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DIGITAL INCLUSION OF TOURISM BUSINESS IN THE CONDITIONS OF GLOBAL SMARTIZATION: POTENTIAL, MECHANISMS AND STRATEGIC TOOLS

INNA KOCHUMA[1], VIKTORIIA HRANOVSKA[2], VALENTINA DEMKO[3], VOLODYMYR DZHUMURAT[1], MAKSYM HORIASHCHENKO[1]

[1]*Bohdan Khmelnytsky National University of Cherkasy, Department of Tourism and Hotel and Restaurant Business, Ukraine*
[2]*Kherson State Agrarian and Economic University, Department of Tourism, Hotel and Restaurant Business and Foreign Languages, Ukraine*
[3]*Dmytro Motornyi Tavria State Agrotechnological University, Department of Economics and Business, Ukraine*

Mailing address: Inna Kochuma, Bohdan Khmelnytsky National University of Cherkasy, Department of Tourism and Hotel and Restaurant Business, 81 Shevchenko Blvd., 18031 Cherkasy, Ukraine, e-mail: inna_kochuma@edu.cn.ua

Abstract
Introduction. The study examines the digital inclusion of the tourism industry amidst global smartization. This study is especially relevant given the transformative impact of smartization on economic systems and business models. The article aims to develop a criterion-based, three-dimensional framework for integrating digital technologies into the tourism industry under these conditions. ***Material and methods.*** The study employs a multi-dimensional methodology, integrating correlation-regression analysis, econometric modeling, and a criterion-based format to evaluate the digital inclusion of tourism businesses. Data from global tourism reports and smartization indicators are used to analyze patterns of digital transformation. ***Results.*** Key findings include the determination of income from online bookings, the share of online travel companies' income by market segments, and the dynamics of digital technology integration in the global tourism industry. Smart systems, such as AI-driven platforms and big data analytics, are identified as key drivers of efficiency, enhanced customer experiences, and economic resilience. The study categorizes countries based on their levels of digital inclusion, highlighting disparities between developed and developing regions. ***Conclusions.*** Digital transformation is substantiated to reshape the tourism industry, contributing to global economic recovery and sustainable development. Smart technology integration fosters innovation, reduces operational costs, and enhances service quality. The research provides actionable insights for achieving long-term economic and environmental benefits in the global tourism sector.

Key words: digital technologies, global smartization, tourism business potential, tourism industry, smart-systems

Introduction

Every year, the digitalization of the tourism business changes the economy and society of the countries of the world, and the relationship between them is reassessed. The digital inclusion of the tourism business is manifested in business models that change in response to the introduction of AI or smart 3D technologies. These technologies serve as a platform for active communication and acceleration of socio-economic transformations in the universe of innovative technologies. The world is witnessing the formation of a fundamentally new digital environment in the tourism business ecosystem, which is the main driver of global changes. These changes may pose multiple risks to the multifaceted processes of effective technology production caused by the Fourth Industrial Revolution.

Digital technologies have changed the lives of the current generation by bringing new types of smartization-based services. This significantly changed the product of tourist services in the global space and expanded the spatial and temporal parameters of the activities of tourism business entities in the real sector of the economy of most countries of the world. In other words, a virtual sector of the tourist business ecosystem ensures interaction between companies and consumers of tourist services with the help of smart technologies. Smart technologies act as an intermediary in global informatization and thus contribute to the expansion of tourism market segments, increasing their influence on the macroeconomic indicators of the national economy.

Smart technologies are an informational component of globalization, associated with techno-globalism and the theory of innovative inclusion of the world economy. The theory reflects the qualitative transformation of the world, changes in technological and economic means of production, and people's views on the values of civilizational development [1]. Moreover, the manifestations of smart technologies globalization in the tourism business ecosystem are an increase in the absolute and relative level of world trade in goods and services and the movement and merger of capital.

The reasons that condition the implementation of global smart technologies in the tourism business are as follows: increased competition, the intensification of transnationalization processes, the creation of strategic and global alliances, which is manifested in the liberalization of national tourism markets, the expansion of access of countries with a weak tourism ecosys-

tem to the international tourism alliance, etc. [2]. This underscores the necessity to implement a model of smart technologies to develop novel methodologies for the digital inclusion of the tourist business, which transitions from a material model to an interactive one [3]. However, it is necessary to consider not only the development of business models but also global smartization, which equips tourist services with digital technologies.

It is problematic to give a single, comprehensive, unequivocal definition of the theoretical foundations of digital inclusion of the tourism business in the conditions of global smartization. An important scientific problem is determining the nature of globalization processes – their objectivity or subjectivity. Global smartization, as an objective phenomenon, does not depend on the will and decisions of individual people since globalization is a natural stage of the evolution of the world economy. It is an integrated complex system that organizes itself and significantly affects the development of international markets [4].

As one of the most information-driven sectors, the tourism industry today reflects the widespread integration of digital technologies across all its areas. However, a comprehensive approach to digital transformation – especially the global shift toward "smart" solutions – relies on implementing national and regional development strategies. These strategies must be adapted significantly to account for each country's unique local characteristics. Tourist business destinations successfully function as independent infrastructural and economic units. Therefore, the most rational approach is to combine strategies that support the local business environment with resources, knowledge, and technologies provided by the state to all economic sectors [5]. In other words, implementing the smartization strategy involves coordinated steps to create a synergistic effect through the interaction of macro-regions, while considering the requirements for establishing a "smart" environment.

Such domestic researchers as Mazaraki et al. [6], Melnychenko et al. [7], and Boyko et al. [8] showed interest in the issues of smart tourism, smart destinations, and their components. The researchers examined the theoretical and methodological foundations of smart tourism, suggested practical tools for digital technology inclusion in the tourism business, and provided recommendations for modifying the organizational structures of management of tourist enterprises under the influence of CRM systems. Meanwhile, Savina and Yakovenko [9] considered various aspects of CRM systems integration and means of analyzing consumer behavior on the Internet to select a way of maintaining client databases. Prykhodko et al. [10] studied the experience of investment and management of "smart cities" in several EU countries at the level of implementation of supranational strategies. Basyuk et al. [11] considered the concept of "smart destinations," which go beyond the city limits, although urban agglomerations initiate this trend (since the concentration of tourist objects and visitors is achieved and balanced in the city). In fact, all researchers emphasize the comprehensive use of IT technologies in the modern tourism business model.

The world experience of digitization of the economy was studied by Zhosan [12], who connects the classification of technologies with the periodization of socio-economic formations (organizations); Schwab [13], the founder of the era of cyber-physical systems, is close to this idea. Developed econometric models for assessing the impact of digitalization on economic processes and various branches of the national economy can be called a separate independent direction in this field. For example, Tang [14] suggests using a complex of positive and negative indicators (stimulators and destimulators), the combination of which allows to assess the effectiveness of digitalization measures in the functioning of the tourism industry of the United Kingdom. The materials of the EU i-SCOOP project [15] contain a comparative analysis of the modern categorical apparatus of digitization (digitalization), with a focus on assessing business transformations and changes in business practices.

The aim of this research is to develop the criteria for a three-dimensional format for the inclusion of digital technologies in the tourism business, which, under the condition of global smartization, allows determining the tourism potential of macro-regions based on key economic indicators and identifying signs of intensive use of smart systems by users of informationized tour operating services.

