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TECHNOLOGY OF VIRTUAL PRODUCT PROMOTION

The results of our research over the past ten years in the field of search engine optimization on the Internet indicate the creation of a new information technology - virtual promotion. The main goal of virtual promotion is to increase the level of sales of goods or services due to technologies that exist in cyberspace. His main idea is to form a so-called market map. This is a new online sales scheme based on the customer's travel map in cyberspace. This scheme is based on the principle that you earn when you attract a new customer. Then the costs are paid by attracting new customers. That is, the more customers your web content attracts, the more you earn. Therefore, to generate income you need to use WEB services to attract potential customers. Existing product promotion techniques are constantly being improved or new ones are emerging. Therefore, the purpose of the new technology is the formation of new designs from WEB services that ensure maximum efficiency of the process of attracting new customers and retaining existing ones. At the same time it is necessary to consider classical structures of formation of marketing sales channels. We will assume that virtual promotion is an information environment where there are two channels. The first channel has the function of distributing knowledge about the product. The second is product marketing. The first channel forms the technology of information transfer (knowledge) about the product in cyberspace. It concentrates actions on transportation, storage and retrieval of information about a product or service depending on the needs of a potential buyer. Another channel is a network of websites, channel telegrams, marketplaces and video blogs. In other words, the marketing channel is formed by real firms that buy and sell information or knowledge about goods or services in cyberspace. Thus, the task is to form a map of virtual promotion, which describes the structure of the marketing channel of the product through the virtual space.

Keywords: Virtual promotion, search engine optimization, market map, web services.

СЕРГІЙ ОРЄХОВ

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ТЕХНОЛОГІЯ ВІРТУАЛЬНОГО ПРОСУВАННЯ ПРОДУКТУ

Результати наших досліджень за останні десять років у сфері пошукової оптимізації в мережі Інтернет свідчать про створення нової інформаційної технології – віртуальне просування. Основна ціль віртуального просування – це підвищення рівня продажу продукту завдяки технологіям, що існують у віртуальному простору. Його головна ідея — сформувати так звану ринкову карту. Це нова схема онлайн-продажів, заснована на карті подорожі клієнта у віртуальному простору.

У статті розглянуто новий об'єкт дослідження – віртуальне просування продукту. Виконано детальний опис цього об'єкту та опис бізнес процесу, який створено на його основі. Цей процес базується на принципі, що ви заробляєте, коли залучаєте нового клієнта. Далі витрати оплачуються за рахунок залучення нових клієнтів. Тобто чим більше клієнтів залучає ваш веб-контент, тим більше ви заробляєте. Тому для отримання доходу потрібно використовувати ВЕБ сервіси. Існуючі методики просування продукту постійно вдосконалюються або з'являються нові. Тому метою нової технології є формування з ВЕБ сервісів нових конструкцій, що забезпечують максимальну ефективність процесу залучення нових клієнтів та утримання вже існуючих. При цьому слід враховувати класичні структури формування маркетингових каналів збуту. Будемо вважати, що віртуальне просування – це інформаційне середовище, де існує два канали. Перший канал має функцію дистрибуції знань про продукт. Другий – це маркетинг знань про продукт. Перший канал формує технологію передачі інформації (знань) про товар у віртуальному просторі. Інший канал – це мережа веб сайтів, телеграмм каналів, маркетплейсів та відео блогів. Іншими словами маркетинговий канал формують реальні фірмі, що купляють та продають інформацію або знання про товари чи послуги у віртуальному просторі. Таким чином, завдання роботи полягає у формуванні карти віртуального просування, що описує структуру маркетингового каналу збуту продукту через віртуальний простір.

В роботі запропоновано алгоритмічне забезпечення для реалізації технології віртуального просування.Також розглядається її програмна реалізація.Результатом виконання алгоритмів є формування карти віртуального просування.

Перспективою для подальших досліджень є реалізація дворівневої системи у складі логістичного каналу трансформації знання про продукт та маркетингового каналу, що керує такою трансформацією.А також опис карти віртуального просування.

Ключові слова: віртуальне просування продукту (ВП), пошукова оптимізація в мережі Інтернет, карта ринку, ВЕБ сервіси.

