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Integrating New Emerging Technologies to Enhance User Experiences in Hospitality Industry. Developing Digital Tourism

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Abstract – The hospitality industry is constantly changing, adapting to new customer preferences, adopting emergent technologies and increasing the intensive use and valorization of the local resources (e.g., accelerated digitalization, increased concern for versatile and sustainable solutions). The present research explores the impact and potential of digital technologies in transforming the hospitality industry, focusing particularly on the emergence and development of digital tourism, by analyzing its evolution, from the integration of virtual and augmented reality (VR/VA) technologies to the implementation of artificial intelligence (AI) and digital tokens, highlighting how these innovations are redefining tourists' experiences with destinations and service providers. Through a mixed methodology, which combines literature review (synthesis and analysis) with qualitative research, this article aims to provide a comprehensive perspective on the challenges and opportunities brought by digital tourism in the new context of the hospitality industry. Thus, a qualitative study, based on semi-structured interviews with hospitality industry professionals, provided valuable insights into the implementation and the future of technologies used in the development of digital tourism. The results of this study make significant contributions to the specialized literature by identifying key factors in the development of the digital tourism in Romania, proposing solutions for balancing digital innovation with a strong impact on increasing the authenticity of travel experiences, and improving relationships with service providers by attempting to provide solutions in managing excessive tourism.

Keywords: Digital tourism, technology, user experience, hospitality industry, services.

I. INTRODUCTION

After the Covid-19 pandemic the hospitality industry enter a new era of development, trying new strategies of sustainable development, resilience and being impacted by the accelerate introduction and use of the digital technologies (Ntounis, et al., 2022). In most areas, disruptive innovations have transformed the way processes are developed (Buhalis, et all., 2019; Lee, et al., 2021; Buhalis, et al., 2024; Chon & Hao, 2025). Thus, the integration of emerging technologies in the hospitality industry significantly enhances user experiences by optimizing service delivery and personalizing interactions.

Technologies such as artificial intelligence (AI), virtual and augmented reality (VR/AR), and the Internet of Things (IoT) are transforming traditional hospitality models, enabling hotels to offer tailored services and improve operational efficiency (Kannan, 2024; Chon & Hao, 2025). The key technologies enhancing user experience are already present to support different services and operations, as follows.

Artificial Intelligence (AI) applications, including chatbots and personalized recommendations, streamline guest interactions and automate routine tasks, leading to improved satisfaction (Budianto, et al., 2024; Chon & Hao, 2025). Virtual Reality (VR) platforms provide immersive previews of services, enhancing event experiences and facilitating better logistics (Sjukriana, et al., 2024). Augmented Reality (AR) has been introduced by touristic agencies to support pre-visualization of the offers (destinations, excursions, hotels interior visualization etc.). Technology significantly enhances the tourist experience by providing immersive, interactive, and personalized engagements that bridge the gap between the physical and digital worlds. This technology not only enriches the way tourists interact with their surroundings but also fosters emotional connections

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and deeper understanding of destinations (Almujareb, et al., 2024; Sánchez-Juárez & Paredes-Xochihua, 2024). IoT devices allow for smart room controls and personalized service delivery, anticipating guest preferences and optimizing resource management (Talukder, et al., 2024; Chon & Hao, 2025). Block chain technologies have the potential to revolutionize the tourism industry by bringing transparency, security and innovation to the forefront. These technologies can improve waste management, security of the transactions and improve overall the marketing of the services (Önder & Gunter, 2022).

The studies in literature are still in the beginning phase and more explain the use of these technologies in tourism services despite other articles provided by the internet-related technologies providers companies (Sarnacchiaro, et a., 2024). The same situation is in the case of using crypto currency in the hospitality industry.

The adoption of the digital technologies field must consider the challenges faced by human resources and managers (e.g., as investments pressure). Some important challenges presented in the literature are:

(a) balancing automation and human interaction because while technology enhances efficiency, maintaining a personal touch remains crucial for guest satisfaction (Kishore et al., 2024);

(b) data security and privacy because the integration of advanced technologies raises concerns regarding data protection, necessitating robust security measures (Talukder et al., 2024).

