search Console and Bing API.

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