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## THE ROLE OF MODERN TECHNOLOGIES IN PLANNING TOURIST ROUTES

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### РОЛЬ СУЧАСНИХ ТЕХНОЛОГІЙ У ПЛАНУВАННІ МАРШРУТІВ ДЛЯ ТУРИСТІВ

Modern technologies have a significant impact on route planning for tourist enterprises, which currently serves as the foundation for providing high-quality and diverse tour services to travelers. The research aims to systematically study the role of modern technologies in tourist route planning. Based on the above statements, a conclusion has been drawn regarding the increasing significance of modern technologies in tourist route planning, driven by easier access to information, expanded data analytics and machine learning capabilities, opportunities to experience immersive views of tourist attractions, enhanced geolocation, and navigation capabilities, as well as online booking and transactions. Furthermore, it has been demonstrated that modern technologies give rise to five transformational zones in the process of tourist route planning. These zones should be regarded as distinct areas experiencing significant development and change due to the implementation of modern technologies in the tourism industry. In aggregate, all transformation zones shape a space where traditional route planning systems evolve into new, innovative, and efficient solutions through the utilization of digital technologies and the internet. Among the transformation zones of the tourist route planning process, we identify the following: route network zones, personalized offering, and communication zones, information acquisition zones, virtualization of potential routes zones, and interaction zones. In the designated zones of transformational route planning for tourists, various modern technologies are present, significantly easing and enriching the travel experience and allowing for the following: providing route immersiveness, adjusting the level of personalization for the route, and embedding convenient and valuable tools for travel preparation and enjoyment. The transformative role is currently driven by the expansion of capabilities to determine route immersiveness, adjust route personalization levels, and integrate convenient and valuable tools for travel preparation, increased flexibility, and enjoyment of the journeys.

Сучасні технології мають значний вплив на планування туристичним підприємствам маршрутів, що наразі є основою для подальшого надання якісних та різноманітних екскурсійних послуг для туристів. Відтак, метою дослідження є системне вивчення ролі сучасних технологій у плануванні маршрутів для туристів. За наведеними вище положеннями зроблено висновок відносно зростаючої ролі сучасних технологій у плануванні маршрутів для туристів, яка зумовлена полегшенням доступу до інформації, розширенням можливостей аналітики даних та машинного навчання, формуванням можливостей отримати іммерсивний погляд на туристичні атракції, розширеними можливостями щодо геолокації та навігації, онлайн-бронювання та розрахунків. При цьому доведено, що використання сучасних технологій формують п'ять зон трансформацій процесу планування маршрутів для туристів. Ці зони слід розглядати, як відокремлені області, де відбувається значний розвиток та зміна завдяки впровадженню сучасних технологій у туристичну індустрію. У сукупності всі зони трансформацій формують простір, де класичні системи планування маршрутів перетворюються у нові, інноваційні та ефективні рішення завдяки використанню цифрових технологій та інтернету. Серед зон трансформацій процесу планування маршрутів для туристів нами виділені: зони маршрутної мережі, зони персоналізації пропозиції та комунікації, зони отримання інформації, зони віртуалізації можливих маршрутів, зони взаємодії. В окреслених зонах трансформацій процесу планування маршрутів для туристів знаходяться різноманітні сучасні технології, які значно полегшують та збагачують досвід подорожі та дозволяють: надати маршруту іммерсивність, скоригувати рівень його персоналізації, а також вбудувати у маршрути зручні та цінні інструменти для підготовки та насолоди подорожами. Основана роль трансформацій наразі зумовлена розширенням можливостей визначати іммерсивність маршруту, коригувати рівень персоналізації маршруту; вбудувати у маршрути зручні та цінні інструменти для підготовки, підвищення гнучкості та насолоди подорожами. Перспективи подальших розвідок у цій сфері полягають у дослідженні перспектив налагодження співпраці між туристичними підприємствами, технологічними компаніями та дослідницькими установами. Ця співпраця може сприяти знаходженню нових інновацій та розвитку більш комплексних рішень для туризму.