Despite the benefits, the hospitality industry must navigate challenges such as employment displacement and the need for significant investment in technology and training (Kishore et al., 2024). Balancing technological advancements with human elements will be essential for future success in this industry.

In this dynamic context of adoption, digital innovation in the hospitality industry, the present research aims to explore and characterize the impact and potential of digital technologies in transforming the hospitality industry, focusing particularly on the development of digital tourism. The mixed methodological approach aims to support investigations and provide a comprehensive perspective on the challenges and opportunities brought by digital tourism in the new context of the hospitality industry. In the end of the paper, a set of conclusions are presented.

II. LITERATURE REVIEW

Digital tourism development is a transformative force in the tourism industry, leveraging digital technologies to enhance efficiency, sustainability, and customer experience. This development is characterized by the integration of digital tools such as big data, mobile applications, e-commerce, and sharing economy platforms, which collectively contribute to the sustainable growth of tourism sectors across various regions (Bekele & Raj, 2024).

The first stage of digital tourism development led to the emergence of online travel agencies (OTAs) and comparison sites, gradually replacing traditional channels of services distribution. The rise of OTAs and search engines opened new possibilities for travelers, allowing them to compare prices, read reviews and easily make informed decisions. This change has not only given consumers more decision-making power but has also forced traditional intermediaries in the tourism industry to adapt.

Smart destinations use a network of interconnected systems to improve visitor experience and resource management. This includes the use of location-based services and the IoT to optimize resource management and improve tourist interactions (UNWTO, 2024). Furthermore, digital tourism has expanded into the realm of social media and user-generated content. Platforms such as Instagram, TripAdvisor, and YouTube have become essential tools for destination marketing and travel decision-making.

The ability of tourists to share their experiences in real time has given rise to a form of word-of-mouth marketing that can greatly influence travel trends and destination popularity (Han et al., 2018; Bekele & Raj, 2024; Chon & Hao, 2025). As a global overview, Table 1 presents a synthesis of the key aspects of digital tourism development, drawing insights from multiple studies presented in literature.

While digital tourism development offers numerous benefits, it also presents challenges that need to be addressed to realize its full potential. The digital divide, regulatory barriers, and the need for enhanced digital literacy are significant hurdles that must be overcome. However, with strategic policies and investments in technology infrastructure, digital tourism can significantly contribute to sustainable development and economic growth in the tourism sector, as supported by the European Commission, too (EC, 2025a).

Table 1. Key aspects of digital tourism development.

Key aspect	Field of actions, arguments and debates	References
Role of digital technologies in tourism	*Big Data and Predictive Analytics*: Big data analytics are used to predict consumer preferences, allowing tourism businesses to tailor services and improve customer satisfaction. This approach enhances service quality and operational efficiency, contributing to sustainable tourism practices *Mobile applications and e-commerce*: Mobile apps facilitate navigation and information access for tourists, while e-commerce platforms streamline booking and purchasing processes. These tools increase the availability and accessibility of tourism resources, particularly in transition economies	(Konar et al., 2024; Polukhina et al., 2025)

