

*H. Mashika,
Doctor of Geography, Professor, Head of the Department of Tourism,
SHEI "Uzhgorod National University"
ORCID ID: <https://orcid.org/0000-0001-6063-5823>*

DOI: 10.32702/2306-6814.2026.1.12

IMPLEMENTATION OF SMART TECHNOLOGIES IN REGIONAL TOURISM SYSTEMS

Г. В. Машіка,
д. геогр. н., професор, завідувач кафедри туризму, ДВНЗ "Ужгородський національний університет"

ВПРОВАДЖЕННЯ SMART-ТЕХНОЛОГІЙ У РЕГІОНАЛЬНІ ТУРИСТИЧНІ СИСТЕМИ

The contemporary development of the economy is characterised by rapid digitalisation and the widespread adoption of innovative technologies across various sectors. The tourism industry is no exception, as increasing competition among tourist destinations, changing consumer behaviour, and growing demands for service quality necessitate the application of new managerial and technological approaches. In this context, the implementation of smart technologies within the operational and developmental environment of regional tourism systems has gained particular importance. The aim of this article is to examine the features and directions of implementing smart technologies in regional tourism systems, as well as to determine their impact on enhancing the competitiveness of tourist regions. The results of the study demonstrate that the adoption of smart technologies in regional tourism systems is one of the key factors driving their modernisation in the context of the digital transformation of the economy. It has been established that smart solutions facilitate the integration of tourism resources, infrastructure, tourism stakeholders, and governance bodies into a unified information space, thereby improving the efficiency of regional tourism systems. The implementation of smart technologies transforms the traditional model of regional tourism, shifting it from fragmented management towards an integrated system based on digital solutions, interaction among tourism market participants, and the exchange of information flows within a shared digital environment. A smart tourism system is characterised by several key features, including network-based governance, a data-driven approach, and customer-centricity. Additional characteristics of smart regional tourism systems include adaptability and flexibility. The combined effect of these features contributes to enhanced competitiveness of regional tourism systems in the digital economy. The identified characteristics indicate that the implementation of smart technologies in regional tourism systems occurs across several interrelated directions, encompassing managerial, infrastructural, informational, and socio-economic aspects of their functioning. The key directions of such implementation include tourism management and development planning systems, tourism infrastructure management systems, systems for managing the production of tourism products and services, human capital and competency management systems, as well as systems for developing institutional and partnership mechanisms.

Сучасний розвиток економіки характеризується стрімкою цифровізацією та широким впровадженням інноваційних технологій у різні сфери господарювання. Не винятком є і туристична галузь, адже зростання конкуренції між туристичними територіями, зміна поведінки споживачів та підвищення вимог до якості туристичних послуг зумовлюють необхідність застосування нових управлінських та технологічних підходів. У цьому контексті особливого значення набуває впровадження Smart-технологій у середовище функціонування та розвитку регіональних туристичних систем. Метою статті є дослідження особливостей і напрямів упровадження Smart-технологій у регіональні туристичні системи, а також визначення їх впливу на підвищення конкурентоспроможності туристичних регіонів. У результаті проведеного дослідження встановлено, що впровадження Smart-технологій у регіональні туристичні системи є одним із ключових чинників їх модернізації в умовах цифрової трансформації економіки. Констатовано Smart-рішення забезпечують інтеграцію туристичних ресурсів, інфраструктури, суб'єктів туристичної діяльності та органів управління в єдиний інформаційний простір, що сприяє підвищенню ефективності функціонування регіональних туристичних систем. Впровадження Smart-технологій змінює традиційну модель регіонального туризму, переводячи її від фрагментованого управління до інтегрованої системи, що функціонує на основі цифрових рішень, взаємодії учасників туристичного ринку та обміну інформаційними потоками у єдиному цифровому просторі. Система Smart-туризму характеризується кількома ключовими ознаками, серед яких: мережева організація управління, орієнтація на дані та клієнтоцентричність. Додатковими характеристиками Smart-систем регіонального туризму є адаптивність і гнучкість. Встановлено, що сукупність цих ознак сприяє підвищенню конкурентоспроможності регіональної туристичної системи в умовах цифрової економіки. Визначені характеристики свідчать про те, що впровадження Smart-технологій у регіональні туристичні системи здійснюється за кількома взаємопов'язаними напрямками, що охоплюють управлінські, інфраструктурні, інформаційні та соціально-економічні аспекти їх функціонування. Ключовими напрямками такого впровадження є системи управління та планування розвитку туризму, системи управління туристичною інфраструктурою, системи управління виробництвом туристичних продуктів і послуг, системи управління людським капіталом і компетентностями, а також системи розвитку інституційних і партнерських механізмів.