*Key words: booking; itinerary; tourist attractions; landmarks; monuments.*

*Ключові слова: бронювання; маршрут; туристичні пункти; визначні місця; пам'ятки.*

#### **TARGET SETTING**

Modern technologies have a significant impact on route planning for tourist enterprises, which currently serves as the foundation for providing high-quality and diverse tour services to tourists. Creating such an impact is achieved through the continuous expansion of options in online platforms and applications designed for assembling packages of tour services and booking hotels, transportation, and restaurants, enhancing geolocation, extending the capabilities of other technologies, and more. What is specific is that the comprehensive integration of modern technologies not only makes the processes of tour route planning and conducting tours more efficient and convenient but also impacts the very nature of tourism, making it more flexible, interactive, personalized, and conducive to active interaction between tourists and local cultures and traditions. The main aspects indicating changes in route planning for tourists include the gradual shift of tourist enterprises towards interactive route planning, enhancing their immersiveness (interactive planning allows tourists to immerse themselves in specific aspects of local cultural heritage, history, and nature in advance), integrating route plans with local services (bringing tourist enterprises closer to local service providers, streamlining the collaboration process, data exchange, and mutually beneficial arrangements), and more.

#### **ANALYSIS OF RESEARCH AND PUBLICATIONS**

Among the studies that have initiated solutions for the issue of route planning for tourists in tourist enterprises, we have identified works by Molnar O.S., Marchenko O.I., Maslyhan O.O., Kampov N.S., and Kolotukha O.V. However, problematic is the fact that while most researchers acknowledge the influence of modern technologies on the approach to route planning for tourists, they often do not highlight the specific details of such changes.

The fragmented nature of these studies emphasizes the relevance and timeliness of comprehensive research on the role of modern technologies in route planning for tourists.

#### **THE WORDING OF THE PURPOSES OF ARTICLE (PROBLEM)**

The aim of the research is to comprehensively study the role of modern technologies in route planning for tourists.

#### **THE PAPER MAIN BODY WITH FULL REASONING OF ACADEMIC RESULTS**

We observe that the conventional understanding of the route planning process for tourists should focus on creating an optimal itinerary or travel plan that includes various tourist destinations, landmarks, attractions, activities, and other interesting points that the tourist can visit follo-

wing an established pattern (see Figure 1).

When planning routes, it is essential to consider that the main objective of the process is to provide the tourist with the broadest possible travel experience, considering their interests, constraints, and conditions.

Thus, with the modern technology's integration into this process, it becomes increasingly convenient, personalized, and immersive, and can be implemented independently by the tourist and with the assistance of tour operators, travel agencies, or specialized online platforms and applications.

The analysis of practical experience of tourist enterprises in route planning for tourists as of 2021 (see Figure 2) revealed the utilization of the following modern technologies: online platforms and applications for planning (used by 54% of enterprises); geolocation and navigation technologies (used by 42% of enterprises); virtual and augmented reality (used by 19% of enterprises); social media and ratings (used by 88% of enterprises); data analytics and personalization (used by 75% of enterprises); electronic tickets and mobile payments (used by 65% of enterprises). Let's examine in detail the specifics of applying the mentioned technologies in route planning for tourists.

Regarding online platforms and applications for route planning for tourists, it is essential to emphasize their significant diversity. Among them are aggregators and search engines such as Trip-Advisor, Airbnb Experiences, mapping applications (e.g., Google Maps), and road trip planning apps (such as Roadtrippers or Visit a City).

These technologies vary in functionality, advantages, and approaches to creating and

