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ROLE OF DIGITAL TECHNOLOGIES IN THE TRANSFORMATION OF SMALL TOURISM BUSINESSES

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РОЛЬ ЦИФРОВИХ ТЕХНОЛОГІЙ У ТРАНСФОРМАЦІЇ МАЛОГО ТУРИСТИЧНОГО БІЗНЕСУ

At present, the tourism industry is undergoing a stage of deep transformation that encompasses not only communication and management processes but also the

physical dimension—namely, the very process of providing tourism services. In particular, for small tourism businesses, which traditionally face limited resources and high dependence on seasonality and changes in the external environment, combining digital technologies with physical innovations opens up new opportunities for entrepreneurial and commercial activities. Accordingly, the aim of the study is to determine the role of digital technologies in transforming small tourism businesses through their integration with physical innovations, as well as to identify the conditions under which such digital-physical solutions become a factor in enhancing operational efficiency, competitiveness, and innovation resilience. The findings of the study demonstrate that the implementation of digital technologies in small tourism businesses is a key tool for their transformation, as it drives significant changes in operational efficiency, competitiveness, and innovation resilience. The formulated provisions confirm the idea that digitalization is not merely an automation tool but a strategic factor that reshapes the fundamental processes of small tourism enterprises. Changes in operational efficiency are associated with the formation of a business entity's ability to use available resources as rationally as possible to achieve set goals with minimal time and financial costs. Changes in competitiveness are reflected in strengthening the ability of small tourism businesses to create unique value propositions and services that exceed consumer expectations and provide sustainable advantages over competitors. Changes in innovation resilience are linked to the development of a business's capacity to maintain long-term development, adapt to technological, economic, and market shifts, and effectively integrate innovations into its operations. Prospects for further research include the development of opportunities to analyze the impact of specific digital technologies on the performance of various segments of the tourism industry.

Наразі туристична індустрія перебуває на етапі глибокої трансформації, що охоплює не лише комунікаційні та управлінські процеси, але й фізичний вимір (тобто сам процес надання туристичних послуг).

Зокрема, для малого туристичного бізнесу, якому традиційно властиві обмежені ресурси та висока залежність від сезонності та змін зовнішнього середовища, поєднання цифрових технологій із фізичними інноваціями відкриває нові можливості для підприємницької та комерційної діяльності. Відтак, метою дослідження є визначення ролі цифрових технологій у трансформації малого туристичного бізнесу шляхом їх інтеграції з фізичними інноваціями, а також визначення умов, за яких такі цифрово-фізичні рішення стають фактором підвищення операційної ефективності, конкурентоспроможності та інноваційної стійкості. За результатами дослідження доведено, що впровадження цифрових технологій у малому туристичному бізнесі є тригером трансформації, оскільки призводить до суттєвих змін у сферах операційної ефективності, конкурентоспроможності та інноваційної стійкості. Це робить цифровізацію не просто інструментом автоматизації, а стратегічним фактором зміни базових процесів малого туристичного бізнесу. Так, зміни у площині операційної ефективності пов'язані з формуванням у суб'єкта малого туристичного бізнесу здатності максимально раціонально використовувати наявні ресурси для досягнення поставлених цілей із мінімальними витратами часу та коштів. Зміни у площині конкурентоспроможності проявляються у зміцненні здатності малого туристичного бізнесу формувати унікальні ціннісні пропозиції та послуги, які перевищують очікування споживачів і забезпечують стійкі переваги над конкурентами. Зміни у площині інноваційної стійкості пов'язані з формуванням здатності малого туристичного бізнесу підтримувати довгостроковий розвиток, адаптуватися до технологічних, економічних і ринкових зрушень та ефективно інтегрувати інновації у свою діяльність. Перспективи подальших досліджень полягають у формування можливостей для аналізу впливу конкретних цифрових технологій на ефективність різних сегментів туристичного бізнесу.

