

# ANALYSIS OF MODERN APPROACHES TO THE CREATION OF WEBSITES OF PHARMACEUTICAL FIRMS OF UKRAINE AND KAZAKHSTAN

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**Introduction.** At the present stage of development of society, with the widespread use of services, Internet sites of pharmaceutical companies are becoming the main source of up-to-date information about medicines, related medical products and services provided.

Currently, an important role is played not only by the design of the web-site, its information support and methods of presenting of the information, but also by the level of the development of electronic equipment, software and new communication technologies. The efficiency of the information obtaining, which complies with the client needs arouses client's interest to the pharmaceutical company and, as a result, attracts a larger number of clients.

**Aim.** The aim of this work is to determine the main trends of modern development of the websites of pharmaceutical companies in Ukraine and Kazakhstan. It was also interesting to Compare how the level of development of electronic equipment, software and new communication technologies affects the development of websites of pharmaceutical companies in these states.

**Materials and methods.** The analysis of the information from the websites of 19 largest pharmaceutical companies in Ukraine and 10 largest pharmaceutical companies in Kazakhstan was carried out. The data are systematized according to the structure of sites, methods of presenting information and modern methods of accessing information. The results are summarized, processed and presented mathematically.

**Results and discussion.** All large pharmaceutical companies are constantly monitoring modern trends in the development of approaches to creating sites, taking into account new modern communication technologies. Currently, a lot of attention in corporate sites is paid to information design and visual design. On the corporate websites of the largest pharmaceutical companies in Ukraine and Kazakhstan, the main Heder menu is built using not only text information, but also photo information (61%). With the modern approach to Slider, not only photos are used, but also video information (in 34% of analyzed corporate sites in Ukraine and Kazakhstan). However, the value of information in pharmacy chains is reliability and efficiency. And therefore, textual and photo information is sufficient to promote such a specific product as medicine on the market. As the analysis has shown, all 100% of sites of pharmaceutical companies in Ukraine and Kazakhstan by type of site refer to corporate sites. This is a site with complex functionality, well developed usability. The corporate websites of pharmaceutical firms are hierarchical (100%), multilingual (98%), and contain links to major social networks (100%). A correctly created corporate website of a pharmaceutical company has a clear hierarchy of its sections, services and pages, the structure of all pages is typical, which contributes to its easier and more comfortable use (100%). About 94% of corporate websites of the largest pharmaceutical companies in Ukraine and Kazakhstan are based on the principle of scalability, which consists in designing the website in such a way that it looks the same quality on screens of different sizes - laptop, tablet or mobile phone. It is important for pharmaceutical companies that customers can quickly receive information about a product or service. And therefore, firms are closely following the development of new, modern communication technologies for the rapid promotion of their products and services to the market. The mobility of access to information ensures the widespread use of modern means of prompt delivery of information regardless of the location of the client. The background for these technologies are modern software for smart phones, the ubiquity of wireless computer networks Wi-Fi, the introduction of 3G and 4G mobile communication technologies that provide high-speed mobile

access to Internet services. As the result the creation of versions of corporate sites for posting on social networks becomes reasonable. Up to 85% of pharmacy networks in Ukraine and Kazakhstan have mobile applications with the most user-friendly interface. Mobile applications allow you to select a city in Ukraine or Kazakhstan and enter the name of the required medicine. The selected pharmacy can be viewed on the city map or made a call to the pharmacy without leaving the application.

**Conclusions.** As a result of data collection and analysis, the main directions of new approaches to the work of pharmaceutical companies with clients were identified. These new approaches make it possible to ensure a prompt search for the required drugs anywhere in the country where access to the mobile Internet is provided. An analysis of the sites of pharmaceutical firms in Ukraine and Kazakhstan showed that firms follow modern approaches to creating sites and promptly use innovations on the sites of their firms. The sites are up to date. That is, pharmaceutical companies have the opportunity to invest in the development of modern technologies for promoting their products in the markets of Ukraine and Kazakhstan.

## **APPROXIMATE METHOD OF SOLUTION SYSTEMS OF VOLTERRA-LOTKA EQUATIONS**

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**Introduction.** The problem of development of antagonistic populations on the example of the Volterra-Lotka problem is considered. From the point of view of mathematics, this problem is described by the system of differential equations that can be solved only by numerical methods, which complicates the analysis and the possibility of prediction.

**The aim of the study** is to prove the possibility of an approximate analytical solution of the system of differential equations of the Volterra-Lotka problem. Formulas are obtained that describe the development of the predator-prey system and predict their development.

**Materials and methods.** Two problems are solved.

1) In the first, the Volterra problem, the system of differential equations describes changes in the numbers of lynx and hare populations over a period of time. The method of linearization is used for the solution. It consists in the fact that changes in the number of populations are small relative to some average value. This allowed to obtain differential equations that can be solved in the form of formulas. The formulas make it possible to predict the period of oscillating development of the population system and the number of populations at a given time. It turned out that the formulas can be applied in the case of large changes in population size without significant errors.

2) The method was used to analyze of more complex system when taking into account mortality in both populations. The numbers of both populations stabilize after some time and remain unchanged. This is the Volterra-Lotka task. The obtained formulas are more complex, but allow to calculate the parameters of population development and give a forecast for the future.

**Results and discussion.** The applied method of linearization made it possible to obtain formulas that describe and predict the development of populations over time.

**Conclusion.** This greatly facilitates the analysis and forecast of population development.