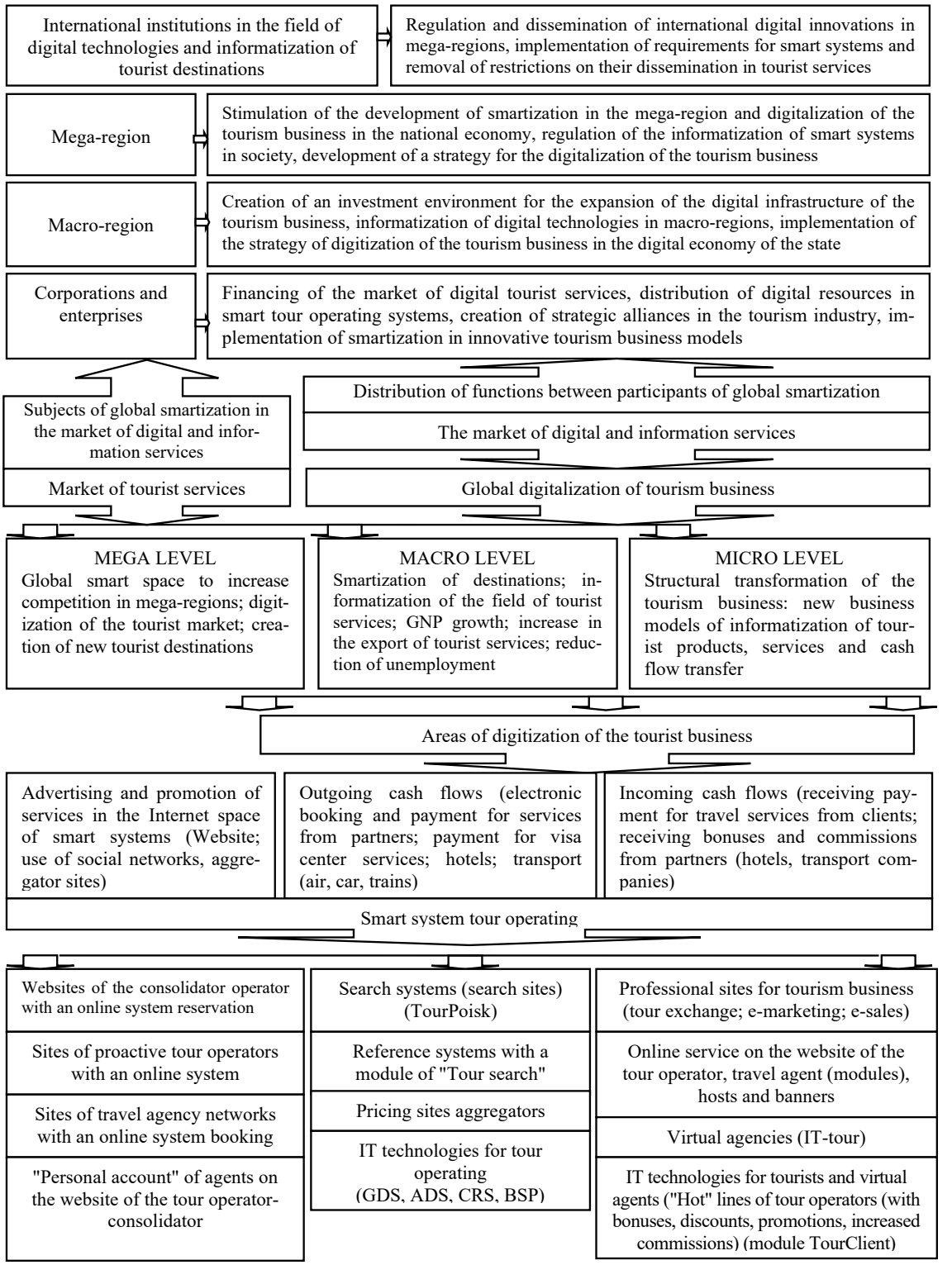
Material and methods

This article does not contain any studies involving human-participants performed by any of the authors. Digital inclusion in the tourist business is mainly aimed at the formation of a new tourist product and marketing activity, as well as the application of new methods of digital market capacity, which significantly affect the price reduction of the tourist product, the reduction of time for the selection and sale of tours, their registration and the issuance of travel documents [16, 17]. Global smartization allows better development of a country's infrastructure; that is, the more information about it can be found, the safer foreign citizens feel in it. The formation of a positive tourist balance and the stimulation of inbound tourism as its asset are impossible without smart-systems that create competitive advantages of tourist products on the world market and are an attractive means of activating tourists [18].

The digital product of smart systems as an object of tourism business is important in the formation of the entire market infrastructure of the destination and is the basis of the marketing mix, while ensuring the interaction of all its other elements [19, 20]. That is, the geopolitical position of any country in the global digital economy is determined by factors that affect the ability of the tourism business to generate new resources (assets of smart systems), to ensure a stable trend of increasing their specific weight in the GDP structure, made on the basis of new knowledge embodied in techniques, technologies and services, in methods of organization and promotion of the product through business models of the new generation, built on smartization [21, 22]. The functional model of digital inclusion of the tourism business as a mechanism of institutional provision of digital technologies and transformation of mega- and macro--regional economic systems in conditions of global smartization is presented in Figure 1.

The first direction of research determines global trends inherent in the market of tourist services in the context of the smartization of society. At this stage, it is necessary to find out: the main changes in mega-regions as objects of tourism business; to identify the impact of the smartization of territories on the effective indicators of the development of tourist activity and the implementation of digital technologies; to assess the impact of the smartization process on the macroeconomic indicators of the countries of the world with a developed digital economy.

The second direction of research singles out the criterion--three-dimensional format of activation of digital inclusion of tourism business and its measurement under the influence of global smartization to identify groups of countries with characteristic signs of the development of the economic system within three vectors: the state of development of the national digital economy, tourist activity of destinations and informatization of users of tourist services (Fig. 2).



Source: built by the authors from the data [18, 23, 24, 25].

Figure 1. Functional model of digital inclusion of tourism business as a mechanism of institutional provision of mega- and macro-regional digital technologies

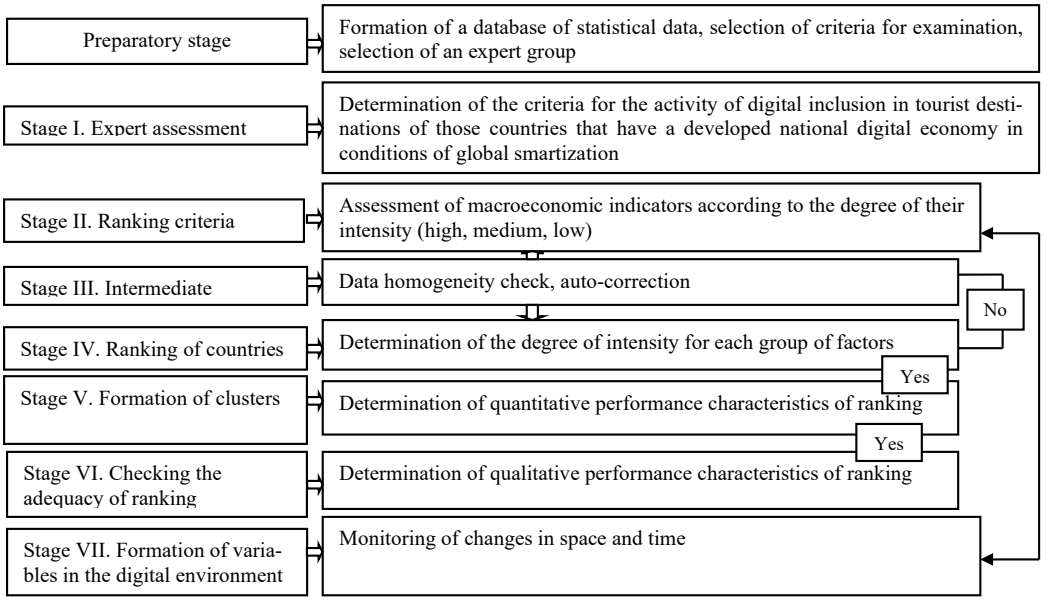


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Figure 2. Step-by-step criterion-three-dimensional format of activation of digital inclusion of tourism business

The third direction of research singles out an analytical toolkit, which takes into account the correlation-regression model of the dependence of factor and result characteristics, which, for a certain set of variables, single out significant indicators of informatization of users of tourist services and ensure the inclusiveness of tourist destinations of countries of the world (macro-regions) with a digital economy.