Introduction

The company from modern marketing requires not only the creation of the concept of goods or services (good product, good price and a certain target segment of potential buyers), but also the establishment of constant communication with real and potential buyers [1-2]. These marketing communications are a complex of promotion.

The term promotion of a good or service was first introduced in the works of Trout and Kotler [1-2]. It is determined that promotion is part of the "4P" principle: product, place, price and promotion.

The promotion complex is formed in four directions [2]:

- advertising, as any paid form of impersonal presentation and promotion of the description of goods or services;

- sales promotion, as short-term actions to encourage the purchase of goods or services;

- public relations, as free impersonal distribution of descriptions of goods or services through various information channels;

- personal sale, as a presentation of a description of a product or service during personal communication with one or more potential buyers.

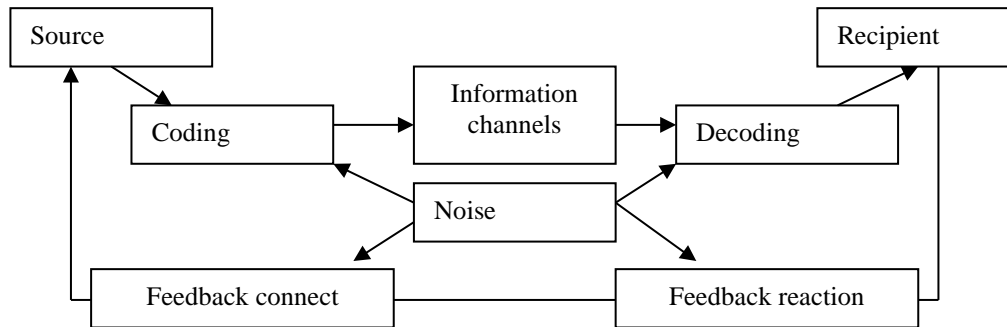Marketing theory [2] describes the communication channel as follows - Figure 1.

Fig. 1. The process of marketing communication

This scheme immediately reflects a set of problems in the process of marketing communications, namely:

- creating a message to the recipient and building or selecting an existing information channel that connects the sender and recipient in the information space;

- the sender wants to know to which channels he sends information and what feedback he will receive in a given period of time. To fulfill this desire, you need to overcome the so-called "white noise" in communication channels and correct encoding and decoding errors. That is, you need to choose the right channel that meets the requirements of the sender;

- third, the construction of the feedback channel of the recipient in response to the message.

Classical marketing theory provides answers to these questions in part, mostly if the communication takes place in a real information space, rather than in a virtual (Internet) [1-3]. To understand the complex of modern problems it is necessary to trace the historical development of this issue (the evolution of marketing communications) since the emergence of the Internet.

Thus, promotion is part of the marketing function of persuasion and stimulation. If the function of marketing is to generate demand and stimulate sales [2], then the implementation of this function is carried out primarily in the information space. Initially, this space was formed by periodicals, television, radio and rumors. Now the information space exists on the Internet and all these information channels also work on the network. The Internet is now the only information space for everyone - for the company, for customers and for competitors.

It is now impossible to hide any information at all, so the competition is intensifying. You can win this competition if you are the first to inform a potential customer about a product or service. The principle of "first entered the consciousness - the first on the market" works here [1]. To implement this principle, the technology of customer relationship management CRM (Customer relationship management) was proposed [4]. Its main purpose is to create an information environment within the enterprise with the duty of accumulation of relevant marketing data (about current prices, about current orders, about current customers). Then compare this internal data with external data to look for competitive advantages. In terms of promotion, CRM collects data on current marketing communications with customers, but the set of these channels is small: e-mail, phone calls and a list of orders (checks in the supermarket). However, the advantage of this technology is the ability to form integrated marketing communications. The purpose of this approach is to extract the maximum profit from existing communication channels.

But in the 21st century, the approach that existed when the classical theory of marketing was formed was: "money - goods - money." That is, the problem existed in the production of goods, and then began the sale of goods that already lie in the manufacturer's warehouse. Now, thanks to the globalization of goods enough, the problem exists in finding a solvent customer for this product. That's why it's right to start a business now by attracting a potential client: "you attract, you earn, you spend". This is a new paradigm of modern business. Within this paradigm, there are two approaches: order orientation and human orientation. Then the product becomes a complex of three elements: the audience, the sales channel and the target message. Thus, the scheme presented in Figure 1 changes – Figure 2.