Keywords: *entrepreneurial activity; commercial activity; resources; management processes; operational efficiency; competitiveness; innovation resilience.*

Ключові слова: *підприємництво; комерційна діяльність; ресурси; управлінські процеси; операційна ефективність; конкурентоспроможність; інноваційна стійкість.*

Problem statement. At present, the tourism industry is undergoing a phase of profound transformation that encompasses not only communication and management processes, but also the physical dimension (that is, the very process of providing tourism services). In particular, for small tourism businesses, which traditionally face limited resources and high dependence on seasonality, the combination of digital technologies with physical innovations opens new opportunities for entrepreneurial and commercial activity. Intelligent booking systems, mobile applications, and customer-flow management platforms are increasingly being integrated with the material and technical infrastructure of enterprises (including sensor networks, IoT devices, contactless navigation systems, and “smart” access, security, and service infrastructure).

This outlined combination of solutions contributes to the optimization of operational processes, the improvement of service quality, and the creation of a personalized tourist experience. For example, the use of intelligent access systems allows guests to perform self check-in through a mobile key, while sensor networks and IoT devices provide automatic climate and energy-consumption control, adapting the conditions of stay to the individual needs of the tourist. At the same time, interactive navigation panels and contactless information kiosks enhance guests’ spatial orientation and reduce the workload on staff. In this context, there arises a need for scientific reflection on the role of digital technologies as a driver of not only digital but also physical modernization of small tourism businesses.

Analysis of research and publications. The peculiarities of using digital technologies in small tourism businesses have been examined by scholars such as

Valinkevych N., Shestakova A. [1], Makhovka V.M. [4], Sheveliuk M.M. [6], Maslyhan O.O., Todierishko E.V., Kuznetsova O.V., and Shafranov K.V. [5]. In particular, researchers have studied the key features of the digitalization of tourism enterprises, including the automation of customer service processes, the use of online services for booking and communication, the integration of intelligent resource-management systems, the application of analytical tools for demand forecasting, the development of digital marketing channels, and the creation of personalized offers.

At the same time, although these scholars have repeatedly noted that the introduction of digital technologies merely changes the foundations of small tourism businesses—transforming their business models, the nature of customer interaction, operational activities, and adaptability to market dynamics—the systemic role of digitalization in the transformation of such businesses has still not been comprehensively explored.

Formulation of the article's objectives. The aim of the study is to determine the role of digital technologies in the transformation of small tourism businesses through their integration with physical innovations, as well as to identify the conditions under which such digital–physical solutions become a factor in enhancing operational efficiency, competitiveness, and the innovative resilience of enterprises.

The paper main body. At present, digital technologies—as a combination of information tools, software platforms, and algorithmic solutions that enable data processing, communication, customer-flow management, and decision support—are key triggers of transformation in small tourism businesses [3-4]. They drive restructuring through the digitalization of operational processes, customer interactions, and the enhancement of managerial flexibility.

In particular, the digitalization of operational processes occurs through the automation of routine functions, the use of electronic occupancy control systems, online monitoring of equipment status, and the integration of IoT sensors to optimize energy consumption or infrastructure performance [1; 3].

Digital tools modernize customer interactions by enabling multichannel communication (via mobile platforms and applications, chatbots, and personalized recommendation systems) with opportunities for contactless service and interactive elements (facilitated through digital guides, AR navigation, and online service customization).

Management flexibility is enhanced through the use of cloud platforms, data analytics systems, and digital dashboards, which allow small business owners to quickly adjust prices, allocate resources, track demand in real time, and rapidly adapt their business models to seasonal or market fluctuations.

In contemporary conditions, their significance has been substantially strengthened by integration with physical innovations, enabling a shift from purely informational digitalization to comprehensive modernization of the material and technical components of tourism services. This combination not only automates routine processes but also creates new forms of tourist experiences based on contactlessness, personalization, and intelligent environmental adaptability.

The integration of digital technologies with physical devices (sensor networks, IoT modules, contactless navigation systems, smart locks, multimedia panels) forms unified digital–physical complexes, in which data collection, processing, and operational execution occur in real time. As a result, the material elements of service become “smart” (responding to tourist behavior, automatically adjusting stay conditions, and enhancing service quality) [3]. Thus, the effectiveness of digital–physical solutions is realized under a set of conditions (outlined in Table 1), which we collectively identify as factors enhancing operational efficiency, competitiveness, and the innovative resilience of enterprises.