If there is a positive correlation between the indicators, the forecast limits (minimum and maximum criteria) are calculated, according to which the amount of income from the new format of the tourist business model gradually increases. The main characteristic of the correlation dependence is the regression line – a function that sets analytical values and connects the x-factor characteristics with the average values of the y-conditional characteristics, which are distributed into the resulting characteristics [4]. Therefore, in the correlation-regression model, the regression line is set analytically and calculated in the form of a regression equation:

$$y = f(x) \quad (1)$$

Construction of the regression equation consists of two main stages: selection of the type of function f(x); finding the parameters of this function. The main task of regression analysis is to determine the influence of factors on the performance indicator (in absolute terms). First of all, for this, it is necessary to select and substantiate the relationship equation that corresponds to the nature of the analytical stochastic dependence between the studied features. Correlation, as a statistical dependence between values, which does not have a strictly functional nature, occurs when one of the values depends not only on the given second, but also on some random factors; or when among the conditions on which both quantities depend are common to both of them [2, 4]. The ratio of the correlation moment to the product of the mean square deviations is called the coefficient of pair correlation:

$$r = \frac{n\sum xy - (\sum x)\times(\sum y)}{\sqrt{|n\sum x^2 - (\sum x)^2||n\sum y^2 - (\sum y)^2|}} \quad (2)$$

For independent values r = 0, while for functional dependencies, r = ± 1. If an increase (X) leads to an increase (Y), then r^+ (positive); if to a decrease, then r^- (negative). If there is no value (r), enter the coefficient of determination $R = r^2$, which is always positive. Correlation is considered strong if ($r \leq 0.75$). The fourth direction of research includes the verification of business models for adequacy and significance. The proposed research algorithm is aimed at identifying new signs of the development of digitalization of the tourist business in the conditions of global market smartization. For the effective development of the digitalization of the tourism business in mega- and macro-regions with a national digital economy, it is necessary to use the general method of evaluating the Digitization Index (IDI) [26].

It is proposed to introduce a modified version of the TB-IDI evaluation methodology in the tourism industry, i.e. the integral Index of Business Digitization in the Tourism Industry (TB-IDI – Tourism Business Digitalization Index), as a weighted average sum of three sub-indices: the level of profitability of services in digitalized tourism infrastructure (reflects the degree of accessibility and the quality of the provision of tour operating services via the Internet), the level of online spending on tourism in the field of TB-IDI (includes the costs of online retail and online advertising), the level of information of users of the smart-system of tour operating via the Internet (calculated as a weighted average value of the sub-indexes of the lower level: informing users and government institutions about the services of smart tour operating systems via the Internet). Determining the level of digitalization of the tourism business in the macro-regional economic system (countries of the world) involves the algorithm presented in Figure 3.

The proposed methodology makes it possible to compare the level of digitalization of the tourism business in macro-regional economic systems, to identify sub-regions-leaders and regions-outsiders, as well as to develop empirical recommendations for increasing the level of providing tourist services through smart-systems.