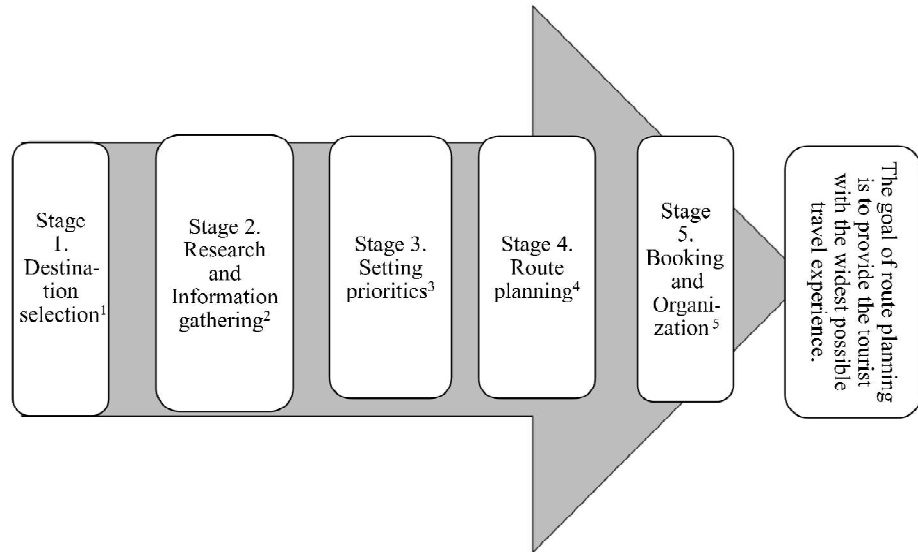


Figure 1. Conventional scheme of route planning for tourists

Note:

1. Selecting the place or region the tourist will visit.
2. Gathering information about interesting places, landmarks, events, cultural activities, restaurants, hotels, etc., at the destination.
3. Setting planning priorities and specific constraints for the route, such as budget, time, physical capabilities.
4. Based on the collected information, the planning entity devises an optimal route, including the sequence of visiting places and activities.
5. The planning entity proceeds with booking hotels, transportation, additional site tours, and activities in advance to ensure the planned journey.

Source: formed based on [1; 2; 3].

customizing routes, thus enabling planning entities to create and tailor tourist itineraries to varying degrees. These applications provide detailed information about tourist attractions, recommendations, operating schedules, prices, and booking capabilities.

Regarding geolocation and navigation technology, it encompasses GPS and various positioning systems such as Galileo, BeiDou, etc. These techno-

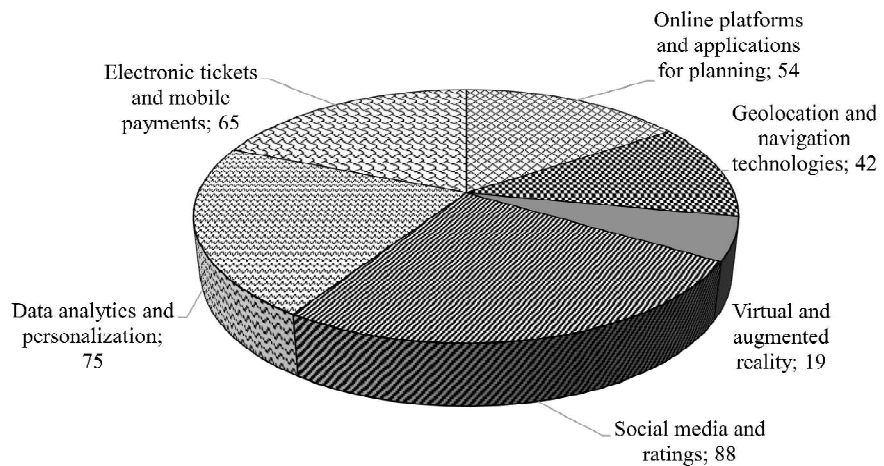


Figure 2. Percentage of enterprises using technology in route planning as of 2021

Source: formed based on Ernst & Young Global Limited data.

**Table 1. Characterization of data analytics and personalization technologies applied in route planning for tourists**

Technology	Features of application	Role in route planning
Data Analytics	Includes the collection and analysis of large volumes of data, such as booking history, support inquiries, feedback, and other relevant information	Assists in understanding trends, demand, and the popularity of various routes and services.
Machine Learning	Involves the development of algorithms that analyze and predict tourist behavior based on their historical data.	Creates routes or services that can interest tourists based on their previous choices.
Audience Segmentation	Incorporates data analysis to segment tourists into different groups with similar interests and needs.	Enables the creation of offerings that cater to the unique needs of each group.
Personalized Offers	Augments data analytics capabilities with audience segmentation procedures, enabling tourism companies to personalize their offerings.	Develops personalized offers for tourists, considering their interests, previous choices, and demand.
Email Marketing and Advertising Campaigns	Comprises data collection on tourists, particularly regarding their interests and needs.	Designs special advertising campaigns and offers tailored to the interests and needs of specific tourists.

Source: formed based on [1; 3].

logies enable tourist enterprises to easily locate tourist attractions, restaurants, hotels, museums, and other points of interest, as well as determine the optimal route. It allows tourist enterprises to create more detailed route plans, assessing distances and estimated time of stay at different locations.