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	Digital co-creation and personalization: Technologies such as AI and IoT enable personalized travel experiences, fostering a collaborative environment where tourists actively participate in creating their travel experiences. This shift from traditional to service-oriented approaches enhances authenticity and community building.	
Impact on sustainable development	*Environmental and economic benefits* - Digital solutions help reduce the environmental impact of tourism by optimizing resource use and promoting sustainable practices. They also drive economic growth by increasing tourism efficiency and competitiveness, as seen in regions like China and Greece. *Community empowerment and cultural preservation* - Digitalization supports community empowerment by creating new business models and preserving cultural heritage. This is particularly evident in alternative tourism markets, where digital tools enhance local ventures' competitiveness.	(Magoutas, et al., 2024; Zhang & Cheng, 2024)
Challenges and opportunities	*Regulatory and infrastructure barriers* -: In some regions, such as Indonesia, regulatory challenges and inadequate technological infrastructure hinder the full potential of digital tourism development. Addressing these issues through improved regulations and strategic policies is crucial for sustainable growth. *Digital literacy and education* - The integration of digital tools in tourism education enhances students' skills and adaptability in the digital landscape. However, there is a need for further development in media and digital literacy to maximize these benefits.	(Julianti & Pinpak, 2024; Rodríguez & Rodríguez, 2025)
The focus of future directions	*Smart development and innovation* - The future of digital tourism lies in the smart development of technologies that integrate deeply with the tourism economy. This includes the creation of new scenarios and modes of tourism that leverage digital intelligence for enhanced experiences. *Addressing the digital divide* - Bridging the digital divide is essential to ensure equitable access to digital tourism benefits. This involves expanding technology applications and overcoming challenges related to IT security and data privacy.	(Wu et al., 2024; Singh et al., 2024)

Source: Authors own development

III. RESEARCH METHODOLOGY

The research methodology has been designed having two specific stages:

(1) The analysis of the digital tourism indicators based on the EU Tourism Scoreboard (2025) supporting the analysis based on secondary data which has allowed a comparison of the Romania vs. EU27 status. It is well-known that, "the EU Tourism Dashboard offers interactive visualizations of data and indicators relevant for the European tourism ecosystem". The EU Tourism Dashboard operates with indicators related to the green, digital and socio-economic EU policy pillars which allow "profiling EU countries and monitoring their progress towards more sustainable tourism in environmental, digital and socio-economic terms". For the aim of this research, there have been considered and analyzed only the indicators related to the digital pilar. The research results interpretations are based on the graphical representation of the digital indicators for Romania and EU27;

(2) Qualitative research based on a semi-structured interview. At this stage of the research, the interest was to investigate operational aspects of Romania digital tourism, with a focus on security, user experience, and technological innovation. The main objectives followed by the qualitative research were:

- Understanding the current state and challenges in implementing digital tourism technologies from the information technology (IT) perspective;
- Exploring security measures and concerns related to digital tourism platforms;
- Investigating the role of emerging technologies (AI, VR/AR) in shaping the future of digital tourism;
- Identifying potential barriers and solutions for the wider adoption of digital tourism technologies;
- Collecting expert opinions on the integration of digital technologies with traditional tourism experiences.

The moderator has an interview guide available, containing a series of questions to be asked, to obtain as much relevant data for the research as possible. The research was addressed to professionals in the hospitality industry, from organizations in Romania. Since the research is exploratory, it was not aimed at obtaining a random statistical sample. Instead, participants who fit the objectives of the study were distinctly selected (20 professionals who accept the invitation that have more than five years of experience in the field and have different managerial positions). The data collection method was carried out through five online interviews organized with four participants each, via Zoom.

The data analysis (analysis of each interview) has been supported by the read.ai application connected to each Zoom meeting of interviews. This AI software act as a participant in the meeting, "taking notes" (record

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each participant intervention time, including the moderator behavior) and creating a summary, and key take aways of the meeting. The results interpretation provided by read.ai has been refined by a focus group organized by the authors of this article. These results have been centralized and in-deep analyzed by each question.

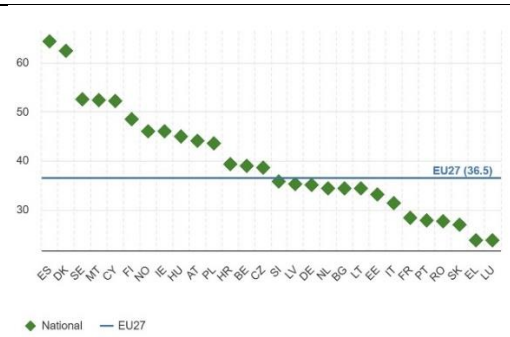
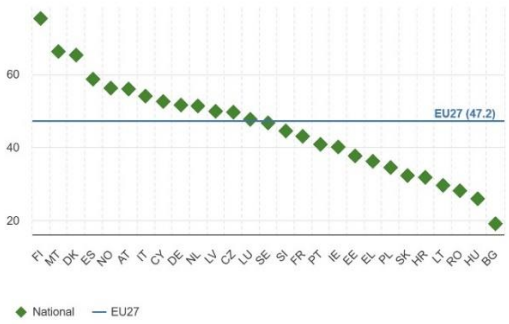
IV. RESULTS AND DISCUSSIONS