Key words: regional tourism systems; innovative technologies; digitalisation; competitiveness; tourism services; smart technologies.

Ключові слова: регіональні туристичні системи; інноваційні технології; цифровізація; конкурентоспроможність; туристичні послуги; Smart-технології.

PROBLEM STATEMENT

The modern development of the economy is characterised by rapid digitalisation and the widespread adoption of innovative technologies across various sectors. The tourism industry is no exception, as rising competition between tourist destinations, changes in consumer behaviour, and increasing demands for high-quality services necessitate the application of new managerial and technological approaches. In this context, the introduction of smart technologies into the functioning and development of regional tourism systems becomes particularly important.

Exact, universally agreed-upon statistics on the percentage of regional tourism entities that have specifically implemented smart technologies are currently not

available in global public sources as a single consolidated figure. However, there is data on the overall level of digital transformation in the tourism sector, which can serve as a representative indicator of the scale of digital innovation adoption (including smart technologies). For instance, 76% of tourism companies consider digital transformation essential for gaining a competitive advantage, indicating a significant proportion of businesses that have already implemented or plan to implement digital solutions in their operations. Approximately 70% of companies view digital innovation as a priority in strategic planning, while 80% of market operators are increasing investments in digital infrastructure (which includes smart technologies). Around 66—76% of tourism businesses have adopted various digital solutions (such as digital marketing, data analytics,

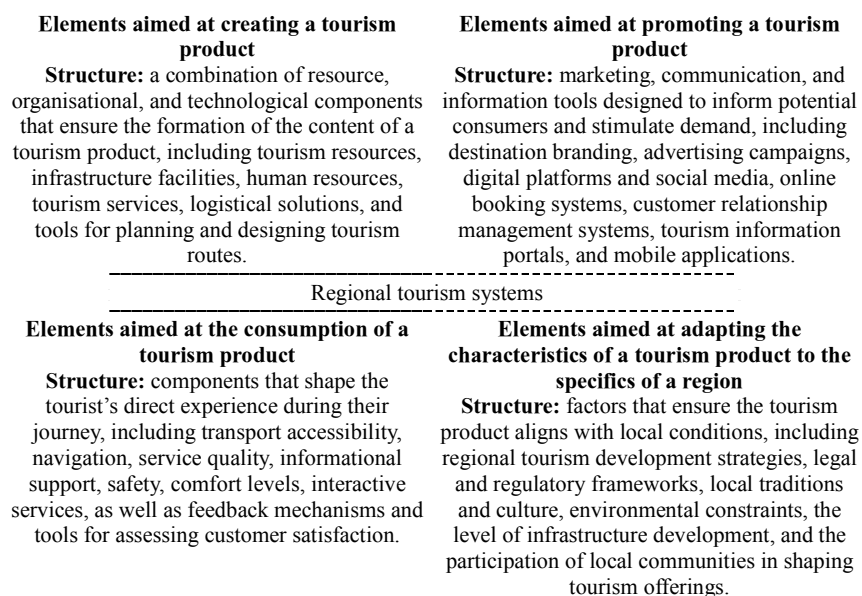


Figure 1. Structural characteristics of a regional tourism system

Source: created by the authors based on [1; 4; 6—7].

service automation, etc.), reflecting active digital transformation.