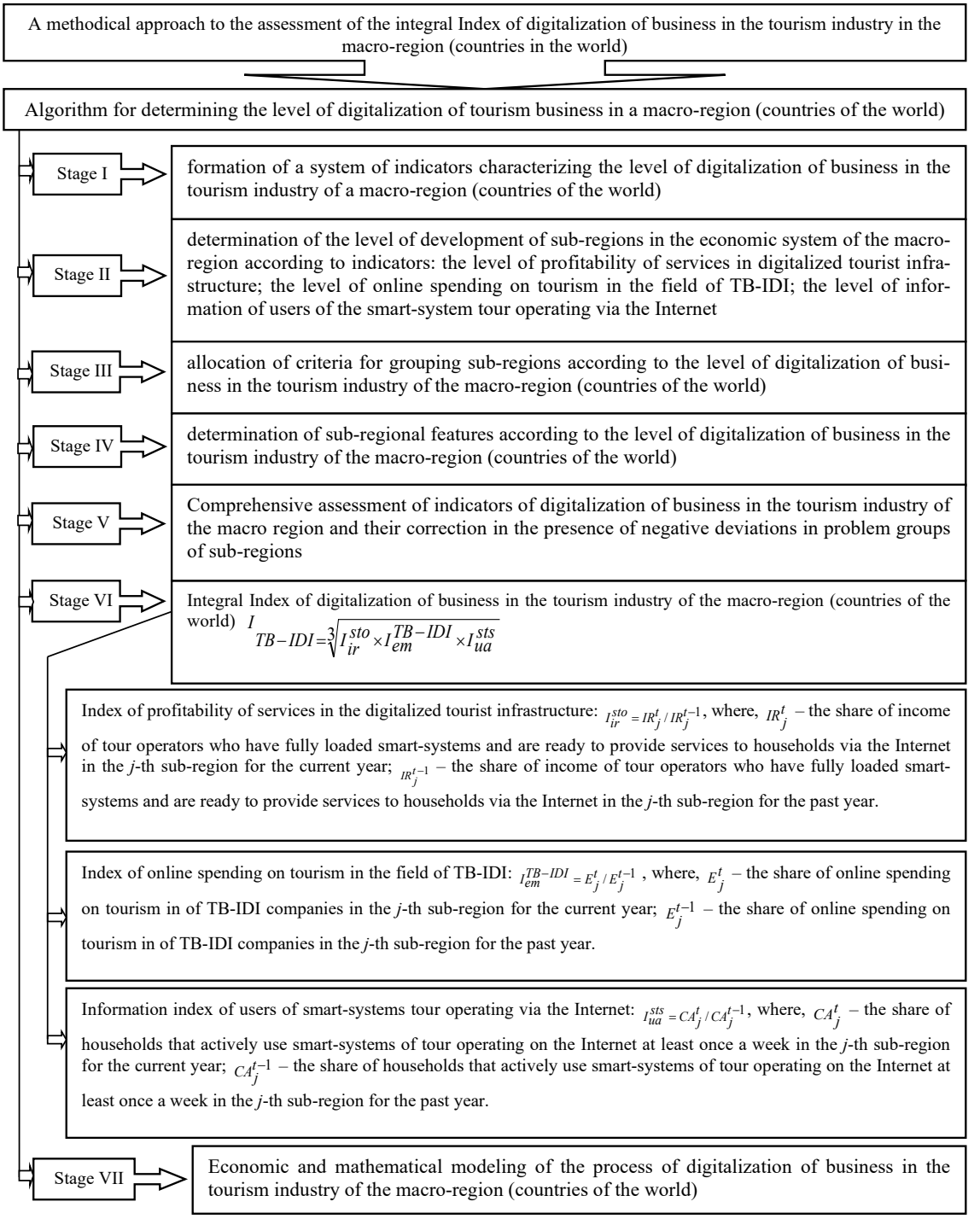

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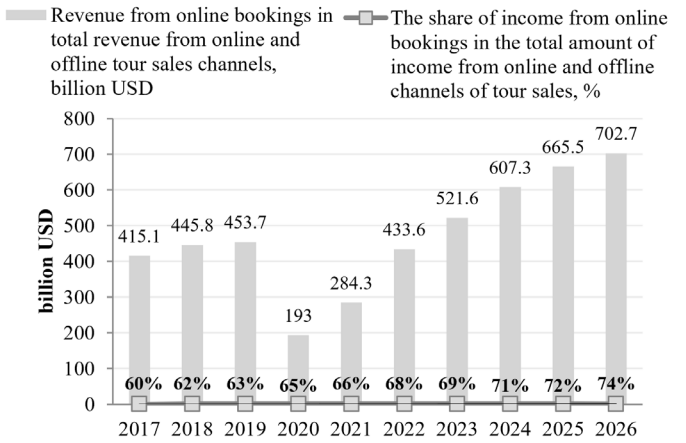
Figure 3. Integral index of digitalization of business in the macro-regional tourism industry (stage III of the study)

Results

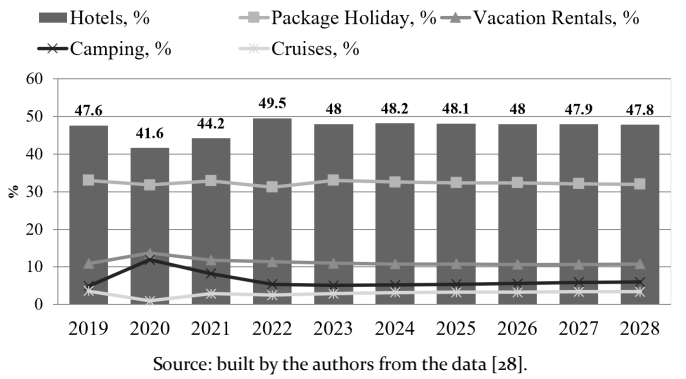
Currently, the digital transformation of the tourism industry is taking place all over the world. By 2026, the tourism business from online sales will bring 74% of income to the world economy (which in conversion will amount to about 702.7 billion USD for the projected total revenue of 950 billion USD). In 2021 global online sales of tours amounted to 430.8 billion USD from 494.08 billion USD of their total volume (this is 31% more than in 2020), in 2020 – 297.26 billion USD from 346.35 billion USD. Such a high rate of growth was maintained in 2022 as an effect of the weakening of the pandemic. In 2022, 68% of all travel bookings were made online. In 2023, the income of the tourism industry from online bookings amounted to 521.6 billion USD, which was equal to 69% of the total volume of sales of tours in the world. In 2024, compared to 2023, the increase in income amounted to 16.4%, which is equal to 71% of the total volume of online sales of tours (Fig. 4).



Source: built by the authors from the data [27].

Figure 4. The income and its share from online bookings in the world for 2017-2023 and the forecast for 2024-2026, billion USD (%)

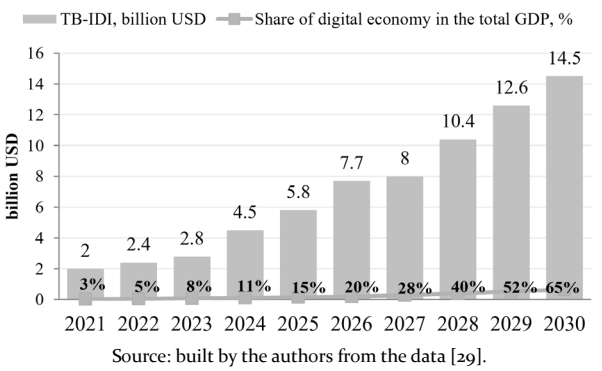
By segments of travel in the tourism industry, the largest share of revenue is generated by online hotel reservations – an average of 47%, vacation tour package bookings – 32.3%, and online real estate rentals – 11.3%, camping reservations – 6.3% (Fig. 5).



Source: built by the authors from the data [28].

Figure 5. The share of travel revenue of online travel companies in 2019-2023 and the forecast for 2024-2028 (%)

It is predicted that the revenue of the global travel market by segments from online travel companies will amount to 1030.27 billion USD in 2027, and 1036.5 billion USD in 2028. By 2030, digital implementations in the tourism industry will have a positive impact on increasing its share in global GDP (Fig. 6).

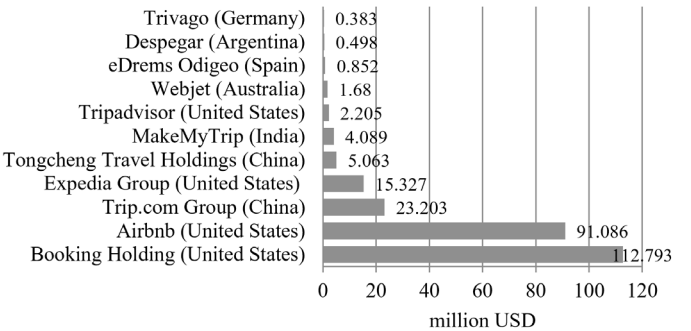


Source: built by the authors from the data [29].

Figure 6. The dynamics of digital technologies implementation in the world tourism industry in 2021-2023 and the forecast for 2024-2030

Regarding the competitiveness of online travel companies, the leading position is occupied by Booking Holding (United States), which has the highest revenue in 2023 – USD 112.793 million [19]. In terms of revenue, it is followed by Airbnb company (United States) – USD 91.086 million (an online site for hosting and searching for short-term rental of private housing around the world). In the third place is Trip.com Group (China) – 23.203 million USD, in the fourth place is Expedia Group (United States) with a market capitalization of 15.327 million USD, and in the fifth place is Tongcheng Travel Holdings (China) with a capital in the amount of 5.063 million USD. Therefore, digital enterprises confirm not only their viability, but also occupy leading roles in the world. Such successes were achieved thanks to successful online interaction with users [30].

The market capitalization of the leading online travel companies around the world for the 3rd quarter of 2023 is presented in Figure 7.



Source: built by the authors from the data [28, 30].

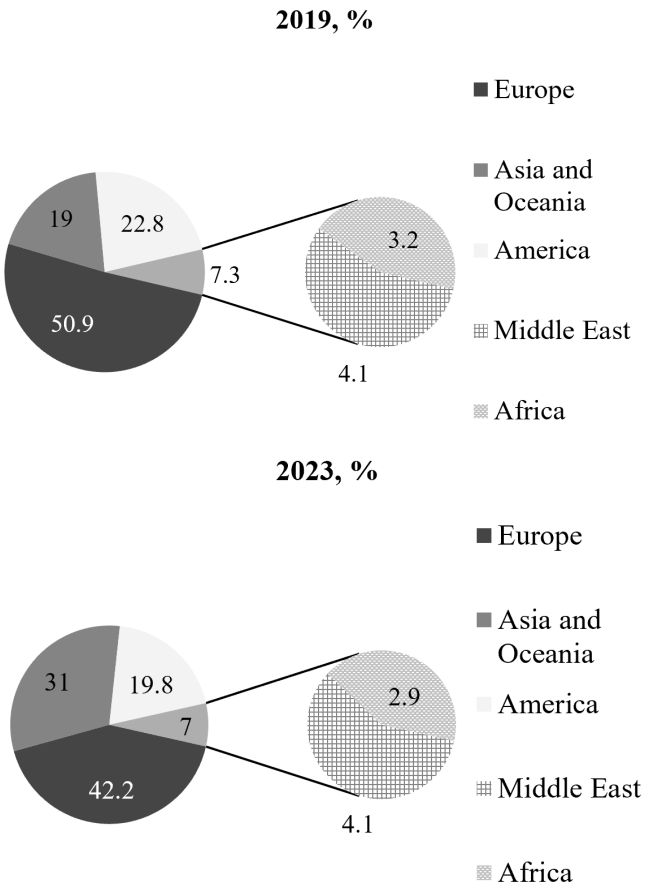
Figure 7. Market cap of leading online travel companies worldwide for the third quarter of 2023 (million USD)

Over the past five years (2019-2023), in the structure of the overall distribution of income, business profitability from the digitalization of the tourism industry in the Asia-Pacific region greatly increased. Thus, Asia and Oceania increased its share of revenue from digitalization of tourism by more than 1.6 times, pushing all other parts of the world by this indicator (Fig. 8).