As can be seen from the new sales scheme, the message about the product exists in parallel with the real product in the warehouse. The whole sales process is separated from the warehouse and operates in parallel. That is, a virtual description of a product or service can earn without a real product. This is the principle of "derivatives", when you buy shares of the company, you buy the future opportunity to earn dividends from a company.

Then the main areas of implementation of the promotion complex will change in cyberspace to the following:

- advertising becomes contextual when short text messages are displayed depending on the user's search on the network;

- sales promotion is transformed into work with user profiles in the social network (social media marketing);

- public relations is realized through a corporate website based on search engine optimization (search engine marketing) [4];
- personal sale is carried out on behalf of an intellectual agent (bot) at market places.
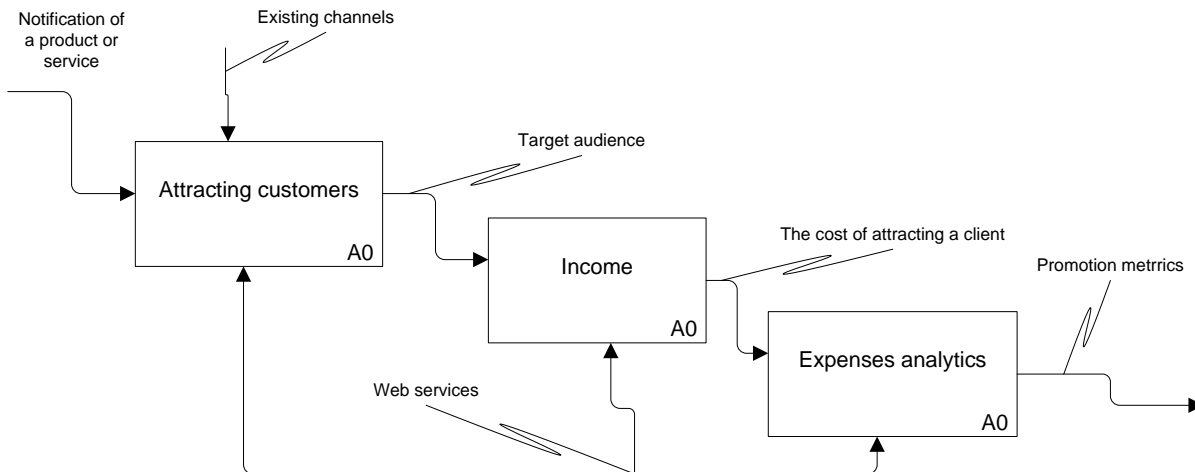

Fig. 2. Modern scheme of selling a product or service

Then we will refer to the new sales scheme as virtual promotion. Virtual promotion (VP) is a set of actions and efforts performed by marketing departments of the enterprise in order to increase the demand and sale of goods or services using Internet technologies. The purpose of virtual promotion is to make a profit by influencing the formation of subjective perception of goods or services by customers.

Problem statement

Virtual promotion is a new research object that combines the efforts of a marketing service in a virtual space to increase sales. Virtual promotion is of the same nature as a logistics system for the distribution of goods. Then the information technology of virtual promotion forms, first of all, an information management system in a distributed hierarchical system, which is the Internet space. Thus, it is necessary to concretize this object of research, using as an analogy the information distribution system, or rather knowledge about a product or service.

We will assume that virtual promotion is an information environment in which two channels are formed: the distribution of product knowledge and the marketing of this knowledge. The first channel is a channel for transmitting information (knowledge) about a product. It is formed on the basis of the operations of transferring knowledge, storing knowledge, processing requests for transferring knowledge. For simplicity, we will consider two main operations in this channel: transfer and storage of knowledge.

Knowledge distribution is formed in the Internet environment based on the URIs of the sites hosting the software component. This is a lot of IP addresses. It works according to the OSI model. In other words, it is a set of software components located at specified IP addresses. Each software component performs either a transfer function or a function of storing knowledge about a product or service.