Although these figures are not specifically "about smart technologies in regional tourism systems," they provide a rough picture of the level of digitalisation and innovative activity among key players in the tourism sector. They indicate that a substantial portion of tourism enterprises are already implementing or planning to implement digital solutions, creating favourable conditions for the wider adoption of smart technologies within regional tourism systems.

Thus, the implementation of smart technologies in regional tourism systems contributes to more efficient management of tourist flows, improved service quality, increased investment attractiveness of regions, and the sustainable development of territories.

ANALYSIS OF RESEARCH AND PUBLICATIONS

Recent research and publications on the adaptation of regional tourism systems to digital transformation, including the works of N.V. Biletska, Y.E. Dashchuk, and M.I. Lepky, indicate an intensification of scientific interest in smart tourism as a micro- and meso-level component of contemporary tourism policy. These authors emphasise the formation and development of the Smart Destination concept, which serves as a strategic approach to the digital transformation of regional tourism systems. In this context, the importance of implementing digital platforms for managing tourist flows is highlighted, as they enable effective service coordination, resource optimisation, and improvements in service quality. The use of technologies such as Big Data, the Internet of Things (IoT), and Geographic Information Systems (GIS) is considered a key toolkit for analysing tourist behaviour, forecasting demand, and tailoring services to individual consumer needs.

Additionally, O. Khytra and V. Palyukh, in their studies, examine the socio-human resource aspects of

digital transformation in tourism. In particular, they underscore the importance of developing human capital and digital competencies as a prerequisite for the successful adoption of smart technologies. Special attention is also given to the need to establish partnerships between government authorities, local businesses, and community initiatives to create a synergistic environment conducive to innovation.

However, despite the growing scholarly interest in smart tourism, the theoretical foundations and empirical studies on the comprehensive implementation of smart technologies in regional tourism systems remain underdeveloped. This highlights the need for further interdisciplinary research to outline methodological principles, practical implementation models, and frameworks for assessing the effectiveness of digital innovations in tourism.

FORMULATION OF THE ARTICLE'S OBJECTIVES

The aim of this article is to examine the features and directions of implementing smart technologies in regional tourism systems, as well as to assess their impact on enhancing the competitiveness of tourist regions.

THE PAPER MAIN BODY

Regional tourism systems should be understood as:

- complex socio-economic formations that develop within a specific territory (N.V. Biletska [1]);
- entities that bring together a combination of tourism and infrastructure resources, tourism operators who manage them, governing bodies, and consumers of tourism services (T.H. Sokol, O.A. Fastovets [3]);
- territorially localised tourism complexes that operate based on the interaction of natural resource potential, human capital, and the institutional environment (O. Khytra, V. Palyukh [4]).

In practice, these systems represent a combination of interconnected elements aimed at creating, promoting, and

Table 1. Characteristics of the directions of smart technology implementation in regional tourism systems

Directions of Smart technology implementation	Specifics of smart technology implementation in regional tourism systems
Tourism management and planning systems	Integration of digital platforms, analytical tools, and large datasets to support informed managerial decision-making, forecast tourist flows, monitor the effectiveness of tourism policies, and strategically plan regional development.
Tourism infrastructure management systems	Use of digital sensor networks, Internet of Things (IoT) technologies, Geographic Information Systems (GIS), and "smart" transport and navigation systems to optimise tourist flow distribution, monitor facility occupancy, and enhance the safety and quality of infrastructure services.
Systems for managing the production of tourism products and services	Application of Big Data, cloud services, artificial intelligence, and CRM systems to forecast tourist demand, personalise tourism offerings, optimise business processes, and respond quickly to changes in the market environment.
Human capital and competency management systems	Use of digital platforms to assess competencies, organise remote and personalised training, optimise staff allocation, plan career development, and improve the digital skills of tourism sector employees.
Systems for developing institutional and partnership mechanisms	Integration of digital platforms to enhance transparency and effectiveness of interactions between government authorities, businesses, communities, and academic institutions; coordination of joint projects, support for public-private partnerships, and informed strategic decision-making based on data.