China returned to being among the world's leading consumers of international tourism in 2023 after recovering from the consequences of COVID-19. However, in 2022, the USA took the leading position in the list of the world's consumers in international tourism industry; Spain, the United States, and France were the most traveled countries [32].

Thus, in 2023, Chinese spending on international travel reached USD 196.5 billion, surpassing the USA (USD 150 billion), Germany (USD 112 billion), the UK (USD 110 billion), and France (USD 49 billion). The Republic of Korea, India, the Russian Federation, Canada, and Italy were among the 2023 leaders in consuming tourism. Notably, India rose to 8th place in 2023 (compared to 14th in 2019) and highlighted its increasing significance as a source market. Italy moved up from 10th to 7th place [33].

France, Spain, and the USA strengthened their positions in 2023, being the world's leading host countries. France proved to be the most traveled country in 2023, attracting over 100 million international tourists. The second and third most traveled countries were Spain (85 million tourists) and the USA (66 million tourists), respectively. They were followed by Italy (57 million tourists) and Turkey (55 million tourists). Austria, Germany, the UK, Greece, and Mexico were also among the top ten tourist-attracting countries. If compared to the pre-pandemic results of these countries, Greece jumped from 13th to 9th place,



Source: built by the authors from the data [28, 30, 31].

Figure 8. Mega-regional structure of income from digitalization of the tourism industry for 2019-2023 (%)

while Austria, Germany, Italy, Mexico, and Turkey rose one position each. The UK climbed three positions (from 10th to 7th) [33].

The USA earned USD 176 billion in international tourism receipts, which allowed it to head the ranking in 2023. Spain came second, having earned USD 92 billion. The UK took the third place (USD 74 billion), followed by France (USD 69 billion), and Italy (USD 56 billion). In 2023, other top earners from international tourism included Japan, Macao (China), Australia, Mexico, the United Arab Emirates, Canada, Saudi Arabia, Turkey, Germany, and India, rounding out the top 15 tourism-earning countries. Saudi Arabia made the most significant upward movements in the ranking (from 27th pre-pandemic to 12th), followed by the United Arab Emirates (from 13th to 6th), Canada (from 15th to 9th), Turkey (from 12th to 7th), the UK (from 5th to 3rd place), and Mexico (from 17th to 15th). Additionally, Croatia (from 32nd to 25th), Morocco (from 41st to 31st), and the Dominican Republic (from 43rd to 34th) moved up in the top 50 rankings by receipts in 2023, as did Qatar (from 51st to 37th) and Colombia (from 50th to 44th) [33].

The latest World Tourism Barometer reports that international tourist arrivals will reach 97% in the first quarter of 2024. According to the UN tourism forecast, international tourism is anticipated to fully recover in 2024, and arrivals are expected to grow 2% above the 2019 level. This recovery is driven by strong demand, improved air connectivity, and the ongoing recovery in China and other major Asian markets. In 2023, total export revenues from international tourism, including both receipts and passenger transport, reached an estimated USD 1.7 trillion, approximately 96% of pre-pandemic levels in real terms. Tourism direct GDP also returned to pre-pandemic levels in 2023, amounting to an estimated USD 3.3 trillion, which is equivalent to 3% of global GDP [33].

Discussion

Support for the development vector of Industry 4.0 and Industry 5.0 in most countries of the world forms the appropriate strategic policy of tourism, which is reflected in the mechanisms of building the potential of smart tour operating systems and their implementation in strategic programs for the implementation of the digital economy, aimed at updating the technological base in cities. The digital economy implies a significant change in the tourism resources of countries. One of them is the transition to smart cities. The definition of the essence of the "smart city" is given by H.P. McKenna, who interprets it as "the integration of the territory with effective physical, digital and human systems into the artificial environment for the sake of a sustainable, prosperous and comprehensive future of citizens" [34]. The scientist explores the interaction of the concepts of the visible and invisible environment, within the framework of digital theory and methods that expand its possibilities in smart cities and regions, taking into account human geography, urban planning in various areas, such as environmental design, human-computer interaction, information technology, sociology and emotional computing. Relationships between variables using an integrated methodological approach combined with an explanatory correlational design based on urban research, covering countries on three continents.

M. Deakin, an expert in the field of urban planning, proposed a modern classification of smart cities: versions 1.0, 2.0 and 3.0. In the "smart city" 1.0, there is no general strategy, automation has touched individual, unrelated components. In version 2.0, previously independent initiatives and a maximum number of different sources of information are combined and interconnected. Version 3.0 assumes that the integration of all components is complete, and the entire digital infrastructure is filled with intelligent technologies [35]. On this basis, more complex contextual schemes of interaction between urban infrastructure and market entities are being developed, which allow the development of a modern high-tech tourism industry and play a decisive role in the inclusion of smart cities [10], since initiatives to attract tourists lead to an increase in the investment attractiveness of the destination [11], accelerated implementation of innovative business models of public-private partnership to simulate the tourism industry in the post-conflict period and the openness and responsibility of users of tourist services in this period [36]

Digitization of the tourism business includes strategic smart tools, artificial intelligence in particular, which affects business processes and models the virtual world according to given parameters; artificial intelligence is built into software systems for information processing and software documents necessary for the operation of these programs. That is, smartization is the level of a new generation of digital technologies, which is aimed at the automatic performance of business functions with limited access to this human process [37]. Therefore, at the current stage of global smartization, the potential of advanced digital technologies in the tourism infrastructure is expanding and demonstrates the progressive specific orientation of business as a priority vector in the public policy of most countries of the world (Tab. 1).