a. The Analysis of the Digital Tourism Indicators at the European Level

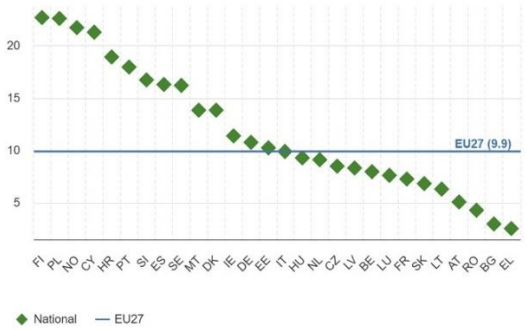
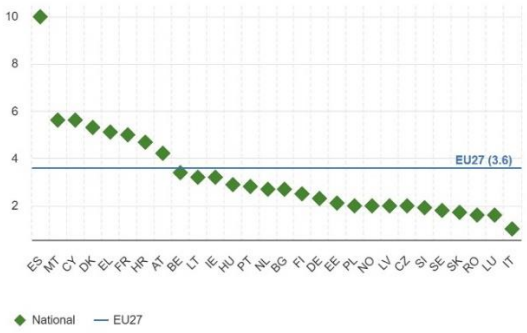
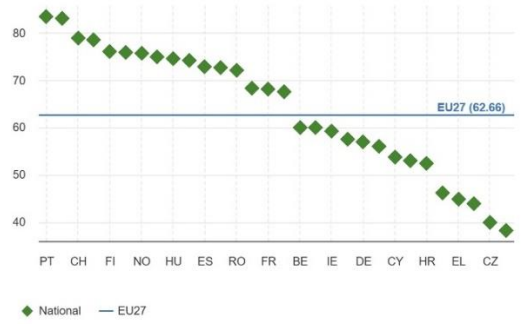
The EU Tourism Scoreboard (EC, 2025b) allows interactive access to data and indicators relevant to the European tourism ecosystem, including those related to the digitalization of tourism services. Thus, based on the functionalities of this online tool, an analysis (based on secondary data, provided by the Eurostat database) of the digital transition of European tourism was carried out, which provided a precise overview that can support operators in the field in developing evidence-based strategies. In addition, the platform also provides information on platforms, applications available at the level of each EU country in the field of digitalization of tourism services.

For this research, a comparative debate between Romania and the EU27 has been developed based on the allow profiling of EU countries and monitoring their progress towards the digital tourism. This secondary data analysis approach has been developed based on the EU Tourism Scoreboard and by considering only the digital tourism indexes (see Table 2). As can be observed, the only index in which Romania has a superior situation than the EU27 level is the “Internet speed at tourism destinations” (%). For the other analyzed indices, values far from the EU27 average are observed, which demonstrates that Romanian digital tourism is poorly developed, but as in the future, the situation can be maintained because of the "Personnel training on digital skills" (%) value and then due to the situations presented by the "Enterprise using social media" index (%) and the "Enterprises seeking ICT specialists" index (%) values.

Table 2. The digital pilar index characterizing the digital tourism development.

