

Use of Information Technologies and Marketing Tools for The Formation of An Educational Platform

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Abstract

The positive impact of digitization and globalization processes on the development of the business environment at the national and international levels, which is inextricably linked to the involvement of advanced achievements in the field of science, has been proven. The leading role of competition between participants of a certain market in the process of identifying advanced scientific achievements, which can be monetized due to the formation of demand among consumers for products with new qualitative characteristics, has been established. Peculiarities of the use of information technologies in the process of building an educational platform have been studied. The necessity of using digital marketing tools in the process of promoting an innovative educational product to customers has been proven. The expediency of using advanced marketing strategies to form a high level of student loyalty to the educational platform has been established. The characteristic features of representatives of generations Z and alpha, which are the main part of education seekers and form a specific demand for educational products in modern conditions, are revealed. The expediency of creating educational products with interactive technologies and the use of the Internet has been proven, which significantly increases the level of interest among representatives of generations Z and alpha. The expediency of using machine learning algorithms to optimize processes in modern conditions based on the use of server technologies is substantiated. The peculiarities of the integration of neural networks into the educational platform are revealed in order to use the accumulated amounts of information in the process of improving the educational process and increasing the level of assimilation of skills and abilities by students. The expediency of using comprehensive information about consumers of a digital educational product has been established in order to maintain a high level of loyalty in the long term and attract new consumers thanks to the formed positive image on the market. The opportunity to obtain an optimal result regarding the promotion and monetization of an educational product thanks to the combination of machine learning and digital marketing technologies has been established.

Keywords

communications, information technologies, machine learning, optimization, educational platform, digital marketing, target audience

1. Introduction

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Digitization processes lead to the transformation of all types of economic activity and contribute to the optimization of the activities of various institutions due to the activation of the use of advanced technologies. The key role at the global and national levels is played by the education system, which allows for the formation of a highly effective workforce with up-to-date skills and abilities. The intensity of technology development requires constantly updating knowledge in order to ensure that the skills and abilities of the economically active population meet the needs of the modern market. Along with this, when forming an effective education system, it is necessary to take into account the social and psychological characteristics of generations Z and Alpha, which make up the majority of students in secondary and higher education institutions. The orientation of the specified categories of the population to the digital environment and a specific system of values should be taken into account when developing an innovative education system, which will allow to achieve effective results.

The construction of an effective education system and its improvement on a permanent basis requires the introduction of advanced solutions that take into account the specifics of the effects of environmental factors. Digitization of modern generations, the COVID-19 pandemic and the growing popularity of interaction through digital communication channels contribute to the active introduction of online approaches to the educational process. The development of such technologies as machine learning, artificial intelligence, blockchain, virtual and augmented reality, etc., has a significant impact on the reorientation of the educational process to offline approaches.

The creation of educational resources using innovative technologies and modern digital marketing tools will allow effective cooperation with the target audience, which is interested in obtaining modern skills and abilities using training programs based on distance learning. Identification of the target audience and interaction thanks to the use of modern marketing strategies allows companies (universities) to significantly increase the loyalty of potential users and identify directions for the development of the educational product.

2. Related Works

In the conditions of active reorientation of the population's significant number to the digital environment, a large number of scientists in different countries of the world are dealing with the issues of using information technologies for the formation of educational platforms. A comprehensive study of scientific works on the peculiarities of educational products development in the digital environment allows to identify the presence of various approaches used by companies in the market of educational services. The presence of significant competition between developers of digital educational products and the active introduction of innovative technologies leads to the need for constant research into the evolution of educational platforms and the optimal approaches identification to providing educational content to students.

Features of using Learning management system (LMS) are presented in work [1]. The authors proved the feasibility of development and implementation of modern approaches in the field of E-learning in the conditions of increased interaction between the population that actively uses digital technologies. Thanks to the use of LMS, it is possible not only to increase the effectiveness of the educational process implementation, but also to optimize the implementation of related types of work.

Features of the selection of effective approaches to teaching students using e-Learning technologies are presented in the work [2]. Along with this, the work [3] revealed the features of creating specialized educational applications thanks to the use of modern programming languages. The approach presented by the authors is based on the active use of mobile gadgets (smartphones, tablets and laptops) by a large number of modern users. Innovative technologies and approaches in the educational process are positively perceived by education seekers, who mainly belong to the younger age groups.

