INTRODUCTION

Formulation of the problem

The tourism industry is a highly profitable sector of the world economy, which is developing rapidly. In addition, it, in its development, affects the development of such major sectors of the economy as trade, construction, agriculture, all modes of transport, telecommunications, finance, insurance and others.

The rapid growth of tourism has made it an economic phenomenon of our time. According to Zurab Pololikashvili, Secretary General of the World Tourism Organization, “Around the world, in countries of all levels of development, many millions of jobs and businesses depend on a strong and prosperous tourism sector. Tourism is also a driving force in the protection of natural and cultural heritage, preserving it for future generations” (BAIEV et al., 2019, p. 1392).

ANALYSIS OF RECENT RESEARCH AND PUBLICATIONS

Domestic and foreign scientists, in particular: V. Baiev, G. Bagiev, I. Bakhov, J. Ballesteros, U. Gretzel, V. Kvartalnov, Ch. Koo, Zh. Xiang, S. Krasnov, S. Melnychenko, D. Nikulin, Ye. Romat, M. Sigala, M. Skopen, T. Tkachenko, M. Hernandez and others, dedicated their works to studying the issue of implementing intelligent technologies in tourism.

In the works of these authors, the peculiarities of the development of intelligent technologies in tourism were considered, the advantages of their practical use in tourist activity were determined. However, this issue needs further research and discussion, because despite the significant amount of scientific and practical work aimed at the introduction and use of modern information technologies and systems in tourism, the issue of implementing intelligent technologies in the tourism industry, in particular of using neural networks, remains insufficiently studied. The purpose of the article is to explore the essence and features of the use of intelligent technologies in tourism and to develop proposals for their implementation.

PRESENTING THE MAIN MATERIAL

The development of the tourism industry is of great importance as one of the effective areas of structural adjustment of Ukraine's economy. To solve this problem, Ukraine has adopted a “Strategy for the Development of Tourism and Resorts for the Period up to 2026” (ROZPORJADZHENJA KABINETU MINISTRIV UKRAJINY, 2017), according to which, its expected end results are:

- to increase the competitiveness of national and regional tourist products;
- to improve the quality of life of the population by ensuring economic growth, environmental security, consolidation of society, providing access to services in the field of tourism and resorts;
- to create new jobs, to expand employment and self-employment opportunities for the population;
to create a modern tourist information infrastructure, as well as to ensure the dissemination of information about the tourist resources of Ukraine in the world information space (THE WORLD TOURISM ORGANIZATION, n.d.).

Indeed, one of the features of tourism is that the main core that coordinates the various participants in the tourism market is information. It is information flows, not goods, as in most other industries, that provide interaction between producers of travel services.

Today, tourism is a global computerized business involving the largest airlines, hotel chains and travel corporations around the world. Tourism and information are inseparable (XIANG, 2020). First, the decision to travel is made on the basis of information; second, the tour itself at the time of purchase is only information, too; and, finally, information is exchanged many times by participants in the tourism market. Technologies for the development and implementation of tourist products should allow in the shortest possible time:

1) providing information on the availability of vehicles;
2) providing information on the availability of accommodation for tourists;
3) providing information about the possibilities of excursions;
4) providing reservation of seats and rooms;
5) providing information support;
6) paying for tickets, paying bills, etc.

Only modern powerful computer technologies of information processing and transmission are able to solve the outlined tasks. Moreover, the versatility of tasks in the tourism industry requires the integration of various information technologies, starting with software products for certain tour operators, travel agencies and all market participants, the use of global computer networks and artificial intelligence.

Currently, even giants of the computer market are interested in the informatization of the field of tourism. As an example, one can cite the electronic travel office Expedia by Microsoft, which allows any credit card holder to buy a tour, book a seat on a plane or a place at a hotel, buy tickets to entertainment events and book a car anywhere. Expedia Group is an American global travel company that includes websites that are mainly travel organizers and metasearch engines (CarRentals.com, CheapTickets, Expedia.com, HomeAway, Hotels.com, Hotwire.com, Orbitz, Travelocity, Trivago and Venere.com) (EXPEDIA GROUP COMPANY, n.d.).