Index	Distribution per EU countries	Index for Romania	Index for EU27
E-commerce sales (%) based on the data available for 2023	 Source: ICT usage in enterprises, Eurostat (table: isoc_ec_eseln2, 2-digit NACE sectors considered: I55-I56, N79; weights from table: sbs_na_sca_r2).	27,7%	36,5%
Enterprise using social media (%) based on the data available for 2023	 Source: ICT usage in enterprises, Eurostat (table: isoc_cismt, 2-digit NACE sectors considered: I55-I56, N79; weights from table: sbs_na_sca_r2)	28,1%	47,2%

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Personnel training on digital skills (%) based on the data available for 2022	 Source: ICT usage in enterprises, Eurostat (table: isoc_ske_ittn2, 2-digit NACE sectors considered: I55-I56, N79; weights from table: sbs_na_sca_r2).	4,3%	9,9%
Enterprises seeking ICT specialists (%) based on the data available for 2022	 Source: ICT usage in enterprises, Eurostat (table: isoc_ske_itrcrn2, 2-digit NACE sectors considered: I55-I56, N79; weights from table: sbs_na_sca_r2).	1,6%	3,6%
Internet speed at tourism destinations (%) based on the data available for 2023	 Source: JRC, based on: Ookla (internet speeds); TripAdvisor (location of tourism accommodation capacity).	72,02%	62,66%

Source: Authors synthesis based on the data available at (EU Tourism Dashboard, 2025).

Table 3. The qualitative research results (results from the five online semi-structured interviews)

Question	Comments synthesis, refined from those provided by read.ai after each online meeting	Interpretations and conclusions
What do you think are the biggest challenges in implementing digital tourism technologies?	User adoption and education represent a significant challenge. Respondents highlighted resistance to change and the need for training of both tourists and industry personnel. Financial and infrastructural aspects constitute another important barrier. The implementation of these technologies requires substantial investments, both in the development and maintenance phases. The lack of adequate infrastructure was also mentioned as a major impediment. Data security and the protection of personal information stand out as a central concern. The considerable volume of personal and financial data processed in the tourism sector accentuates this issue.	The successful implementation of digital solutions in tourism faces a multifaceted array of challenges. Overcoming resistance to change through comprehensive user adoption and education programs for both tourists and industry personnel is crucial. Significant financial investment and the development of adequate infrastructure are prerequisites for deployment. Furthermore, robust data security measures and the protection of personal information are paramount concerns that must be addressed proactively. Ensuring seamless integration and interoperability across

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	Integration and interoperability of systems represent another major challenge. Effective coordination between various actors in the sector is necessary. Ensuring equitable access to technology for all stakeholders was identified as a major challenge in implementing digital solutions in tourism.	diverse systems and fostering equitable access to technology for all stakeholders are also essential for realizing the full potential of digitalization in the tourism sector. Addressing these interconnected challenges holistically will be key to unlocking the benefits of digital transformation and fostering a more efficient, sustainable, and inclusive tourism industry.
What are the main cybersecurity risks in digital tourism platforms?	Theft and exposure of personal data: Almost all respondents mentioned this risk, underlining the importance of protecting users' personal information. Phishing and social engineering attacks: Several respondents highlighted these types of attacks as significant risks. Vulnerabilities in payment and reservation systems have been mentioned as the risks associated with online payment and reservation systems. Identity theft was explicitly mentioned by two respondents, but implicitly in many other responses that refer to unauthorized access to personal data. Ransomware and Denial-of-service attacks (DoS) that can block the functioning of hardware infrastructure. Lack of necessary skills in the case of staff, which can lead to vulnerabilities in security systems. Impact on customer trust, referring to the long-term consequences of possible security breaches in hospitality establishments. Large-scale vulnerabilities, referring to the potential impact on many users in the event of a successful cyberattack.	Overall, the responses cover a wide range of cybersecurity risks relevant to digital tourism platforms. They reflect a good understanding of the security challenges in this area, from common risks such as phishing and data theft, to more specific concerns related to new technologies and the impact on customer trust. The diversity of responses provides a comprehensive picture of the perceptions of security risks of hospitality industry managers in adopting and promoting digital tourism, which is a valuable result for a qualitative study.
How do you see AI and machine learning transforming the hospitality industry?	Personalization was identified as a key aspect of the transformation brought by AI and ML in industry operations. This includes personalized offers, intelligent recommendations and experiences tailored to individual needs. The importance of AI-based recommendation systems to suggest suitable destinations, activities or offers was highlighted. Respondents mention improving operational efficiency by automating processes and analysing data in real time. The role of virtual assistants and chatbots in improving communication with customers and providing rapid information is highlighted. The ability of AI and ML to optimize prices and dynamically adjust offers, to analyse customer behaviour and trends (through the ability of AI and ML to analyse search patterns and tourist behaviours to anticipate trends) was highlighted. The usefulness of AI for automatic content generation to update and improve websites or social media presence of units in the hospitality industry was highlighted. Virtual tourism is associated with the concept of virtual travel, to help those who cannot travel physically. This is often overlooked, but technological advances can bring great benefits to such social categories. Security risks and threats are highlighted in the use of AI and ML in tourism, as well as the possibility of these technologies being used by cyber attackers.	Overall, the responses provide a comprehensive and nuanced picture of how AI and machine learning are perceived as transformative factors in the tourism industry, reflecting both the opportunities and challenges associated with these technologies.
How can VR/AR technologies be better integrated into the travel experience?	Pre-trip virtual tours are positively appreciated by most respondents as an important way to help tourists explore and choose destinations before traveling. Enriching cultural and historical experiences supports the potential of VR/AR to provide historical and cultural context, as well as interactive reconstructions of historical sites. The use of augmenting the on-site experience by using VR/AR to add interactive information and context during actual visits is highlighted. Improving tourism marketing is supported by using VR/AR to improve the presentation and promotion of destinations.	All the ideas presented are in line with current trends and the recognized potential of VR/AR in tourism. There is a broad understanding of the potential of VR/AR to enhance the tourist experience at all stages: pre-trip, during the trip and post-trip. Respondents emphasize the importance of balancing technology with the authenticity of real experience. The answers refer to specific applications (such as digital information boards, QR codes) to