Source: created by the authors based on [1—2; 4].

consuming a specific tourism product, developed with consideration of the natural, cultural, economic, and social characteristics of a given region (see Figure 1).

The Uman community serves as an example of a regional tourism system, where all elements—from the creation and promotion of a tourism product, which includes excursions to the Sofiyivka Arboretum, cultural and historical routes, festivals, and other recreational and entertainment services—to its consumption and adaptation to local conditions, interact to provide a comprehensive tourist experience.

In the context of digital transformation, regional tourism systems experience substantial structural and functional changes driven by the adoption of smart technologies. These technologies encompass a combination of hardware (sensors, mobile devices, and Internet of Things components [6—7]), software solutions (digital platforms, analytical systems, and mobile applications), and network infrastructure (broadband internet, cloud services, and data transmission systems). Their integration establishes an intelligent digital environment that facilitates more efficient operation and development of regional tourism systems.

We concur with N.V. Biletska [1] that the implementation of smart technologies transforms the traditional model of regional tourism, shifting it from fragmented management towards a system operating on the basis of integrated digital solutions, market participants, and information flows within a unified digital space. Such a system is characterised by [2]:

— Firstly, a networked management structure, which involves horizontal interaction between government

authorities, tourism businesses, infrastructure operators, and local communities based on partnership and shared data utilisation.

— Secondly, a data-driven nature, reflected in the use of large datasets, analytical platforms, and geographic information systems to inform managerial decisions, forecast tourist flows, optimise resource allocation, and minimise negative socio-environmental impacts that could affect the development of tourist regions.

— Thirdly, customer-centricity, manifested in a focus on the needs and behavioural patterns of tourists, enabling the personalisation of tourism products and services, enhancing customer satisfaction, and fostering a positive tourist experience.

Additional characteristics of a networked smart regional tourism system include adaptability and flexibility, which determine its capacity for self-learning based on data analysis, the integration of physical and digital infrastructure, and alignment with territorial development goals. Collectively, these features enhance the competitiveness of the regional tourism system.

The analysis of these characteristics indicates that the implementation of smart technologies in regional tourism systems occurs across several interrelated directions, covering managerial, infrastructural, informational, and socio-economic aspects of their operation. Among the key directions of such implementation (see Table 1) are [1—2; 4]:

— Tourism management and planning systems, or a set of organisational, analytical, and digital tools that

ensure the planning of tourism system development, the assessment of managerial decision effectiveness, and the formation of regional tourism development programmes;

- Tourism infrastructure management systems, or integrated mechanisms for monitoring and optimising the operation of tourism infrastructure facilities;

- Systems for managing the production of tourism products and services, or organisational and technological complexes that coordinate the creation, modification, and promotion of tourism products and services;

- Human capital and competency management systems, or mechanisms for developing, training, and optimally allocating personnel within tourism enterprises and regional management authorities;

- Systems for developing institutional and partnership mechanisms, or a set of measures and solutions aimed at establishing collaboration between government authorities, businesses, public organisations, and local communities.

Thus, there is a need to examine the specifics of smart technology implementation in regional tourism systems across each of the aforementioned directions, as this allows for the identification of transformations in their functional components [1—2].

Thus, the implementation of smart technologies in the management and planning systems of regional tourism development transforms the entire process of decision-making and monitoring their effectiveness. In particular, the integration of digital platforms, analytical tools, and large datasets enhances the transparency of managerial processes and the responsiveness to changes in demand and supply. An example of this approach is the use of integrated strategic planning platforms such as BARET Smart Destination Solution and others, which allow for the analysis of data on tourism resources, regional development potential, seasonal fluctuations, and the economic efficiency of tourism products.