Thus, computer technology has provoked the creation and application of fundamentally new electronic marketing channels for the promotion and sale of tourist products (GRETZEL et al., 2015). A modern travel product to be more attractive to tourists should become not only more affordable but also individual. The main trend in the field of the consumption of a person is taking into account his/her individuality, which is possible only in the context of individual production by the person him/herself, which requires the production of means of production by the person him/herself, the prerequisites for this being miniaturization and nanotechnology. Based on this general pattern, a tour should be created taking into account the characteristics of the person (SHOVAL; SCHVIMER; TAMIR, 2018).

Today, however, in reality, new tours constitute no more than 5% of the existing ones, i.e., the existing trend is subject to a strong limitation – adherence to old tours (BALLESTEROS; HERNÁNDEZ, 2017). The fact is that the idea of the last tour is represented by certain images on the person’s mind that are tied to real objects, and a new round is a model that in reality does not yet exist (because there is no experience). Therefore, it is necessary to develop a tour model that would meet the expectations of the tourist. The model should be consistent with the environment. The environment is the world of the tourist’s models, his/her culture. The bearers of this culture are tourists who have already gone on one or another tour. Therefore, it is necessary to form, with their help, this world of models – the "profile" of the tourist.
The main concept is: to turn each trip of an active participant into a tour, and, accordingly, each participant into the creator of new tours. Working with such tourists is extremely important and has many advantages:

- they independently order new tours (i.e., create a permanent budget);
- one can create new tours from old ones (update them), adding new elements;
- they bring new tourists because the latter trust them, not the company;
- they are ready to report information about their impressions (feedback base);
- there is no need to pay a salary;
- there are dozens of employees, but hundreds of tourists.

One can create a tour model today with the help of a tour designing tool. For example, with the help of the TripAggregator system, which is a new tourist information system for searching and booking tours, routes and excursions. Since a tour model is made using a tour designing tool, the main task is to create a world of tourist models, i.e., a "Tourist Profile"; as it is a case of the formalization of such weakly structured concepts as "impressions," "intentions," etc., it is necessary to use artificial intelligence technology. The general scheme of operation of the TripAggregator system is given in Figure 1. According to the general scheme, it is necessary to solve the following tasks:

1. To obtain a "world" (set) of models, a "profile" of a tourist - to develop technology based on artificial intelligence and reviews (feedback).
2. To create a repository of these "profiles" using a "profile" designing tool.
3. To "sift" a tour created using a tour designing tool through a certain tourist "profile."
4. To obtain an adequate tour model that would suit a particular tourist.
5. On the basis of each tour, to manage the "profile," making it more adequate.

**Figure 1.** General scheme of the work of the TripAggregator system

![Diagram](image)

**Source:** Search data.

The implementation of such a system - the creation of a tour adapted to the "intentions and wishes" of a tourist, will give a synergistic effect based on an increase in the number of booked tours tied to this system, as well as lobbying them among friends and acquaintances, which, in
turn, will expand and form the knowledge base of "profiles" of tourists. For storage and further work with a tourist "profile," it is necessary to design:

1) a storage of "profiles" of tourists, which is a database and should be created using appropriate means;
2) the unit of adjusting the tourist "profile".

The proposed scheme of operation of a tour development system (based on the functioning of neural networks) is presented in Figure 2. Analysis of possible types of management shows that, in this case, the most acceptable type of management is the "trial and error" one. If the system does not respond to the impact (real tour) found on the model (tourist "profile") as expected, then our model is not adequate. Management is reduced to obtaining new information and using it for the next act of management.

The algorithm is cyclical and repeats with each new tour. The adjustment algorithm should be built on the basis of neural networks, which are mathematical models, as well as their software or hardware implementations, built on the principle of organization and functioning of biological neurons. We can say that to some extent the system copies the behavior of a manager when he/she uses the existing experience in organizing tourism activities in a new environment. He/she seeks an analogy in different cases and learns from the examples of successful and erroneous decisions - both his/her own and other people's ones. This forms the ability of the management to act successfully in new situations, although they differ from previous actions.