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	Navigation and orientation are mentioned as supporting interactive guide-type applications that can be accompanied by simulations and immersive experiences (for tourist activities and exploring inaccessible destinations). The wider possibility of personalizing the experience offered by the potential of VR/AR technologies. The association with mobile applications and reservation systems can be achieved by integrating VR/AR with other digital technologies in tourism. Providing more powerful post-travel experiences through VR/AR for creating digital souvenirs or memento experiences. The potential of VR/AR technologies to facilitate the documentation and sharing of travel experiences is mentioned.	broader concepts of enriching the cultural experience.
How can the digital divide be addressed in the context of tourism technologies in Romania?	Education and awareness - this aspect is seen as essential in reducing the digital divide by developing the digital skills of workers, including managers; the need to provide guidance and assistance for users is highlighted. Investments in digital infrastructure are aimed at improving access to technology. Development of accessible and easy-to-use applications - this includes adapting technologies to different needs and resources. Compatibility with older devices - ensuring that applications work on older hardware devices or in areas with poor connectivity but also optimizing applications for mobile devices. Collaboration and public-private partnerships between different sectors (from the IT and hospitality industries) to improve digital infrastructure and create a digital ecosystem including big data, innovation and smart tourism networks. Use of AI to create experiences adapted to different categories of users. The use of AI for automatic website generation, this specific solution to help reduce the digital divide, is also considered.	The analysis results outline several key strategies to reduce the digital divide and promote digital inclusion. Education and awareness initiatives are crucial for developing digital skills among workers and providing user support. Investments in digital infrastructure are necessary to improve technology access. The development of accessible and user-friendly applications, including adaptation to different needs and compatibility with older devices and mobile platforms, is essential. Collaboration and public-private partnerships are vital for enhancing digital infrastructure and creating a smart tourism ecosystem. Finally, the use of AI to personalize experiences and even automate website generation is highlighted as a potential solution to bridge the digital divide.
What emerging technologies do you think will have the biggest impact on tourism in the next 5-10 years, in Romania?	• AI and ML are seen as having a major impact in personalizing experiences, improving customer relationships and optimizing operations. • VR/AR are perceived as technologies that will transform tourism experiences, offering immersive tours and contextualized information. • Blockchain is mentioned for securing transactions and identity management. • IoT and 5G are seen as technologies that will improve connectivity and enable the development of smarter and more personalized services. • Robotization and automation for customer service and streamlining operations. • Voice search technologies mentioned interact more naturally with tourism services. • Facial recognition is mentioned in the context of security and • personalization of services. • Big Data technologies are used for analyzing and effectively using data in the hospitality industry. • Cybersecurity issues mentioned in the general context of the increasing importance of data security in the digital age. • Decentralized Technologies, without a specific specification.	The research results offer several key insights into the perceived impact of emerging technologies on the tourism and hospitality industries. In summary, the insights point towards a future of tourism are characterized by more personalized and immersive experiences, enhanced operational efficiency, greater security, and data-driven decision-making, all enabled by the integration of these advanced technologies.