Another channel is marketing. It is based on a graph of websites, telegram channels, video blogs and marketplaces. On the other hand, the marketing channel is formed by firms that buy or sell knowledge about a product or service in the virtual space. The case of free placement of knowledge about the product for storage is possible. That is, a website or a telegram channel receives knowledge on a paid or free basis for storage. The moment of uploading knowledge to the server (website) will be considered the transportation or transfer of knowledge in the virtual space.

Thus, the distribution channel sets the configuration of virtual promotion, and the marketing channel sets its organizational structure. Virtual promotion will be considered successful if a potential client for a product or service downloads knowledge to his storage platform or makes a request for such a download from one of the specified IP addresses.

Thus, we get a two-tier system, where the levels actively interact and the marketing level is the manager. The distribution channel plays the role of the assignee. In addition, it can be argued that virtual promotion consists in the formation of an organizational system for managing the knowledge distribution channel in the virtual space. We will call this organizational structure of market map management. This map shows the two levels at which transportation, storage and transfer of knowledge about a product or service to a potential buyer is carried out.

Let's try to classify the knowledge distribution channel based on well-known analogues from the field of logistics. At the moment, two basic logistics concepts are known: "just in time" or "quick response" and assortment or "continuous replenishment".

The first concept is based on assessing the demand for a product. In our case, this approach is not applicable, since virtual promotion as a pioneer forms future communication channels with potential customers. Of course, it is

possible to form any forecast value, for example, based on the theory of probability, but such forecasts will be ineffective.

The second concept implies that knowledge about the product should be placed in the given points of the virtual space and wait for its activation by potential buyers. This option is closer to our situation. In this case, we perform three actions: consolidation or concentration, customization and dissipation.

The first operation means concentration of knowledge about a product or service on a corporate website, telegram channel or video blog. At the same time, these software components must be configured so that knowledge on demand is transmitted as quickly as possible over the Internet.

The second operation means processing knowledge depending on the essence of the request. We form a combination of knowledge, sort them into certain groups or sets. That is, the transformation of knowledge depending on external requests for their receipt. In other words, we reformat into a form that is acceptable to a potential buyer in order to induce him to buy.

The third operation of "scattering" implies the transfer of knowledge about the product to other storage nodes in specified formats. In other words, we duplicate knowledge on the web. We will assume that such dubbing is also accompanied by reformatting, since we operate in the anti-plagiarism system of programs and components.

We will call this knowledge distribution channel intensive, since the number of consumers is huge and potentially unlimited. Based on such a detailed description of the phenomenon of virtual promotion, we can make a statement of the research problem and set a verbal description of information technology that implements a geographically distributed system of distribution of knowledge about a product or service in the form of a sequence of stages - Figure 3. The result is a virtual promotion map.
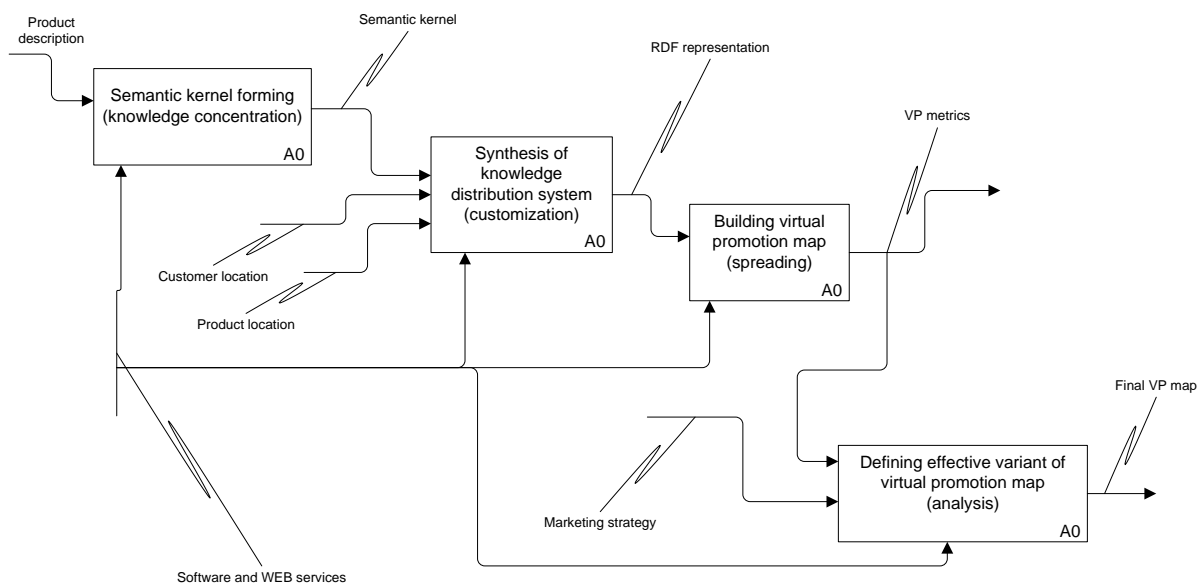