The implementation of smart technologies in tourism infrastructure management systems transforms the operation of infrastructure facilities—including hotels and other accommodation, tourist and excursion centres, transport hubs and routes (bus and rail services, airports), parking facilities, public spaces, museums, cultural and natural heritage sites, recreational and leisure areas, and sports and entertainment venues. In particular, the use of digital sensor networks, IoT, GIS, and "smart" transport and navigation systems enables the optimisation of tourist flow distribution through the real-time collection and analysis of data on visitor density, facility occupancy, transport infrastructure, and alternative routes for tourists.

Safety is also enhanced through the implementation of video surveillance systems with analytics, monitoring of transport flows, access control to facilities, and the rapid provision of information to tourists and relevant authorities in the event of emergencies. Furthermore, the quality of tourism services is improved through service personalisation, automation of service processes, digital navigation, online booking, and interactive information systems. An example of such

implementation is the Tourism Data Analytics Platform, which collects real-time data on hotel occupancy, tourist flows along main routes, and the usage of museums and public spaces.

The implementation of smart technologies in systems for managing the production of tourism products and services transforms the processes of their creation, promotion, and consumption. In particular, these technologies enable the forecasting of tourist demand, the development of personalised tourism offerings, and the rapid adaptation of products to changes in the market environment. This is driven by the use of Big Data, cloud services, artificial intelligence, and customer relationship management (CRM) systems, which form the foundation for optimising the business processes of tourism enterprises [6—7].

An example of this is the use of the TravelClick (Amadeus) platform, which allows hotels and tourism companies within a regional tourism system to personalise offers for different tourist segments by analysing their preferences and behavioural patterns, optimise pricing and service packages based on dynamic analytics, and respond promptly to seasonal fluctuations and changes in market demand, thereby enhancing sales efficiency and customer satisfaction.

The implementation of smart technologies in human capital and competency management systems transforms the processes of workforce training, development, and management in the tourism sector. In particular, digital tools enable organisations to:

- Assess employee competencies using data analytics and learning management systems.

- Organise personalised training through online platforms, virtual workshops, and simulation models.

- Optimise the allocation of human resources according to demand, seasonality, and the specific characteristics of tourism products.

- Enhance employee collaboration by using digital platforms for information sharing, task planning, and performance monitoring.

An example of this is the implementation of systems such as Cornerstone OnDemand or SAP SuccessFactors, which facilitate the analysis of employee skills, the automation of training programmes, the planning of career development, and the enhancement of digital competencies among staff in tourism enterprises and regional tourism management authorities. This contributes to the development of a highly skilled and adaptable workforce capable of operating effectively within the context of the digital transformation of the tourism sector.

The implementation of smart technologies in systems for developing institutional and partnership mechanisms transforms the process of organising collaboration between government authorities, local communities, tourism businesses, and academic institutions [5]. In particular, digital tools enable organisations to:

- Enhance the transparency and efficiency of communication among participants in the tourism ecosystem through integrated data-sharing and collaborative planning platforms.

— Coordinate the implementation of joint projects and programmes using digital systems for monitoring, resource management, and budget planning.

— Support public-private partnerships through evaluations of investment effectiveness and strategic decision-making.

— Facilitate the timely exchange of information and data on the development of tourist areas, resources, and socio-economic indicators to inform well-grounded managerial decisions.

An example of this is the use of the Smart Destination Governance platform, which integrates data from local government authorities, tourism enterprises, and civil society organisations, enabling the planning of joint initiatives, coordination of infrastructure development, assessment of investment impacts, and support for the sustainable development of tourist regions.

CONCLUSIONS

The findings of the study indicate that the implementation of smart technologies in regional tourism systems is one of the key factors driving their modernisation in the context of the digital transformation of the economy. It has been established that smart solutions enable the integration of tourism resources, infrastructure, tourism stakeholders, and governance bodies into a unified information space, thereby enhancing the operational efficiency of regional tourism systems.

The adoption of smart technologies transforms the traditional model of regional tourism, shifting it from fragmented management towards an integrated system based on digital solutions, interaction among tourism market participants, and the exchange of information flows within a common digital environment. A smart tourism system is characterised by several key features, including network-based governance, a data-driven approach, and customer-centricity. Additional characteristics of smart regional tourism systems include adaptability and flexibility. It has been demonstrated that the combined effect of these features contributes to increased competitiveness of regional tourism systems in the digital economy.