Regarding virtual and augmented reality, it should be noted that these technologies allow tourists or tour guides to preview the appeal and attractiveness of a place that is intended to be included in the route. Specifically, such technologies enable immersive 360-degree videos and photos, providing a realistic impression of the ambiance and allure of the location without physically being there. Additionally, for tour guides and tour operators, this enables more effective promotion of tourism services and showcasing their offerings without the physical presence of tourists, which can save time and effort. It also helps improve the quality of service (specifically, a tour guide can assess the potential route beforehand and consider the characteristics of the tourist group to provide a more personalized experience [2]).

Regarding technologies such as social media and ratings (such as TripAdvisor, Google Maps, Booking.com, Airbnb, and others), it is noteworthy that they currently enable tourists to learn about the experiences of other travelers, obtain recommendations and advice, which contributes to a more informed selection of routes. The main advantages of social media and ratings in route planning for tourists include [2]:

1. Real Reviews. Planning entities can view reviews and comments from users who have used certain services or visited specific places. It helps to avoid unsatisfactory experiences and make more informed choices.

2. Recommendations and Advice. Planning entities can receive recommendations and advice regarding routes, travels, leisure destinations, restaurants, and activities from individuals with similar interests.

3. Photos and Videos. Social media platforms allow users to view photos and videos shared by tourists, providing a glimpse of the actual ambiance and atmosphere of visited places and landmarks.

4. Interaction with others. Planning entities can engage with other travelers, ask questions, and gather information about new places and services being explored.

Regarding data analytics and personalization technologies in the context of tourism, they encompass various tools and methods for collecting, processing, and analyzing data about tourists' preferences, behavior, and past choices (see Table 1).

Indeed, these technologies help tour operators and travel agencies analyze the demand for various routes and, as a result, offer personalized proposals to tourists based on their interests and previous choices.

Regarding technologies like electronic tickets and mobile payments, their focus is on facilitating tourists' access to travel services and payment operations, as well as expediting transactions.

The use of electronic tickets offers the following advantages in route planning for tourists: easy booking and acquisition of tickets for flights, trains, buses, cruises, and other transportation means online, quick, and convenient check-in and boarding, and reduced costs.

The use of mobile applications offers the following advantages in route planning for tourists: the ability to plan and make payments for travel services through clients' mobile devices; the option to plan and make payments for travel services using Apple Pay, Google Pay, and other mobile payment methods.

According to the provided information, it is evident that modern technologies significantly transform the existing process of route planning for tourists and the provision of touristic services. Five main areas of transformation in the process of route planning for tourists can be identified (Figure 3).

Indeed, based on the presented data in Figure 3, it is evident that the zone of transformations in

the process of route planning for tourists should be considered as a distinct area where significant development and change occur through the implementation of modern technologies in the tourism industry. In combination, all these transformation zones create a space where traditional route planning systems are transformed into new, innovative, and efficient solutions through the utilization of digital technologies and the internet [2; 6]. Let's examine each of these zones in more detail:

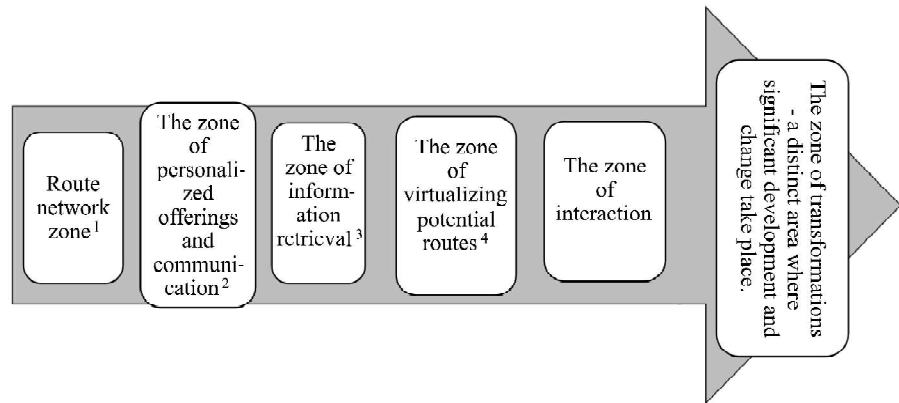
**1. Route Network Zone.** Specifically, the transformation in this zone is driven by the fact that route planning applications can consider various factors such as distance, travel time, availability of public transport, and the location of tourist attractions and points of interest. They assist tourists in optimizing their itinerary within the available route network (which encompasses all points of tourist interest within a specific tourist destination [1]) to visit as many places as possible within a limited time frame.