Fig. 3. Technology schema

The main idea that we put into this information technology can be formulated as follows: to teach the virtual space to respond to the injection of concentrated knowledge about a given product or service in a given period of time. Reaction means the appearance of orders for the purchase of a given product or service in a given geographic location.

To perform training according to the theory of artificial intelligence, it is required to have a knowledge representation model, a training sample, a training method and a criterion for stopping the training process [5].

At the first stage of technology implementation, we form the so-called semantic core [5]. So we carry out the concentration of knowledge about the product in the form of a new model of knowledge representation based on the semantic network. Then we synthesize a system for the distribution of this knowledge in the virtual space. To do this, we form the nodes of the virtual promotion map in order to understand where to place the semantic core. At the next stage, we fill these nodes with copies of our semantic core, indicating the original source.

Having formed a map in the virtual space, we analyze the effectiveness of this map based on the metrics of virtual promotion, which are based on WEB metrics. We need to constantly change this map in order to adapt to the current configuration of the virtual space. The goal is to ensure that knowledge is located in those nodes of the worldwide network that are most often viewed by potential buyers of a given product or service.

Proposed approach

Based on a detailed description of the research object, we will formulate an approach to the synthesis and rational choice of the organizational structure for managing the distribution channel of knowledge about the product

in the virtual space. Thus, an approach to creating a map of virtual promotion of a product or service is proposed in the form of the following sequence of stages - Figure 4.
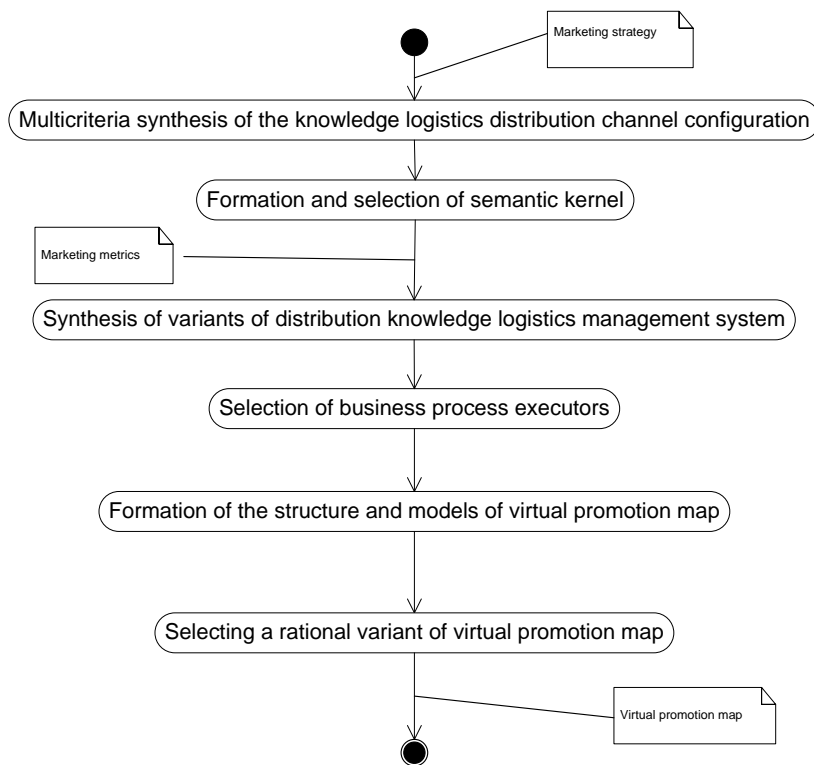

Fig. 4. Solution schema

UML diagram [6] displays the transformation of a marketing strategy into a virtual promotion map by sequentially performing the following steps.