Optimizing the use of educational platforms is related to the integration of machine learning algorithms, among scientific works in this direction it is advisable to pay attention to the following article [4]. The approach proposed by the authors involves the use of recommender systems, which, based on information about user interaction with educational content, offer new customers appropriate educational materials.

The work [5] reveals the peculiarities of using digital marketing tools for the promotion of educational services on the Internet. Scientists have proven the feasibility of using specialized social

networks to establish communications with the target audience, which is mainly represented by students and high school students.

3. The Aim

Ensuring the effectiveness of the implementation of the educational process in modern conditions involves solving a set of tasks that will allow the development of effective solutions that quickly adapt to changes in the influence of external and internal environmental factors. The complexity of creating a modern product in the educational field requires the implementation of an effective management model that will ensure the effectiveness of the functioning of all parties involved in the project. One of the modern approaches involves the use of learning management systems (LMS). The effectiveness of the LMS is explained by the use of specialized software products that enable the educational institution to carry out full monitoring on the platform of the educational process, generate reports within the framework of individual courses and according to the filter system, improve educational programs and courses, etc. Thanks to the use of modern technologies, the online learning process on the platform allows optimizing the interaction between teachers and students [6]. Cooperation between teachers and students on a specialized online platform allows for 24/7 cooperation, as access to educational content is possible at any time regardless of location, provided there is an Internet connection. The teacher gets the opportunity to monitor the students' activities and quickly check the completed tasks. Integration into the internal chat platform allows for communication between specific teachers and students, which helps to provide a personalized approach for education seekers.

The distribution of machine learning algorithms in modern conditions makes it possible to use the data accumulated thanks to the educational platform about the various activities of the participants in the educational process. The use of powerful servers allows universities to constantly accumulate large amounts of information in accordance with a justified system of metrics. Given the automatic data collection based on the business intelligence system, the number of relevant indicators can be very large. The flexibility of the data collection system allows universities to quickly change the set of metrics that are accumulated by the educational platform in the process of interaction with the participants of the educational process [7].

4. Models and Methods

Data obtained over a long period of time can be used as a valuable resource for improving various processes within educational activities. Along with the direct optimization of the educational process, increasing the effectiveness of communication between teachers and students, increasing the effectiveness of assimilation of educational content, it is also possible to use the obtained data to promote the educational product in the digital environment thanks to the use of modern marketing tools.

There are a large number of machine learning algorithms that can be integrated into an educational product in order to process large amounts of information and optimize target results. Among the most effective algorithms in modern conditions, it is advisable to pay attention to neural networks that allow processing large volumes of structured, semi-structured and unstructured information.

4.1. Integration of the neural network into the educational product

The first stage of the integration of the neural network into the educational product involves the use of a system of indicators with relevant data about the educational process. In the future, it is possible to improve the neural network in order to use text information, audio and video content as data [8].

Figure 1 shows the basic scheme of the neural network in terms of using the available data and obtaining the final optimal result based on it, after implementing the appropriate algorithm.

For different types of information, specific steps of neural network implementation are used, but the general system of calculations involves the following actions:

1. Selection of primary data.
2. Normalization of data that is presented in digital form.

3. Determination of the number of hidden and final layers of the neural network.
4. Identification of the optimal activation function.
5. Implementation of a neural network according to a certain number of iterations.
6. Training of the neural network in accordance with the set parameters and checking the quality of the model thanks to the use of appropriate metrics.
7. Increasing the efficiency of the neural network by changing various parameters and searching for the optimal result.