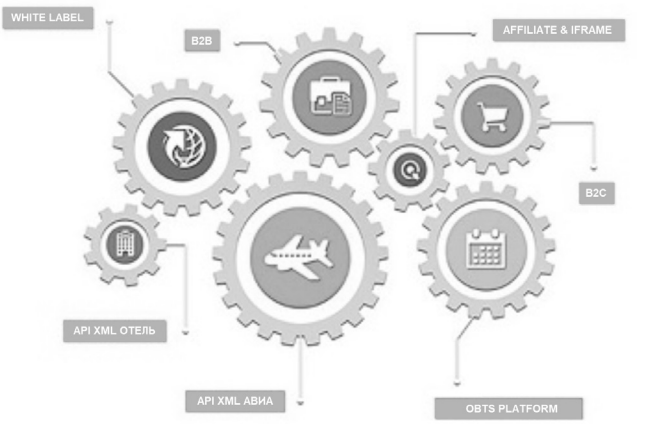
Table 1. Inclusive digital technologies in the tourist infrastructure of the countries of the world

The potential of digital technologies in the tourism industry	
Unmanned buses	Saving time, improving road safety, reducing emissions of harmful substances (Japan, USA, Denmark, France, UAE)
Hydrogen fuel	Environmental friendliness, efficiency of energy use, reduction of dependence on oil (Germany, Japan, USA, China, Iceland)
Roads with solar panels	Environmental friendliness, energy generation, reduction of CO2 emissions (France, Germany, Italy, China, India)
Google Mobile	Availability of information about the area, convenience for tourists, improvement of navigation (USA, EU)
Space Travel	Development of space tourism, new type of travel, development of space technologies (USA, EU, China)
Accelerated moving tourist tracks	Saving time, convenience for tourists, improving accessibility for people with disabilities (Japan, USA, EU, China)
Smart hotel rooms	The possibility of setting up the room according to the client's personal needs, ensuring maximum comfort (Japan, USA, China, France, Great Britain)
Interactive tourist maps	Convenience of finding the area and orientation in an unfamiliar place (USA, France, Great Britain, Italy)
Drones to shoot video from a height	A powerful means of marketing, attracting tourists to the area (New Zealand, Canada, Japan)
Smart bracelets and other devices for tracking the movement of tourists	Possibilities of tracking the route of tourists and analyzing their behavior to improve and optimize the tourist infrastructure (USA, Japan, China, France)
Virtual reality for tours	Opportunities to visit remote tourist destinations that may not be available in real life (USA, Japan, China, France)

Source: built by the authors based on the data [38].

The basis for the revival of the urban environment and citizen participation in the digitalization of tour operating business models is, first of all, big data – technologies for collecting, processing and storing structured and unstructured information arrays, which are characterized by a significant volume and speed of changes. A strategic approach in creating smart tour operating systems and expanding business in a certain destination is the use of artificial intelligence – a system that is able to perceive information with a certain degree of autonomy, learn and make decisions based on the analysis of large data sets [16], including imitating human behavior, distributed ledger technologies, quantum technologies, computer engineering, virtual and augmented reality technologies, and others [25].

The digital transformation of the tourism business can be considered through the prism of the features of the service sector, among which we can distinguish: smart destination, smart business, smart experience. The first concerns integration into the tourism infrastructure to ensure mobility, resource allocation and ensure a stable quality of life for residents and visitors [35]. The second refers to the digitization of business processes and the creation of a complex ecosystem with close public-private cooperation for the purpose of sharing resources and co-creating tourism experiences [38]. The third concerns the improvement and enrichment of the experience through the personalization of the provided services and the monitoring of business processes in real time [24]. For example, a digital platform of a general agent for the sale of tourist products and services (GSA Platform) based on ONLINEBISTRO has been created in the global universe to serve countries and regions [39]. GSA receives a 100% fully functional reservation system, including accounting tools, request processing functionality, and contracting functions. GSA earns revenue from sales of a variety of travel services and travel solutions (OBTS, White Label, B2B and B2C) as well as full marketing campaign support to promote search engine recognition and brand presence. GSA is 100% online operation under a trusted brand name, advertising and marketing, revenue from sales of travel services and technology, automatic ticketing, automatic cancellation, net price from more than 250 global suppliers, multilingual back office, online 24/7 order support, effective sales platform setup training (Fig. 9).



Source: GSA Platform [39]

Figure 9. Functionality of reservations on the GSA Platform

GSA Platform provides an opportunity to work both with a tourist and a B2B client. In order for the client to be able to buy a travel service on the platform, it is necessary to put a markup on each of the services located in the Back Office, connect a payment solution and add a public offer contract. All services in the system are 100% confirmed; therefore, after purchasing the service, the client is guaranteed to receive a document confirming the purchase of the service. Also, for working with B2C customers, the system has an Affiliate Program, which allows a large number of modules to be connected to the necessary Internet portals with a large traffic of potential leads [39].

GSA Platform provides an opportunity to work with B2B partners by direct connection to the client's site, as well as through sales channels OBTS Platform, White Label B2B & B2C Platform, B2C Platform, XML API. For each client, the OBTS Platform provides an opportunity to create a client group, markup, account manager, analytics and much more. The agent undergoes registration and, after its confirmation, gets access to the Back Office, where he can book with his margin, communicate with the client on each order, issue documents in his colors, logo, etc. (Fig. 10).

According to Eurostat data, 95 countries were selected for their ranking based on the signs of business activity in the digital environment of the tourism industry [40]. According to the

Source: GSA Platform [39]

Figure 10. Interaction content GSA Platform with customers through sales channels OBTS Platform, White Label B2B & B2C Platform, B2C Platform, XML API

method of expert evaluations, specialists of tourism companies expanded the algorithm for calculating the Business Digitization Index in the tourism industry through important indicators and their limiting criteria, which in the conditions of global smartization determine: the level of the country's GDP per person; the level of online income from digitalization of business in the country's tourism industry (total volume); the level of online income from digitalization of business in the country's tourism industry (in % of the total volume of exports); the level of online spending on tourism (total volume); the level of arrival of tourists to the country; the level of digitization of the country's tourist destination (in % of the population) (Fig. 11).

Digital inclusion of the tourism business in the context of global smartization depends on the dynamics of tourism services in various macro-regions, the development of digital technologies, and social and demographic factors. This allowed us, on the basis of a set of common features revealed through qualitative and quantitative factor analysis, to distinguish groups of clusters of countries according to the level of digitization of their economy in the structure of global smartization and to determine their position according to the level of user information in smart-systems tour operating. Five main groups of countries with different Business Digitization Index in the tourism industry were formed. Thus, according to the above criteria (Fig. 11), the countries were divided into conditional clusters (Tab. 2).

Examining the structure of macro-regions with different types of business activity and the level of information of users of smart-systems tour operating via the Internet revealed that 50% of them are occupied by "Highly developed countries of digital tourism services (HDDTS)", 30% by "Countries that export digital tourism services (EDTS)" (Fig. 12). Such a regularity testifies to the significant impact of global smartization and inclusiveness of tourist services, income generation and its contribution to the GDP of the countries of the world.

Considering the rate of increase in the level of smartization in terms of macro-regions of the world, it should be noted that in terms of the number of mobile smartphone users in the world, the largest volume belongs to the countries of Asia and Oceania. This is due to the high population density in this tourist destination. In the countries of European integration development, the annual increase in the level of smartization in 2025 compared to 2024 will increase from 107.3% to 127.8%, which demonstrates the positive dynamics of the use of innovative smart technologies in the states. In 2026, it will increase by another 1.5 times, and will gradually increase (on average by 6.3%). In this macro-region, on average, the number of mobile smartphones per 100 households will be equal to 152.4 units (this group includes Ukraine); by 2028, their increase to 172.6 smartphones is predicted. European countries are in the second place by indicator, African countries are in the last place (Fig. 13).