**Figure 2.** Scheme of the work of a tour designing system (based on the functioning of neural networks)

**Source:** Search data.
The advantages of neural networks over other intelligent technologies are:

1) in the possibility of obtaining results for unknown patterns; indeed, a neural network trained on many examples does not require knowledge of the patterns of development of processes; it is able to solve problems only in the presence of input and output data;

2) in the possibility of obtaining results in the presence of a large number of non-informative input data. The neural network itself will determine the unsuitability of individual input data to solve the problem.

3) a well-trained neural network acquires a new quality - the ability to generalize; for example, neural networks trained on certain input data can be used to work in the context of other input data, i.e., they acquire the ability to adapt to the environment, which is especially important for work in a dynamic, unstable environment, and neural networks have the ability to relearn in real time;

4) neural networks have a very high performance due to the fact that parallel processing information is embedded in their architecture, which is crucial in creating systems that work in real time.

It is established that it is necessary to analyze the current existing systems of organizing feedback of tour operators and travel agencies, which is the basis for the formation of samples for neural network training. A performed analysis of tour operator feedback organization revealed 3 types of feedback organization

1. The section "Reviews" (the form is arbitrary) - 70%. The features are as follows: often, there are negative responses; there is no combination of separate elements of a tour and the tour itself; high probability of data manipulation. Conclusion: there is almost no data for processing, structuring and storage.

2. Groups in social networks - 15%. The features are the same as in the previous type; in addition, there are more positive reviews about a particular tour or its elements. Conclusion: there is not enough data for processing, structuring and storage.

3. A section with questions - 15%. It has the features of all previous items; it contains clear questions that involve clear answers; the questions are not systemic. Conclusion: there is a small amount of data that can be structured and processed, but it is usually not stored.

Focusing on the tourist as a user of these systems, they should be aimed at supporting the tourist by:

1) anticipating his/her needs that are based on various factors and providing recommendations based on his/her wishes, such as personal interests and preferences of the user;

2) improving the experience of tourists by offering a lot of information; customer-oriented interactive services based on location;

3) giving tourists the opportunity to share their travel experiences, so they help other tourists in the decision-making process, revive and strengthen their travel experience, while forming a tourist profile.

From an industry perspective, the emphasis is on the potential contribution of these systems to process automation, efficiency improvement, new tourist product development, demand forecasting and crisis management. Although these systems can be described as heterogeneous, distributed, and sometimes even fragmented, the main goal of developing such systems should be openness, scalability and collaboration, ensuring full autonomy of relevant industry participants and supporting the entire tourism experience at all stages of the business.
CONCLUSIONS

The article explored the essence and features of the use of intelligent technologies in tourism and suggested proposals for their implementation. It has stated that every travel agency should use its own strategies, tactics and tools to achieve and maintain a competitive advantage. It is stressed that the use of the latest advances in data processing becomes one of the advantages for a travel business company. That is, with the growth of the number of tourist trips, the capacity of the means of information support of the tourist business should also increase. It substantiated that well-designed and properly trained neural networks are able to independently identify laws of nature and society, patterns of business processes, economic, political, social and other phenomena, to identify connections and patterns of subject areas and to put them in mathematical computer models. Therefore, the creation of a database of tourism models, i.e., a tourist “profile,” will allow forming a modern tourist product, more attractive for tourism, which will not only be affordable, but will also take into account the individual needs of tourists.

REFERENCES

BAIEV, V.V.; BAKHOV, I.S.; HOLOVACH, N.V.; ZGALAT-LOZYNSKA, L.O. The Economic determinants of the world medical tourism industry development. *Journal of Environmental Management and Tourism*, 2019, 10 (6(38)), p. 1392-1398. DOI: 10.14505/jemt.v10.6(38).22.

BALLESTEROS, J.G.T.; HERNÁNDEZ, M.H. Assessing the impact of EU rural development programs on tourism. *Tourism Planning & Development*, 2017, 14 (2), p. 149-166. DOI: 10.1080/21568316.2016.1192059.

EXPEDIA GROUP COMPANY. Official site, n.d. Available at: https://www.expediagroup.com/home/. Access: Feb. 10, 2021.

GRETZEL, U.; SIGALA, M.; XIANG, Zh.; KOO, Ch. Smart tourism: foundations and developments. *Electronic Markets*, 2015, 25 (3), 179-188. DOI: 10.1007/s12525-015-0196-8.