Source: Author's own development.

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b. The Qualitative Research Results

Since the indices presented in Table 2 refer to the situation in 2023 and 2022 and are based on data reported by the Romanian Ministry of Tourism, the intention of the research was to discover other facets of reality in the development of digital tourism in Romania. Thus, qualitative research was developed with hospitality industry managers, which was carried out from September 2024 – February 2025 and was based on semi-structured interviews. This research has provided valuable insights into the implementation and the future of technologies used in the development of digital tourism. The research results are centralized in Table 3.

Qualitative research highlighted a significant increase in the adoption and use of digital technologies in tourism. Mobile travel apps, booking platforms have recorded high adoption rates, demonstrating their deep integration into the modern travel experience. This trend reflects a fundamental change in the way tourists plan, book and experience travel (as perceived by the managers involved in the research). Furthermore, the research results revealed a predominantly positive attitude towards digital tourism technologies. Most managers consider that these technologies improve travel experience, facilitate planning and offer a greater degree of personalization. However, some reluctance was also observed, especially regarding data privacy and cybersecurity. Another aspect observed during the online interviews was the reluctance towards the novelty of technology, especially regarding the use of AI and how it will reflect and influence the behavior of the traditional consumer.

VII. CONCLUSIONS

The paper explores the impact and potential of digital technologies in transforming the hospitality industry, focusing on digital tourism. It highlights the integration of technologies like VR/AR, AI, and IoT, and their role in redefining tourist experiences. The research underlined the accelerated digitalization in the hospitality industry during the post-COVID-19 period focuses on the role of emerging technologies (such as AI, VR/AR, and IoT) in enhancing user experiences by optimizing service delivery and personalizing interactions. In the research context several key technologies have been discussed based on the literature review. Several challenges for the digital tourism development have been discovered (identified via the secondary data analysis and the qualitative research): balancing automation and human interaction (with a lor of efforts for maintaining the “personal touch” while enhancing efficiency in the process of services provided by the hospitality industry); data security and privacy to ensure robust security measures; urgent investment pressure which are required for technology and training. In addition, the study uses a mixed methodology combining literature review with qualitative research through semi-structured interviews with industry professionals. This approach provides insights into the implementation and future of digital tourism technologies.

The main research results are related to the analysis of the digital tourism indicators done based on the EU Tourism Scoreboard data and creating a comparative analysis of the digital tourism in Romania vs. EU27. Furthermore, qualitative research based on a semi-structured interview has highlighted challenges in user adoption, financial barriers, infrastructure, and data security in the case of digital tourism development. The study identifies key factors for developing user-friendly digital tourism platforms and proposes solutions for balancing digital innovation with authentic travel experiences. It emphasizes the importance of improving relationships with service providers and managing excessive tourism.

Several contributions of the presented research should be mentioned in compared to the analyzed literature: (a) the study focuses on the impact of digital technologies like AI, VR/AR, and IoT in transforming the hospitality industry, providing a detailed analysis of their implementation and future potential. The study specifically addresses the development of digital tourism, analyzing its evolution and the integration of technologies to enhance user experiences. This focus on digital tourism is a relatively new and rapidly evolving area in literature; (b) unlike many studies that rely solely on literature reviews, this research combines a comprehensive literature review with qualitative research based on semi-structured interviews which provides a more holistic view of the current trends and challenges.

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