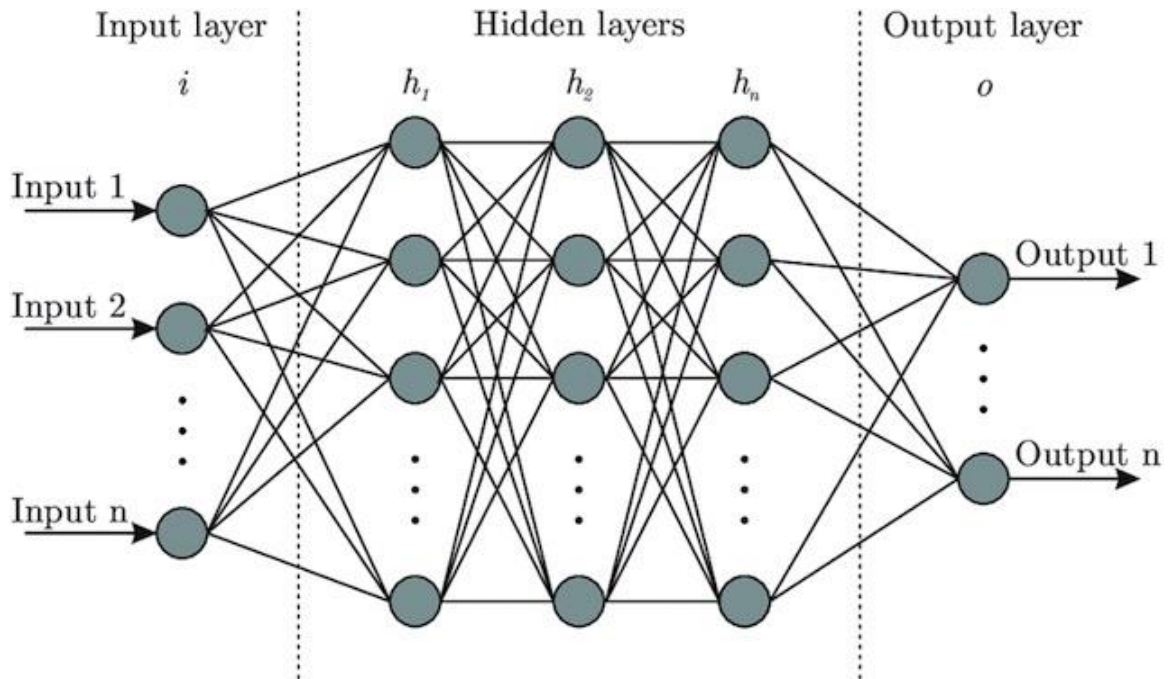


Fig.1. Basic structure of the neural network [9]

Figure 2 shows the main types of activation functions used in the construction of various neural networks. Among the most widespread activation functions in modern conditions, it is advisable to pay attention to such a function as ReLU (Rectified Linear Units) [10].

4.2. Main directions of using neural networks in the educational product

Based on the specifics of the use of neural networks in practical activities, the specified algorithm can be used as part of an educational product to ensure the following results:

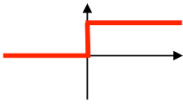
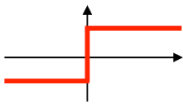
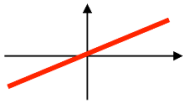
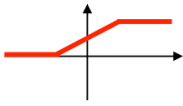

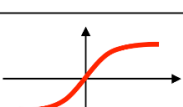
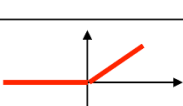
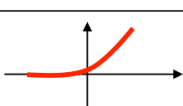
1. Classification of participants in the educational process. Based on the system of metrics, certain features are identified, according to which students are divided into groups. Each group is characterized by behavioral characteristics according to the social, economic, psychological and demographic characteristics used. For each population, it is possible to form a specific educational model that will allow to achieve optimal results in the educational process. The flexibility of the educational platform will allow individual groups to choose an effective mode of the educational process with the selection of optimal content [11].

The division of users into groups is actively used in the process of implementing modern marketing strategies in the digital environment. Thanks to the use of neural networks, it is possible to divide users into groups, which will allow identifying potential users of the educational platform on the Internet. For each target audience, it is advisable to use appropriate marketing tools in order to achieve the highest possible level of conversion when promoting an educational product in the digital environment [12].

2. Recommendation systems. Based on the system of metrics, the neural network forms certain groups of education seekers, which are used by the recommender system when selecting relevant courses or the best educational content for a new student. Due to the anticipation of the needs of a specific student, it is possible to maximize the interest of the student in the learning process and achieve

the optimal level of knowledge acquisition. The interaction between the student and the educational platform based on the system of interests acts as an effective incentive and allows developing the product in accordance with the needs of modern consumers, who mainly belong to generation Z [11]. The specified generation is characterized by interest in interactive content, which is provided in the form of interesting and short videos, as well as actual photo materials with a short description. It is advisable to implement the direct learning process for the specified category of education seekers in accordance with the principles of gamification, involving them in the performance of tasks according to the principles of stimulation and motivation [13, 14, 15].