Criteria for assessing business activity and digital inclusion of the tourism industry in the context of global smartization

The level of GDP per person, thousands USD	
Low GDP	to 1.035
GDP is lower than average	1.036-4.085
GDP is higher than average	4.086-12.615
High GDP	over 12.616

The level of online income from digitalization of business in the country's tourism industry (total volume), billion USD	
Low level	to 6.156
Average level	6.156-12.313
High level	12.314-18.471
TOP-15	over 18.472

The level of online income from digitalization of business in the country's tourism industry (in % of the total volume of exports), %	
Low level	to 6
Average level	6-16
High level	17-40
TOP-15	over 40

Level of online spending on tourism (total volume), billion USD	
Low level	to 0.400
Average level	0.400-6.0
High level	6.0-90.0
TOP-15	over 90.0

The level of tourist arrivals to the country (total volume), million people	
Low level	to 3.719
Average level	3.719-7.418
High level	7.418-15.518
TOP-15	over 15.518

The level of digitization of the country's tourist destination (in % of the population), %	
Low level	to 25
Average level	25-50
High level	50-75
TOP-15	over 75

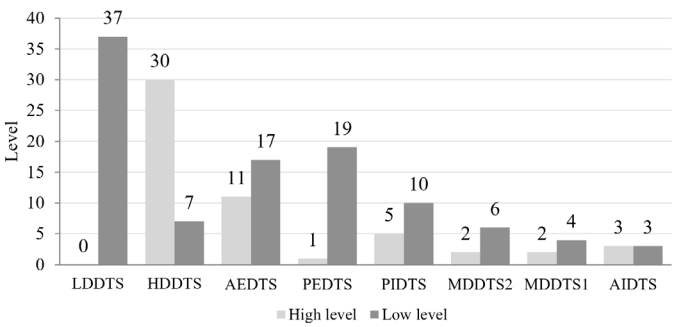
Source: built by the authors from the data [2, 3, 40].

Figure 11. Criteria for assessing world business activity in the digital tourism industry

Table 2. Global smartization of countries' economies according to the IDI of business in the tourism industry

No.	Country's level of digitalization of tourism business		Description
1	Countries exporting digital tourism services (EDTS) (a high level of tourist arrivals)	Passive exporting countries (REDTS) (dependent on the digital economy)	The income level of countries is low or below average; there is dependence on the provision of services to tourists from the smart city; vacation in cheap countries (Central American countries, Africa, Asia and Oceania).
		Active exporting countries (AEDTS) (independent of the digital economy)	The income level of countries is high or above average; countries have elite resorts, smart cities for the travel of tourists with a high or average level of wealth; stability of the economy; the incomes of citizens of these countries depend on the volume of tourists; the cost of recreation is moderately high (Middle Eastern countries).
2	Highly developed countries of digital tourism services (HDDTS) (high level of the tourism industry in the digital economy)		Countries with a high level of total revenue in GDP from tourism; the level of dependence of states on the provision of tourism services is quite low; countries of this type have a high level of activity in the digitalization of tour services; the cost of recreation is quite high (European and North American countries with a high level of user information in the smart-system tour operating).
3	Countries importing digital travel services (IDTS) (stage of development of "Industry 3.0")	Passive importing countries (RIDTS) (independent of the digital economy)	Countries are inactive in the tourism business; the level of revenue from tourism services to GDP is low; countries are independent from travel companies, the level of user information in the smart-system tour operating does not affect the economy of countries (Algeria, Angora, Argentina, Botswana, Ecuador, Gabon, Iraq, Kuwait, Libya, Nigeria, Norway, Oman, Venezuela).
		Active importing countries (AIDTS) (oriented to the digital economy)	In the countries receiving income from digitalization of the tourism industry, business is at an average level; in the structure of total revenues, the tourism industry occupies a small share in the country's GDP; tourism business is quite developed (Brazil, Colombia, Qatar, Saudi Arabia, Syrian Arab Republic, UAE).
4	Countries of European integration development of digital tourism services (MDDTS) (passive participants in the development of the tourism industry in the digital economy)		"The first group of countries of European integration development MDDTS1" – Kazakhstan, Macedonia, Tajikistan, Turkmenistan, Uzbekistan. "The second group of countries of European integration development MDDTS2" – Armenia, Azerbaijan, Georgia, Bosnia and Herzegovina, Kyrgyzstan, Moldova, Serbia, Ukraine. Countries are in the process of transforming a traditional economy into a digital one; tourist infrastructure and the level of user information in the smart tour operating system at the stage of development.
5	Least Developed Countries Digital Tourism Services (LDDTS) (inactive participants in the development of the tourism industry in the digital economy)		Low-income countries; there is no tourism business activity; lack of export-import of tourist services, the level of user information in the smart-system tour operating is low (Benin, Bolivia, Cameroon, Cuba Lesotho, Madagascar, Mozambique, Pakistan, Paraguay, Sierra Leone, Yemen, Zambia, Zimbabwe).

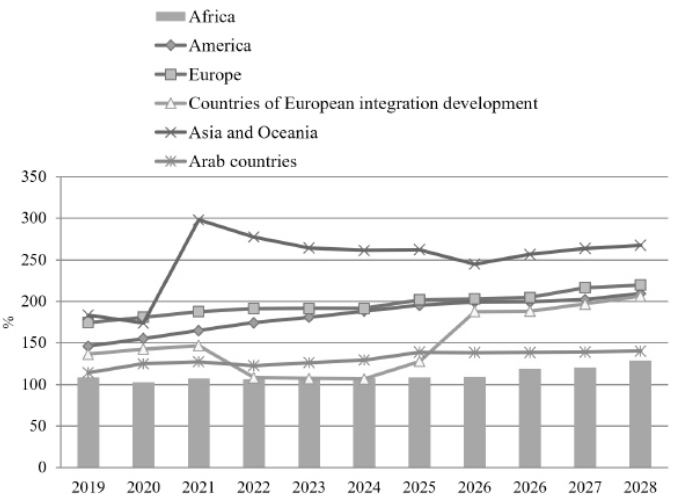
Source: built by the authors based on data [40, 41].



Source: built by the authors from the data [40].

Figure 12. The level of informatization of users of smart-systems tour operating

In order to identify the degree of relationship between business activity in the digital environment of the tourism industry of the world and the penetration of global smartization into it, a correlation analysis was conducted according to the above indicators in Figure 9. At the same time, the indicator of the average amount of profit (economic effect) from the digitalization of business in the tourism industry (total volume) was used as the outcome variable (Y). Regression analysis of indicators was



Source: built by the authors from the data [40].

Figure 13. The growth rates of smartization in countries with different types of tourism business activity in 2019-2023 and the forecast for 2024-2028

carried out for each of the clusters of countries analyzed above. The multivariate regression equation for clusters is as follows:
1. Passive countries exporting digital tourism services (EDTS) (3)

