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DIGITALIZATION OF THE MANAGEMENT OF TOURIST ROUTE NETWORKS AND THE QUALITY MANAGEMENT OF TOURISM AND HOSPITALITY SERVICES

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ЦИФРОВІЗАЦІЯ УПРАВЛІННЯ МАРШРУТНИМИ ТУРИСТИЧНИМИ МЕРЕЖАМИ ТА МЕНЕДЖМЕНТУ ЯКОСТІ ТУРИСТИЧНИХ ТА ГОТЕЛЬНО-РЕСТОРАННИХ ПОСЛУГ

In the current context of the development of the tourism and hospitality industries, digitalization serves as a key factor in enhancing management efficiency and ensuring the competitiveness of their stakeholders. Information technologies significantly transform the processes of organizing tourist routes, allowing for the optimization of logistics, the improvement of service quality, and the personalization of the tourism product. At the same time, digital tools provide integrated quality management in the hospitality sector, supporting the monitoring of service standards, the analysis of customer feedback, and prompt responses to changes in demand.

The purpose of this article is to analyze modern digital technologies in tourism and hospitality management and to determine their impact on improving customer service quality and the efficiency of route network management. The contemporary tourism industry is actively integrating digital solutions, including systems for managing tourist flows and routes, service quality control platforms, mobile services for tourists, big data analytics and artificial intelligence, the Internet of Things and smart technologies, virtual and augmented reality, as well as the integration of services into unified systems of planning, booking, and monitoring. The authors demonstrate that the implementation of such

technologies fosters the formation of flexible, customer-oriented, and competitive management models in the tourism and hospitality industries. It is also proven that digital technologies play a crucial role in managing tourist route networks, which are considered organized systems of routes with related transport services and infrastructure that ensure the movement of tourists between objects, locations, and regions. Digitalization enables the transition to remote management and the integration of transport, information, and service infrastructures. Future research prospects lie in examining the impact of integrating the latest digital technologies on the efficiency of managing tourist route networks and on improving the quality of tourism and hospitality services.

У сучасних умовах розвитку туристичної та готельно-ресторанної сфер цифровізація є ключовим чинником підвищення ефективності управління та забезпечення конкурентоспроможності їхніх суб'єктів. Інформаційні технології суттєво трансформують процеси організації туристичних маршрутів, дозволяючи оптимізувати логістику, підвищувати якість обслуговування та персоналізувати туристичний продукт. Паралельно цифрові інструменти забезпечують інтегрований менеджмент якості у готельно-ресторанному бізнесі, сприяючи моніторингу стандартів сервісу, аналізу клієнтських відгуків та оперативному реагуванню на зміни попиту. Відтак метою статті є аналіз сучасних цифрових технологій у сфері туристичного та готельно-ресторанного менеджменту та визначення їхнього впливу на підвищення якості обслуговування клієнтів і ефективності управління маршрутними мережами. Сучасна туристична індустрія активно інтегрує цифрові рішення, серед яких системи управління туристичними потоками та маршрутами, платформи контролю якості послуг, мобільні сервіси для туристів, аналітика великих даних і штучний інтелект, інтернет речей і смарт-технології, віртуальна й доповнена реальність, а також інтеграція сервісів у єдині системи планування, бронювання та моніторингу. Доведено, що впровадження таких технологій сприяє формуванню гнучких, клієнтоорієнтованих і конкурентоспроможних моделей управління у туристичній та готельно-ресторанній сферах. Доведено, що цифрові технології відіграють ключову роль в управлінні маршрутними туристичними мережами, які розглядаються як організовані системи туристичних маршрутів із пов'язаними транспортними послугами та інфраструктурою для забезпечення переміщення туристів між об'єктами, локаціями та регіонами. Завдяки цифровізації відбувається перехід до дистанційного управління та інтеграції транспортної, інформаційної та сервісної інфраструктури. Перспективи подальших досліджень полягають у вивченні впливу інтеграції новітніх цифрових технологій на ефективність управління маршрутними туристичними мережами та підвищення якості туристичних і готельно-ресторанних послуг.

Key words: customer service quality; route networks; tourism; transport services; transport; service networks; tourism and hospitality services.