**Table 1. Components of the effectiveness of digital–physical solutions
contributing to the transformation of small tourism businesses**

Effectiveness Component	Content and characteristics	General manifestations of small business transformation
Operational efficiency*	Automation of resource-intensive and routine processes; integration of digital systems with physical devices (IoT, sensors, smart infrastructure); reduction of resource and time costs; optimization of workflows	Increased speed of service operations; reduced operational costs; rational use of resources; faster customer service
Competitiveness **	Creation of a unique value proposition through the combination of digital services and physical innovations; personalization of the customer experience; rapid response to changes in demand	Establishment of a sustainable market advantage; increased customer satisfaction; expansion of market segments through new services and improved service quality
Innovation Resilience***	Ability of the enterprise to adapt its business model to technological changes; use of data and digital analytics for development; integration of a modernized material and technical base	Support of long-term growth; enhanced flexibility and adaptability; ability to implement innovations without significant risks to operational stability

Note:

* the extent to which an organization achieves its objectives in daily activities through effective use of resources. In other words, it is an indicator of how well an enterprise performs its operational tasks, ensures the quality of products or services, meets customer needs, and attains planned results with minimal expenditure of time, effort, and material resources.

** the ability of an enterprise to successfully compete in the market by offering products or services that provide greater value to consumers compared to the offerings of other market participants.

*** the ability of an enterprise to sustain continuous development and maintain long-term viability through systematic innovation, adaptation to technological and market changes, and effective utilization of new opportunities.

Source: created by the authors based on [1; 3-4]

With regard to the operational efficiency of small tourism businesses, we interpret it as an enterprise’s ability to utilize its resources as rationally as possible in order to achieve its objectives with minimal costs and time expenditures [1; 4].

Accordingly, its transformation through the integration of digital-physical solutions manifests itself in the intensified automation of routine processes (booking, check-in, resource management [5-6]), the optimization of energy consumption, the reduction of staff workload, and the acceleration of customer service (Table 2). For example, the implementation of a “smart” room management system in a small hotel allows automatic regulation of lighting and climate control

based on room occupancy [1-2]. This enables a 15–30% reduction in energy consumption, decreases manual work for administrative and technical staff, and ensures faster preparation of rooms for new guests. At the same time, an integrated CRM system automatically records the duration of client stays and transmits the data to the front desk, significantly speeding up check-in and check-out processes, thereby enhancing service responsiveness and overall business efficiency. In fact, the analysis of operational efficiency transformation elements in small tourism businesses indicates that digital–physical solutions have an optimizing effect on resource utilization and customer service processes.

Regarding the competitiveness of small tourism businesses, we interpret it as the ability of an economic entity to create unique value propositions and services that exceed consumer expectations and provide an advantage over other market participants.

Table 2. Transformation of operational efficiency in small tourism businesses in the context of digital-physical solutions

Element facilitating transformation	Characteristics in the context of digital-physical solutions	Impact on the operational efficiency of small tourism businesses
Automation of routine processes	Use of digital systems for booking, check-in, and resource management; integration with physical devices (IoT, sensors)	Reduction in processing time, fewer errors, improved data accuracy.
Optimization of energy consumption	Sensor systems, IoT devices, intelligent climate and lighting controllers	Resource savings, cost reduction, enhanced sustainability of operations.
Reduction of staff workload	Redistribution of routine tasks to digital and physical systems.	Allows staff to focus on customer interaction and service quality improvement.
Increased service speed	Interactive navigation panels, contactless kiosks, fast check-in/check-out systems.	Reduced customer waiting time, enhanced tourist experience, increased guest satisfaction.

Source: created by the authors based on [1-2; 5-6]

Consequently, the transformation of this capability occurs through the integration of digital technologies with physical innovations, which directly affects the quality and personalization of service, as well as the overall tourist experience, enabling rapid responses to changes in market demand (see Table 3).

Table 3. Transformation of competitiveness in small tourism businesses in the context of digital–physical solutions

Element facilitating transformation	Characteristics in the context of digital-physical solutions	Impact on the operational efficiency of small tourism businesses
Improvement of service quality and personalization	Use of digital systems for analyzing customer preferences, mobile applications for service personalization, integration with physical devices (smart locks, sensors, interactive panels).	Ensures high-quality service, meets the individual needs of tourists, and enhances customer satisfaction and loyalty.
Unique tourist experience	Use of AR/VR technologies, interactive navigation systems, sensor-based infrastructure, and other physical innovations integrated with digital platforms.	Creates unique services and experiences for clients, distinguishing the enterprise from competitors and enabling rapid response to changes in demand.