The identified characteristics indicate that the implementation of smart technologies in regional tourism systems takes place across several interrelated directions, encompassing managerial, infrastructural, informational, and socio-economic aspects of their functioning. The key directions of such implementation include tourism management and development planning systems; tourism infrastructure management systems; systems for managing the production of tourism products and services; human capital and competency management systems; and systems for developing institutional and partnership mechanisms.

Prospects for further research include examining the effectiveness of specific models for the implementation of smart technologies in regional tourism systems, as well as developing methodologies to assess their impact on the economic, social, and environmental sustainability of regions.

Література:

1. Білецька Н.В. Впровадження Smart-технологій у регіональні туристичні системи. Проблеми економіки. 2024. № 3 (61). С. 84—91.

2. Дашук Ю.Є., Лепкий М.І. Досвід використання smart-технологій в управлінні туристичним продуктом міста. Приазовський економічний вісник. № 3 (14). 2019. С. 294—299.

3. Сокол Т.Г., Фастовець О.А. Регіональний вектор розвитку туризму в Україні. Розвиток методів управління та господарювання на транспорті, 2022. № 1 (78). С. 132—144.

4. Хитра О., Палюх В. Особливості застосування інноваційних технологій у публічному управлінні туристичною дестинацією. Mechanism of an Economic Regulation. 2023. № 1 (103). С. 30—40.

5. Царук В.В. Туризм в Україні в умовах воєнного стану — проблеми відновлення та пошуку нових моделей управління. Таврійський науковий вісник. Серія "Публічне управління та адміністрування". 2023. № 4. С. 15—24.

6. Ящишина І. В. Реалізація концепції смарт-туризму: світовий досвід та вітчизняна практика. Наукові записки Національного університету "Острозька академія". Серія "Економіка". 2019. № 14 (42). С. 54—59.

7. Ящишина І. В. Суть та особливості смарт-підприємств. Наукові записки Національного університету "Острозька академія". Серія "Економіка". 2018. № 11 (39). С. 14—18.

References:

1. Biletska, N.V. (2024), "Introduction of Smart Technologies into Regional Tourism Systems", *Problemy ekonomiky*, vol. 3 (61), pp. 84—91.

2. Dashchuk, Yu.E., and Lepky, M.I. (2019), "Experience in using smart technologies in managing the city's tourism product", *Pryazovs'kyi ekonomichnyi visnyk*, vol. 3 (14). pp. 294—299.

3. Sokol, T.G. and Fastovets, O.A. (2022), "Regional vector of tourism development in Ukraine", *Rozvytok metodiv upravlinnya ta hospodaryuvannya na transporti*, vol. 1 (78), pp. 132—144.

4. Khytra, O., and Palyukh, V. (2023), "Peculiarities of the application of innovative technologies in public management of a tourist destination", *Mechanism of an Economic Regulation*, vol. 1 (103), pp. 30—40.

5. Tsaruk, V.V. (2023), "Tourism in Ukraine under martial law — problems of restoration and search for new management models", *Tavriys'kyi naukovy visnyk. Seriya "Publichne upravlinnya ta administruvannya"*, vol. 4, pp. 15—24.

6. Yashchyshyna, I.V. (2019), "Implementation of the concept of smart tourism: world experience and domestic practice", *Naukovi zapysky Natsional'noho universytetu "Ostroz'ka akademiya"*. Seriya "Ekonomika", vol. 14(42), pp. 54—59.

7. Yashchyshyna, I.V. (2018), "The essence and features of smart enterprises", *Naukovi zapysky Natsional'noho universytetu "Ostroz'ka akademiya"*. Seriya "Ekonomika", vol. 11 (39), pp. 14—18.

Стаття надійшла до редакції 29.12.2025 р.