Ключові слова: якість обслуговування клієнтів; маршрутні мережі; туризм; транспортні послуги; транспорт; сервісними мережі; туристичні та готельно-ресторанні послуги.

PROBLEM STATEMENT

In the modern context of the development of the tourism and hospitality industries, digitalization has become a key factor in enhancing management efficiency and ensuring the competitiveness of their stakeholders. Information technologies significantly transform the processes of organizing tourist routes, enabling the optimization of logistics, the improvement of service quality, and the personalization of tourism products. At the same time, digital tools contribute to integrated quality management in the hospitality sector by ensuring the monitoring of service standards, analyzing customer feedback, and promptly responding to changes in demand.

The scientific study of the problems associated with digitalizing the management of tourist route networks and service quality management has practical significance, as it enables the improvement of tourism companies' efficiency, ensures

the comfort and satisfaction of tourists' needs, and stimulates the development of regional infrastructure. Particular attention is given to the use of modern digital platforms, mobile applications, and data management systems that enable the integration of information flows, route planning, and real-time quality control of services.

Thus, the relevance of this research is determined not only by the general trend of economic digitalization but also by the necessity for the tourism industry to adapt to constantly changing market conditions, increase consumer satisfaction, and implement innovative approaches to managing tourism and hospitality networks.

ANALYSIS OF RESEARCH AND PUBLICATIONS

The problems of applying modern digital technologies in the field of tourism management have been studied by such researchers as Gavri-

Table 1. Main areas of modern digital technology use in tourism and hospitality management

Areas of digital technology use	Specifics of Digitalization in Tourism Management	Significance for tourism management
Systems for managing tourist flows and routes	Use of Geographic Information Systems (GIS) and specialized platforms	Allows planning of routes, analyzing the occupancy of tourist sites, and optimizing logistics.
Platforms for service quality management	Use of CRM systems, online surveys, and analytical tools	Enables assessing customer satisfaction levels, monitoring service standards, and responding promptly to changes in demand.
Mobile technologies and digital services for tourists	Use of digital tools that allow tourists and tourism companies to perform various operations via smartphones, tablets, or computers online	Provide tourists with the ability to book tickets, hotels, and excursions in real time, and offer interactive maps and personalized recommendations
Big Data analytics and artificial intelligence (AI)	Use of analytics tools in combination with AI solutions	Ensures personalization of tourism offerings, automation of services, creation of optimal routes, and managerial decision-making based on data analytics.
Internet of Things (IoT) and smart technologies in the hospitality sector	Technologies that enable connection and automated management of physical objects and devices via the Internet, collect real-time data, and optimize the operations of tourism enterprises.	Allows automation of hotel and restaurant resource management, monitoring of energy consumption, security, room conditions, and kitchen equipment.
Virtual and augmented reality (VR/AR)	Digital technologies that create new ways for users to interact with information and objects.	Facilitates the creation of virtual tours of tourist sites, museums, and resort areas, as well as interactive familiarization with company services.
Integration of all services into a unified system	Use of modern digital platforms that integrate different areas of a company's activity into a single ecosystem.	Enables the integration of route planning, booking, resource management, and service quality monitoring within a single ecosystem.

Source: compiled based on [1; 3; 6].

lyuk S., Sokol T., Miho O., Khoroshenyuk A. [1], Maslyhan O.O., Tereshchuk O.S., Kizyun A.H., and Hutsol A.V. [2]. In particular, they examined issues related to the effectiveness of implementing digital solutions in the tourism and hospitality sectors, challenges in adapting personnel to new technologies, the integration of various information systems, improving service quality, and managing tourist flows.

These scholars also highlighted the impact of digitalization on the competitiveness of tourism and hospitality enterprises and regions, as well as the need to ensure data security and transparency of business processes in the digital environment.

At the same time, the analysis of modern digital technologies in the field of tourism and hospitality management remains rather fragmented, including in terms of determining their impact on service quality and the efficiency of route network management.

FORMULATION OF THE ARTICLE'S OBJECTIVES

This article aims to analyze modern digital technologies in the field of tourism and hospitality management and to determine their impact on improving customer service quality and the efficiency of route network management.

THE PAPER MAIN BODY

Modern digital technologies in the field of tourism and hospitality management began to be gradually implemented from the late 1990s to the early 2000s, when the development of the Internet and information technologies became accessible to a wide range of enterprises.