In the process of promoting an educational product on the Internet, the marketing strategy also involves the use of a recommendation system to attract new customers. Based on relevant information, suggestions for educational content that may be useful to the relevant consumer are provided. Demonstration of relevant content increases the probability of attracting visitors to the platform and transforming them into loyal consumers of educational services on the specified educational platform [16, 17].

Activation function	Equation	Example	1D Graph
Unit step (Heaviside)	$\phi(z) = \begin{cases} 0, & z < 0, \\ 0.5, & z = 0, \\ 1, & z > 0, \end{cases}$	Perceptron variant	
Sign (Signum)	$\phi(z) = \begin{cases} -1, & z < 0, \\ 0, & z = 0, \\ 1, & z > 0, \end{cases}$	Perceptron variant	
Linear	$\phi(z) = z$	Adaline, linear regression	
Piece-wise linear	$\phi(z) = \begin{cases} 1, & z \geq \frac{1}{2}, \\ z + \frac{1}{2}, & -\frac{1}{2} < z < \frac{1}{2}, \\ 0, & z \leq -\frac{1}{2}, \end{cases}$	Support vector machine	
Logistic (sigmoid)	$\phi(z) = \frac{1}{1 + e^{-z}}$	Logistic regression, Multi-layer NN	
Hyperbolic tangent	$\phi(z) = \frac{e^z - e^{-z}}{e^z + e^{-z}}$	Multi-layer Neural Networks	
Rectifier, ReLU (Rectified Linear Unit)	$\phi(z) = \max(0, z)$	Multi-layer Neural Networks	
Rectifier, softplus	$\phi(z) = \ln(1 + e^z)$	Multi-layer Neural Networks	

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Fig.2. Main functions of the activation [18]

3. Predictive models. Based on the identified relationships, the neural network allows you to obtain predictive values. Within the framework of the educational platform, it is possible to predict the behavior of users and accordingly adapt the learning process to optimize the assimilation of knowledge and the acquisition of relevant skills. Thanks to a comprehensive assessment of user behavior on the

educational platform, bottlenecks are identified (uninteresting educational content, too simple or difficult tasks, inconvenient interface, etc.). Having identified certain problems or potential to improve the educational product based on the appropriate neural network, it is necessary to improve the product accordingly to ensure a high level of competitiveness in the market over a long period of time [19, 20].

5. Further Research

The development of machine learning leads to the emergence of more effective methods of processing large arrays of various information. At this stage, artificial intelligence is very popular, which allows to exploration of big data at a qualitatively new level and the formulation of optimal management solutions. Due to the flexibility of machine learning algorithms and the possibility of constant learning, artificial intelligence will constantly expand the areas of use in various types of economic activity.

One of the directions of using artificial intelligence is the generation of text content, photos, and videos. Among the latest products, it is appropriate to pay attention to the development of the company OpenAI, which brought to the market a new service for generating complex images Dall-E 3, which is interconnected with ChatGPT. It is advisable to conduct research on the possibility of integration into the educational product of Dall-E and ChatGPT. The presented services can improve the communication experience between users and the educational product. ChatGPT will allow the generating of information about relevant educational materials and educational courses based on text queries. Dall-E is advisable to use to generate images that are related to the learning process and will contribute to increasing the interest of students in learning [21, 22].

6. Conclusions

Digitization processes and increasing the efficiency of cloud servers make it possible to implement powerful mathematical algorithms when processing large amounts of information. In conditions of significant competition, companies will constantly introduce advanced information technologies to ensure high demand among consumers for their own products. The market of educational services is characterized by an increased demand for innovative solutions, which is explained by the need to provide modern participants of the educational process with advanced knowledge and skills. The growing demands of representatives of the Z and Alpha generations for educational content require educational institutions to introduce innovative software solutions that will allow providing the educational process in accordance with the needs of the target audience. The logical development of educational platforms is the integration of machine learning algorithms, artificial intelligence, augmented and virtual reality.

7. Further Research

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