ROZPORJADZHENJA KABINETU MINISTRIV UKRAJINY vid 16 bereznya 2017 No. 168-r “Pro skhvalennja Strateghiji rozvytku turyzmu ta kurortiv na period do 2026 roku” [Order of the Cabinet of the Ministry of Finance of Ukraine of March 16, 2017 No. 168-r “About the strategy for the development of tourism and resorts for the period until 2026”]. Available at: https://zakon.rada.gov.ua/laws/show/168-2017-%D1%80#n9. Access: Feb. 3, 2021.

SHOVAL, N.; SCHVIMER, Y.; TAMIR, M. Real-time measurement of tourists’ objective and subjective emotions in time and space. *Journal of Travel Research*, 2018, 57 (1), p. 3-16. DOI: 10.1177/00472875177691155.

THE WORLD TOURISM ORGANIZATION, n.d. Available at: https://www.unwto.org. Access: Feb. 3, 2021.

XIANG, M. The evaluation of tourism resources informatization development level based on BP neural network. In: *International conference on Big Data Analytics for Cyber-Physical-Systems*. Singapore: Springer, 2020, p. 1709-1713.
Use of intelligent technologies in tourism

Resumo
O objetivo do artigo é explorar a essência e as características do uso de tecnologias inteligentes no turismo e desenvolver propostas para sua implementação. O tema da pesquisa – tecnologias inteligentes no turismo, a tecnologia de formar o "perfil" do turista. A metodologia da pesquisa consiste na aplicação de métodos de análise, síntese, comparação, generalização, previsão, bem como no uso de abordagens sistemáticas e de atividade. O artigo apresenta a tecnologia de formação do "perfil" do turista. A novidade científica é que este artigo comprova a eficácia do uso de tecnologias inteligentes para criar um modelo do turista, seu "perfil" utilizando redes neurais. O uso efetivo de informações de diversas fontes no campo do turismo é uma tarefa importante e difícil. Os gestores são frequentemente forçados a tomar decisões com base em informações parciais, incompletas e imprecisas. O artigo considera a gestão do conhecimento em um ambiente em rápida mudança para a tarefa de promover um produto turístico.

Palavras-chave: Turismo. Tecnologias inteligentes para o turismo. Redes neurais. Perfil turístico. Produto turístico.

Abstract
The purpose of the article is to explore the essence and features of using intelligent technologies in tourism and to develop proposals for their implementation. The subject of research – intelligent technologies in tourism, the technology of forming the "profile" of the tourist. The research methodology consists in the application of methods of analysis, synthesis, comparison, generalization, forecasting, as well as in the use of systematic and activity approaches. The article presents the technology of forming the "profile" of the tourist. The scientific novelty is that this article proves the effectiveness of the use of intelligent technologies to create a model of the tourist, his "profile" using neural networks. Effective use of information from various sources in the field of tourism is an important and difficult task. Managers are often forced to make decisions based on partial, incomplete and inaccurate information. The article considers knowledge management in a rapidly changing environment for the task of promoting a tourism product.

Keywords: Tourism. Intelligent technologies for tourism. Neural networks. Tourist profile. Tourist product.

Resumen
El propósito del artículo es explorar la esencia y las características del uso de tecnologías inteligentes en el turismo y desarrollar propuestas para su implementación. El tema de la investigación: tecnologías inteligentes en el turismo, la tecnología de formar el "perfil" del turista. La metodología de investigación consiste en la aplicación de métodos de análisis, síntesis, comparación, generalización, previsión, así como en el uso de enfoques sistemáticos y de actividad. El artículo presenta la tecnología de formar el "perfil" del turista. La novedad científica es que este artículo demuestra la efectividad del uso de tecnologías inteligentes para crear un modelo del turista, su "perfil" utilizando redes neuronales. El uso eficaz de la información procedente de diversas fuentes en el ámbito del turismo es una tarea importante y difícil. Los gerentes a menudo se ven obligados a tomar decisiones basadas en información parcial, incompleta e inexacta. El artículo considera la gestión del conocimiento en un entorno que cambia rápidamente para la tarea de promover un producto turístico.

Palabras-clave: Turismo. Tecnologías inteligentes para el turismo. Redes neuronales. Perfil del turista. Producto turístico.