**2. Personalization and communication zone.** Specifically, the transformation in this zone is driven by data analytics tools and artificial intelligence, along with other analytical applications, which can generate interesting and individually tailored route suggestions for tourists based on their interests, budget, and other factors [2].

**3. Information retrieval zone.** In this zone, the transformation is driven by the ability of tourism professionals to access up-to-date information on public transportation, road conditions, weather, and other factors that may impact the planning of tourist routes [2]. This helps maintain flexibility and convenience in travel arrangements.

**4. Virtualization of possible routes zone.** In this zone, the transformation is driven using virtual reality technologies, enabling both tourism professionals and tourists themselves to make more informed choices about visiting places within their future itinerary [1–2].

**5. Interaction Zone.** The transformation in this zone is driven using social media and mobile applications, which provide the opportunity for



**Figure 3. Main zones of transformations in the process of route planning for tourists at tourism enterprises**

Note:

1 The technology enables consideration of various factors when planning routes for tourists, such as distance, travel time, accessibility of public transportation, location of tourist attractions, and points of interest.

2 The technology allows for the creation of interesting and individually tailored proposals for routes when planning for tourists.

3 The technology enables the use of up-to-date information about public transportation, road conditions, weather, and other factors that may impact route planning for tourists.

4 The technology allows for making informed choices regarding the places to visit within the future route when planning for tourists.

5 The technology enables tourists to communicate with residents, and receive advice, and recommendations from them when planning their routes.

Source: formed based on [1; 4-5]

route planners to interact with locals and receive advice and recommendations from them [2]. With these changes, the possibilities for planning immersive routes and integrating them with local services are expanded.

Indeed, in the transformation zones of the travel route planning process, various modern technologies are present, significantly simplifying and enriching the travel experience. They enable providing immersive routes, adjusting the level of personalization, and embedding convenient and valuable tools for preparation and enjoyment of the journey into the itineraries.

**CONCLUSIONS FROM THIS STUDY AND PROSPECTS FOR FURTHER EXPLORATION IN THIS AREA**

Based on the points, it can be concluded that there is a growing role of modern technologies in travel route planning, driven by easier access to information, expanded possibilities of data analytics and machine learning, the creation of opportunities for immersive exploration of tourist attractions, enhanced capabilities in geolocation and navigation, as well as online booking and payments. Furthermore, it has been demonstrated that:

1. The use of modern technologies defines five transformation zones in the process of travel route planning for tourists. These zones should be regar-

ded as distinct areas where significant development and change occur due to the implementation of contemporary technologies in the tourism industry. Together, all transformation zones constitute a space where traditional route planning systems evolve into new, innovative, and efficient solutions, thanks to digital technologies and internet utilization.

2. Among the transformation zones in the process of travel route planning for tourists, the following can be distinguished: the route network zone, the personalized offering and communication zone, the information acquisition zone, the virtualization of potential routes zone, and the interaction zone. Within these delineated transformation zones, various modern technologies significantly facilitate and enrich the travel experience, allowing for immersive routes, customized adjustments, and the incorporation of convenient and valuable tools for the preparation and enjoyment of journeys.

3. The significant role of transformations is currently driven by the expansion of capabilities to determine the immersive nature of the route (considering the tourist's request for the intensity and depth of interaction with local cultures, traditions, and natural features of the visited places), to adjust the level of route personalization (according to individually tailored recommendations for the tourist, taking into account their interests, budget, and other factors), and to embed convenient and valuable tools for preparation, flexibility, and enjoyment of the journeys (including features that enable constant connectivity, quick navigation to destinations, route adjustments, and orientation in unfamiliar terrain).

The prospects for further exploration in this field lie in researching the possibilities of establishing collaborations among tourism enterprises, technology companies, and research institutions, which can contribute to discovering innovations and developing more comprehensive solutions for tourism.

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