In particular, the 1990s were marked by the emergence of online booking and websites for tourism and hospitality companies; the 2000s saw the integration of CRM systems and the rise of

mobile solutions; the 2010s witnessed the mass digitalization of business processes and the use of Big Data; and the 2020s have seen the implementation of AI, IoT, VR/AR, and smart solutions.

Currently, the tourism industry continues to actively integrate digital technologies that enhance management efficiency, optimize routes, and ensure a high level of service. Among such technologies are digital platforms for the comprehensive management of tourist routes and service networks.

In practice, the main areas of modern digital technology use in tourism and hospitality management include (see Table 1): systems for managing tourist flows and routes; platforms for service quality management; mobile technologies and digital services for tourists; Big Data analytics and artificial intelligence (AI); the Internet of Things (IoT) and smart technologies in the hospitality sector; virtual and augmented reality (VR/AR); and the integration of all services into a unified system for route planning, booking, resource management, and service quality monitoring.

So, systems for managing tourist flows and routes, such as GIS platforms (ArcGIS, QGIS), online tourism services (Google Maps, TripAdvisor, Rome2Rio), and specialized solutions for planning routes for tourism companies, make it possible to ensure tourist comfort, reduce congestion on popular routes, and efficiently allocate resources within tourism infrastructure.

Service quality management platforms, including CRM systems such as Salesforce, Zoho CRM, HubSpot, as well as specialized platforms for the hospitality sector (Opera PMS, Mews, Hotelogix), provide monitoring of service standards, analysis of customer feedback, and prompt response to issues. This allows for improving service quality and building a loyal customer base [4].

Mobile applications and online services, such as Booking.com, Airbnb, Skyscanner, and TripIt, enable feedback and quickly resolve organizational issues during travel.

Analytics tools, such as SAS, Tableau, and Microsoft Power BI, combined with AI solutions (IBM Watson, Google AI, Salesforce Einstein), allow for forecasting tourist demand, personalizing offers, automating service, and making management decisions based on the analysis of large datasets.

IoT solutions, such as Smart Room Solutions, Honeywell IoT, and Siemens Smart Build-

Table 2. Digital technologies affecting the management of tourist route networks

Direction of digital technology impact	Features of application	Impact on the management of tourist route networks
Provide route planning	Through the use of Geographic Information Systems (GIS), interactive maps, and online booking platforms (Google Maps, Rome2Rio, Amadeus)	Enables the creation of individual and group routes, combining different modes of transport, taking into account the load of attractions and travel time.
Provide monitoring of tourist flows	Through the use of mobile applications, IoT sensors, GPS tracking, and big data analytics	Enables real-time tracking of tourist movements, analyzing location attendance, and forecasting demand for specific routes.
Carry out real-time logistics optimization	Through automatic route adjustment tools, routes are adapted to external conditions*	Enables the integration of transport systems and the use of artificial intelligence algorithms for rapid decision-making.

Note
* such as weather factors, traffic, and the occupancy level of tourist attractions.

Source: compiled based on [4–6].

ding, enable automated resource management, monitoring of energy consumption, security, and the condition of rooms and kitchen equipment. Smart technologies enhance customer comfort and optimize operational costs [5].

Virtual and Augmented Reality (VR/AR). Platforms and applications such as Google Earth VR, Oculus VR Tours, and ARKit/ARCore for mobile apps are used to create virtual tours of tourist sites, provide interactive familiarization with services, and enhance the appeal of tourism products.

Modern digital platforms, such as Oracle Hospitality, SAP Concur, and Amadeus IT Group, enable the integration of route planning, booking, resource management, and service quality monitoring. This ensures efficient management of tourism operations, prompt response to changes in demand, and a high level of personalized customer service.

Digital technologies play a key role in managing route-based tourism networks, which are understood as organized systems of tourist routes and associated transportation systems, transport services, and infrastructure that facilitate the movement of tourists between different sites, locations, or regions. Digitalization enables a shift toward remote integration of [6; 3]:

— Transport infrastructure — encompassing transportation systems and vehicles, GPS

navigation, online public and private transport services, as well as traffic management systems;

— Information infrastructure — including geoinformation systems, interactive maps, online booking platforms, mobile applications, and cloud services for data exchange;

— Service infrastructure — such as geoinformation systems, digital quality management platforms, CRM systems, mobile apps for tourist communication, and review and rating systems.