At the first stage, by means of parametric and structural synthesis, we form a logistic channel for the transfer of knowledge in the virtual space. As we said, it has two dimensions: distribution and marketing proper. These are, as it were, horizontal and vertical sections of the future map. The horizontal slice of the card includes the primary sources of knowledge about the product, centers of knowledge consolidation, intermediate points for customizing knowledge and final Internet nodes for receiving and paying for the product by a potential consumer. As an example, we can consider such a chain: a corporate website, a social network, a telegram channel and a marketplace, where the buyer can make the actual purchase of the product. Moreover, we must take into account the fact that we are dealing with various accounts in the social network, telegram channel and marketplace. Each account has different traffic metrics. In this case, we are already talking about the vertical slice of the map.

Nodes in a vertical slice are characterized by their own goals, strategies, material and information flows, management and software components to support their functioning. There is a clear problem of coordination of such disparate systems into a single whole.

Thus, the first stage is aimed at the structural synthesis of the logistics channel in order to accurately determine the number of corporate websites, social media accounts, as well as their placement, that is, a specific list of marketplaces and partner websites on which semantic cores should be placed.

Then the main areas of implementation of the promotion complex will change in cyberspace to the following:
- past attendance of the site;
- the profile of the buyer who usually visits the site;
- the level of costs for interaction with this node;
- assessment of this site by potential buyers;
- set of goods (semantic cores), knowledge about which is located in a given node of the virtual space.

Unfortunately, at the moment there is no mathematical model with a criterion for selecting such a rational set of virtual space nodes in order to form the necessary organizational structure for the distribution of knowledge about the product. However, at the first stage, optimization methods can be taken as a basis, which allow, according to the criterion of the cost of placing knowledge (advertising) on a given Internet node, select a certain subset from the existing set of nodes. Then check this subset and form a distribution channel structure from it. That is, to solve the problem of parametric synthesis. According to the classics in logistics, this problem is solved either on the basis of a modification of the transport problem, or through the problem of inventory management. In our case, these approaches are not applicable. An alternative solution is required.

In this situation, we are dealing with two criteria: costs of placing knowledge in a virtual space node and site attendance by potential buyers of the product.

The second criterion can be interpreted as the capacity of a node to transport knowledge from one node to another.

The presence of these criteria does not contradict the theory of logistics, where two criteria are also considered: minimizing costs and maximizing the level of consumer service.

However, it is necessary to introduce one more criterion that will show the durability of a given virtual promotion card or distribution channel of knowledge about a product, depending on external influences. First of all, it is depend on the influence or imposition of maps on our map from competitors or similar knowledge on the network.

The second stage consists in the formation of a model for representing knowledge about a product in the virtual space. In work [7], we proposed an approach to creating a semantic core of web content. That is, we consolidate knowledge in the form of an RDF schema.

The third stage indicates the synthesis of a distribution channel management system with knowledge about a product or service. We choose the most effective channel from several options based on expert opinion or using optimization methods according to three highlighted criteria.

The next stage is aimed at the selection of performers for the functioning of the distribution channel. As performers, we immediately mean a set of software tools. First of all, such means are Internet bots and web services (Google API, Microsoft Bing API).