$$Y = -19787 + 833x_1 - 95.7x_2 - 0.047x_3 + 42.7x_4 + 3.55x_5 + 0.393x_6$$

2. Active countries exporting digital tourism services (AEDTS) (4)

$$Y = -45739 + 2873x_1 - 295.8x_2 + 1.78x_3 + 27.4x_4 + 7.14x_5 + 0.523x_6$$

3. Highly developed countries of digital tourism services (HDDTS) (5)

$$Y = 85314 - 300.8x_1 + 105.3x_2 - 0.034x_3 + 37.4x_4 + 17.52x_5 + 0.681x_6$$

4. Passive countries importing digital tourism services (RDTS) (6)

$$Y = 4316 - 108x_1 - 36x_2 + 0.234x_3 + 1.48x_4 + 3.84x_5 + 0.428x_6$$

5. Active countries importing digital tourism services (AIDTS) (7)

$$Y = -154 + 158x_1 - 16x_2 - 0.204x_3 + 2.437x_4 + 9.47x_5 + 0.638x_6$$

6. The first group of countries of the European integration development of digital tourism services ($MDDTS_1$) (8)

$$Y = -154 + 158x_1 - 16x_2 - 0.204x_3 + 2.437x_4 + 8.96x_5 + 0.668x_6$$

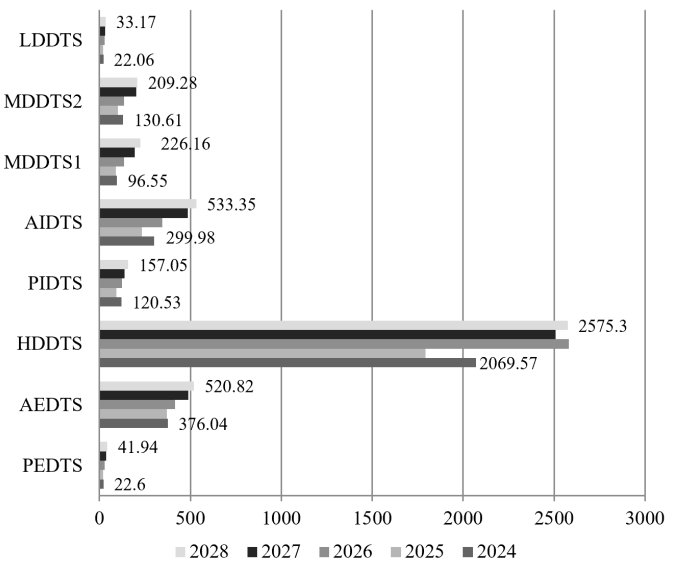
7. The second group of countries of the European integration development of digital tourism services ($MDDTS_2$) (9)

$$Y = -674 + 77.4x_1 - 8.17x_2 + 0.163x_3 + 3.162x_4 + 10.44x_5 + 0.703x_6$$

8. Least Developed Countries of Digital Tourism Services (LDDTS) (10)

$$Y = -1971 - 537.4x_1 - 10.47x_2 + 0.263x_3 + 1.562x_4 + 2.94x_5 + 0.225x_6$$

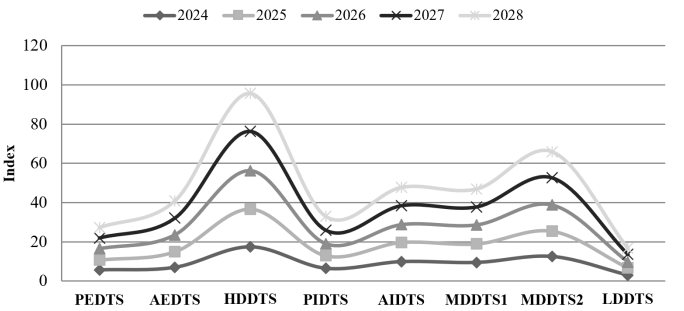
Based on the calculations, the estimated volume of the economic effect (profit) from digitalization of business in the tourism industry by clusters of macro-regions (countries of the world) in the period 2024-2028 was determined (Fig. 14).



Source: built by the authors from the data [40].

Figure 14. Hierarchy of formation of the average amount of profit from digitalization of business in the macro-regions of the tourism industry for 2024-2028, million USD (forecast)

Based on the calculation of indices based on the above indicators, the integral index of digitalization of business in the tourism industry was determined on average for 2024-2028 (Fig. 15).



Source: built by the authors from the data [40].

Figure 14. Hierarchy of formation of the average amount of profit from digitalization of business in the macro-regions of the tourism industry for 2024-2028, million USD (forecast)

Therefore, during 2024-2028, the level of digital inclusion of the tourism business in macro-regions with a passive and active type of development of the exporting countries will be within the range of 5.01-5.76 and 7.04-8.19, which characterizes for the first group a high level of dependence of tourist services on the digital economy, for others – a low level of dependence of tourist services on the digital environment. The level of inclusion of tourism business in highly developed countries with digital tourism services will be in the range of 17.57-19.97.

Reducing the digital gap between residents of urban and rural settlements will make it possible to significantly popularize the digitization of macro-regions and increase the level of digital literacy of society. During the studied period, a partial change in the goals of access to travel services via the Internet is predicted in some countries. If at first the Internet was used by users mainly for sending (receiving) e-mail, browsing the websites of travel companies, tour operators, then Internet banking, digital services for booking vacation tours, tourist activities will become more popular at the end of the analyzed forecast period.

Conclusions

The research proved that the digital transformation of the tourism industry is an effective driver of the global economy's post-pandemic recovery. The transition to smart cities promotes tourism by improving infrastructure, mobility, and personalized experiences, thereby attracting more tourists and increasing investment appeal. This digital transformation supports economic diversification, generates higher revenues, and raises GDP contributions.

As online bookings dominate the market, projected to account for 74% of industry revenues by 2026, smartization is changing tourism into a highly digitized sector. This smartization-driven shift in the tourism business boosts efficiency, broadens market access, and enhances customer experiences. The sector's recovery, with international arrivals expected to surpass 2019 levels in 2025, will increase revenues and economic resilience.

Asia-Pacific, particularly China, is emerging as a leader in tourism spending, reshaping global market dynamics and influencing future growth trends. This regional shift underscores the sector's ability to adapt to changing consumer behaviors, driven by digital innovations. The post-pandemic surge in tourism

activity also reflects growing consumer confidence and stronger global connectivity, positioning tourism as a cornerstone of broader economic recovery and sustainable development in the coming years.

Thus, the conducted research provides the following theoretical and practical implications. As for the theoretical implications, this study enriches the theoretical understanding of global smartization by analyzing its impact on the tourism sector specifically. A developed three-dimensional framework for digital technology integration provides a unique criterion-based perspective on smartization in macro-regional tourism economies. Furthermore, the developed framework can be adapted for analyzing digital integration in other service sectors. It emphasizes the importance of clustering countries based on smartization levels, thus enabling more targeted and region-specific studies in digital transformation. The study advances theoretical discussions on digital tourism by detailing how big data, artificial intelligence, and emerging technologies like blockchain and quantum computing can serve as foundational elements in creating smart tourism ecosystems. This expands theoretical knowledge on how digital tools interact with traditional business models.

Considering practical implications, the study offers tourism stakeholders actionable metrics for evaluating their own digital integration levels by presenting specific criteria for assessing digital readiness and business activity. The findings outline how tourism businesses can evolve towards "smart" destinations and personalized experiences, emphasizing how digital inclusion can improve resource allocation, quality of life, and visitor satisfaction. The clustering of countries based on smartization levels allows governments and industry leaders to tailor their digital strategies more effectively. The study's framework suggests differentiated approaches for countries with high vs. low digital dependence in tourism, providing clear direction for decision-makers in diverse economic and technological environments. Practically, the study underscores the need to bridge the urban-rural digital divide to boost tourism sector digitization in underdeveloped regions. By encouraging digital literacy and infrastructure expansion, the findings offer a roadmap for fostering inclusive digital growth in tourism.

While the study explores multiple digital tools, its analysis is limited regarding certain emerging technologies like blockchain and quantum computing. Future studies could focus on these technologies individually to offer more comprehensive insights into their specific applications within the tourism industry. The second limitation lies in the predictions regarding digital inclusion rates from 2024-2028 that rely on the data, which could be impacted by unforeseen technological, economic, or political changes. This reliance on projections introduces uncertainty, as actual developments in digital adoption may differ from the estimates. While profitability is a primary focus, other potential impacts of digitalization, such as environmental effects and social equity concerns, receive less emphasis, which is the third limitation of this study. This narrowed focus on economic outcomes limits the study's broader applicability in discussions on sustainable tourism.

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