The implementation of digital technologies contributes to the formation of unified intelligent systems that [3; 5—6]:

— Plan routes while taking into account site occupancy, different modes of transport, and optimal travel times.

— Monitor tourist flows in real time to forecast demand and regulate route congestion.

— Perform operational logistics optimization, automatically adjusting routes based on external factors such as traffic, weather conditions, or the popularity of tourist sites.

The outlined features (see Table 2) not only enhance the tourist experience through convenience, personalization, and access to up-to-date real-time information, but also increase the competitiveness of tourist regions and companies by enabling efficient resource utilization, reducing operational costs, and improving customer satisfaction.

Thus, digitalization has transformed the management of tourist route networks from a traditional, static model into an innovative, flexible, and customer-oriented system that meets the challenges of the modern tourism market.

Digital technologies play a key role in the remote management of the quality of tourism and hospitality services.

The application enables continuous monitoring of service standards, improves service personalization and adaptability, and ensures transparency in client interactions. In fact, their implementation contributes to the formation of integrated intelligent systems that [2; 6—7]:

— Provide automated quality control, taking into account service standards, safety requirements, internal procedures, and customer feedback data.

Table 3. Digital technologies affecting the management of quality in tourism and hospitality services

Direction of digital technologies' impact	Features of application	Impact on the management of quality in tourism and hospitality services
automated quality control	through CRM systems, PMS, and digital platforms for managing customer feedback.	Systematic monitoring of service standards, reduction of errors, and faster response times
support service personalization	through big data analysis and the use of artificial intelligence algorithms	Increased tourist satisfaction and loyalty, adaptation of services to individual needs
optimization of internal business processes	through the implementation of IoT and smart technologies in hotels and restaurants (e.g., "smart room" systems, automated resource accounting, energy consumption control)	Cost optimization, enhanced customer comfort, and environmentally friendly business practices.
interactive communication with clients	through mobile applications, chatbots, digital concierge services, and online platforms	Convenience and accessibility of services 24/7, improved communication with clients
reputation management	through digital review management platforms (TripAdvisor, Booking.com, TrustYou), which influence customer trust and the competitiveness of establishments	Building a positive image, enhancing the competitiveness of the establishment.

Source: compiled based on [1—2; 6—7].

— Support service personalization to create offers for tourism clients based on the analysis of their needs, preferences, and history of previous bookings.

— Optimize internal business processes, considering resource availability, staff workload, service levels, and the current operational performance of the establishment.

— Ensure interactive communication with clients, taking into account their requests, booking history, preferences, and real-time feedback.

— Build a positive online reputation through digital platforms that influence customer trust and the competitiveness of establishments.

The details outlined in Table 3 help to enhance service quality and create a positive customer experience. They enable companies in the tourism and hospitality sector to use resources efficiently, reduce costs, ensure transparency in business processes, and strengthen their competitive position in the market.

Digital technologies have significantly transformed the management of quality in tourism and hospitality services, enabling a shift from traditional, manual control methods to intelligent management systems.

CONCLUSIONS

The modern tourism industry is actively integrating digital technologies, which allows for increased management efficiency, optimized routes, and a high level of service. The main directions of digitalization include tourist flow and route management systems, service quality management platforms, mobile services for tourists, big data analytics and artificial intelligence, and the Internet of

Things and smart technologies, virtual and augmented reality, as well as the integration of all services into unified planning, booking, and monitoring systems.

It has been demonstrated that the implementation of such technologies contributes to the formation of flexible, customer-oriented, and competitive management models in the tourism and hospitality sectors.

Digital technologies have been shown to play a key role in the management of tourist route networks, which are considered organized systems of tourist routes with associated transport services and infrastructure to ensure the movement of tourists between sites, locations, and regions. Thanks to digitalization, there is a shift toward remote management and the integration of transport, information, and service infrastructure.

Future research prospects lie in studying the impact of integrating the latest digital technologies on the efficiency of managing tourist route networks and on improving the quality of tourism and hospitality services.

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