At the fifth stage, it is required to solve two problems. The first is associated with the formation of a three-level knowledge distribution management system from a company that sells a product to a multitude of potential buyers - Figure 5.
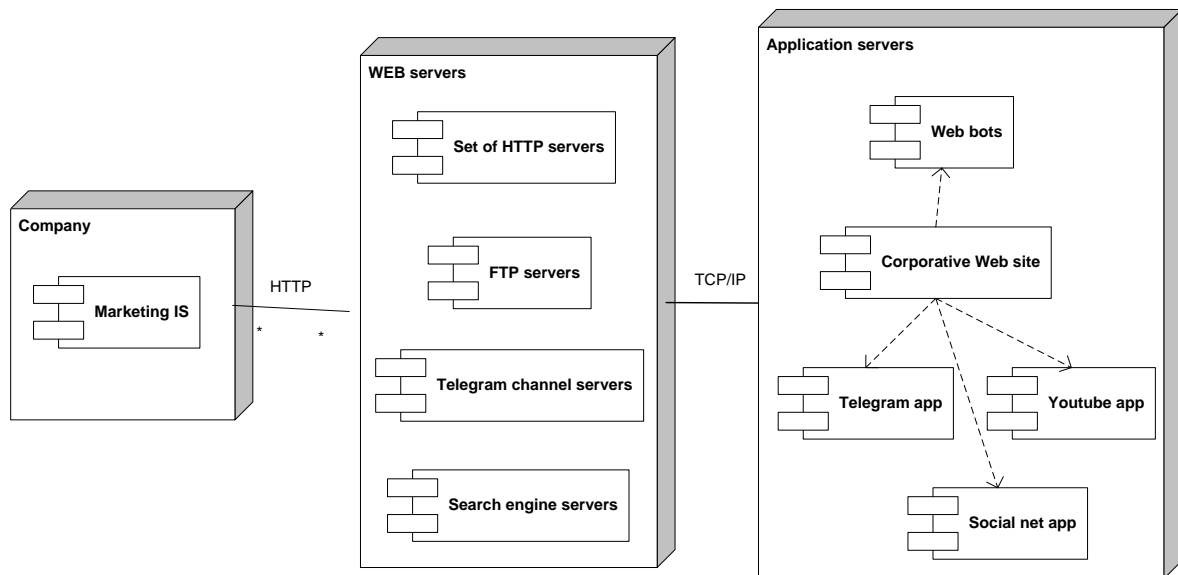

Fig. 5. Three layer system

This three-level system is a testing ground for the formation of options for a virtual promotion map.

The second task is to generate models and software to support the operation of the selected version of the map.

The third task also arises - the task of coordinating the interaction between the company level and the level of third-party custodians of knowledge about the product. For example, there is a problem of coordination of company and social network levels. Inside the social network, a lot of accounts are formed to store knowledge about the company's product. Therefore, it is required to coordinate, that is, to solve this problem already within the level of application servers.

We will assume that each map component at any level has a set of key performance indicators (KPIs). Then, as criteria for managing the components at the level, we consider the degree of deviation from the normal or desired values of these indicators. This is, so to speak, a solution to the first level problem. At the second level, we take the results of solving these problems as constraints in order to reach the criteria in terms of the implementation of the marketing strategy.

Thus, at the fifth stage, we form a map with an exact indication of its elements. Next, we check its implementation according to the criteria of the restrictions for each element. But at the sixth stage, you need to choose one of the many valid card options. For this, we introduce the concept of a rational solution to a multicriteria optimization problem for a set of objects in a distributed hierarchical system. This task includes optimization according to three previously stated criteria.

As a result, according to the scheme (Figure 4), the following actions are required:

- develop a method for synthesizing variants of the virtual promotion map;
- propose models of synthesis of map elements;
- develop a method for solving the problem of coordinating the levels of the map and its elements at one level;
- propose a method for choosing a rational version of the card;
- test a version of the map using real software solutions on the example of a real web project.

Conclusions

The first results of solving the problems indicated in the article are given in articles [4,5,7]. The main problem stated in them is the formation of knowledge for transmission and storage in virtual space. We have proposed a model for representing knowledge about a product or service, which is called the semantic core. This research work has shown the fact of the existence of the core, as well as the fact that, as a whole, the system shown in Figure 5 can be trained to transfer and store the semantic core we need. Thus, now it is possible to implement the tasks and assumptions specified in the article.

The descriptions of the new object of research, called "virtual promotion", indicated in the article, show two interesting facts:

1) firstly, a new effect appears in the virtual space - the logistics of knowledge. These are models, methods and technologies for transporting and storing knowledge in the network. This theory originates from knowledge management, but uses logistics methods precisely to transport knowledge about a product, service, or an individual person in the virtual space;

2) secondly, production cycles for the creation, transportation, storage and sale of knowledge are formed in the virtual space. That is, it is not the goods themselves that are sold, but the knowledge of how to satisfy the given needs with the help of goods.

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