Source: created by the authors based on [1;3-4; 6;]

For example, a small travel agency can utilize a mobile app linked to a client behavior analysis system to design personalized tour packages tailored to past trips, budgets, preferences, and current trends. By combining this digital tool with physical innovations—like interactive offline maps or AR travel guides on-site—the agency can provide tourists with a truly unique experience: customized routes, real-time location-based tips, and smoother city navigation. Research on competitiveness in small tourism businesses shows that these digital–physical solutions let agencies quickly adapt their offerings to shifts in demand—for instance, launching new themed tours or special promotions on short notice—helping them build a sustainable competitive edge [3; 7].

When we talk about innovation resilience, we understand it as the ability of a small tourism business to maintain long-term growth while adapting to technological, economic, and market changes. In the context of digital–physical solutions, this resilience is reflected in the adoption of new technologies, the adjustment of business models to evolving conditions, the preservation of operational flexibility, and the ability to provide continuous service despite fluctuating demand and shifting technological environments (see Table 4).

Таблиця 4. Трансформація інноваційної стійкості малого туристичного бізнесу у контексті цифрово-фізичних рішень

Element facilitating transformation	Characteristics in the context of digital-physical solutions	Impact on the operational efficiency of small tourism businesses
Implementation of new technologies	Integration of IoT devices, mobile applications, AR/VR solutions, and artificial intelligence systems to enhance service and optimize operations.	Reduction of time and resource costs, increased process accuracy, faster request processing, and improved quality of routine operations.
Adaptation of business models	Transition to digital sales channels, subscription models, hybrid tourism services, and the use of big data for decision-making.	Flexible adjustment of offerings, risk reduction, optimization of pricing strategies, and enhanced resilience to demand fluctuations.
Ensuring technological flexibility	Use of modular systems, cloud services, and integrated platforms that allow rapid scaling or modification of functionality.	Shortened implementation time for changes, adaptation of operations to new conditions, and reduced dependence on manual processes.

Source: created by the authors based on [1; 3-4; 7]

For instance, a small tour operator might adopt a predictive analytics platform that leverages digital data on seasonality, customer behavior, flights, and local events to forecast demand for various tours. On the ground, this system is supported by mobile devices used by guides and managers, enabling real-time updates on routes, logistical adjustments, or availability of locations. By integrating digital and physical tools in this way, the business can swiftly modify tour offerings—adding new routes, optimizing schedules, and adjusting itineraries in response to weather or infrastructure changes.

So, research into innovation resilience in small tourism enterprises reveals that such digital–physical solutions enable businesses to respond quickly to market shifts while maintaining high-quality service, even in unstable conditions.

Conclusions. The study’s findings show that implementing digital technologies is a key driver of transformation in small tourism businesses, given the notable improvements observed in operational efficiency, competitiveness, and innovation resilience.

Specifically, improvements in operational efficiency are linked to a business’s ability to make the most of its available resources to achieve goals with minimal

time and cost. This is particularly critical for small tourism enterprises, which often operate with very limited financial and human resources.

Enhancements in competitiveness are reflected in a small tourism business's ability to create unique value propositions and services that exceed customer expectations, providing sustainable advantages over competitors. This capability is essential, as small businesses rely heavily on customer loyalty and market reputation. Offering distinctive services helps them stand out, attract new clients, and maintain stable revenue even in volatile market conditions.

Innovation resilience, meanwhile, is associated with a small tourism business's capacity to sustain long-term growth, adapt to technological, economic, and market shifts, and integrate innovations effectively into their operations. For small enterprises, which are particularly vulnerable to market fluctuations, the ability to implement innovations ensures stability, competitiveness, and growth potential even under challenging conditions.

These results highlight that digitalization is not merely a tool for automation but a strategic factor driving the development and long-term sustainability of small tourism businesses.

Future research could focus on examining the impact of specific digital technologies on the efficiency of different segments within the tourism sector.

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