

The Future of Spa Towns: Integrating Traditional and AI-Based Tools for Sustainable Tourism

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Abstract— Spa towns face new challenges due to the 21st century's global tourism demands and sustainability requirements. Traditional management tools are no longer sufficient to meet the rapidly changing needs of modern tourism. This research aims to evaluate the specific effectiveness of traditional and Artificial Intelligence (AI)-driven management tools in both international and Hungarian contexts, with particular attention to settlement characteristics and the unique challenges of tourism. The results suggest that a combination of traditional and AI-driven tools offers an effective solution to enhancing the sustainability and competitiveness of spa towns. The study places special emphasis on addressing differences between the spa towns and examining the social and ethical impacts of AI-driven tools.

Keywords: spa towns, management, artificial intelligence, sustainability, territorial and city differences

I. INTRODUCTION

In the 21st century, spa towns worldwide are facing new and increasingly complex challenges driven by the growth of global tourism, technological advancement, and sustainability requirements. Over the past decades, traditional management tools, which have played a fundamental role in the development of spa towns, are no longer sufficient to meet the changing demands of modern tourism. The emergence of Artificial Intelligence (AI)-driven management tools offers new opportunities that enable the personalisation of services, optimisation of resources, and assurance of sustainability. However, the application of AI-driven tools also raises numerous social and ethical issues, the management of which is critical for long-term success.

In modern management practices, innovative technologies such as AI are playing an increasingly important role, as they can significantly increase efficiency and competitiveness across various sectors (Ho et al., 2022; Wei–Lin, 2020). This is especially true in tourism, where traditional management tools are no longer sufficient to meet rapidly changing market demands. Spa towns, as outstanding destinations in tourism, face unique challenges that can only be effectively addressed through a comprehensive, integrated management approach and by exploring the opportunities offered by the brilliant tourism destination initiative (Errichiello–Micera, 2021; Kantor et al, 2016).

Spa towns have played a decisive role in tourism over the past centuries, especially in Europe, where spa-based medical tourism has seen significant development. However, the new challenges of global tourism and technological innovations – particularly the application of AI – are opening a new era in the management of these towns (Lisi & Esposito, 2015). Traditional management tools, which have so far ensured the sustainable development and competitiveness of spa towns, are no longer sufficient to meet the complex needs of modern tourism. The introduction of AI-driven tools offers the potential to increase the effectiveness of preventive and proactive management; however, their application may demonstrate varying effectiveness in different regional and international contexts. According to Sztubecka et al. (2022) and Mijajlović et al (2020), the long-term challenges to be analysed in future research on spa towns will be related to ecological and digital transition, competitiveness, sustainability, and resilience. A significant part of the modernisation and sustainability goals of spa-based medical tourism falls under the responsibility of large hotel resorts. Trip et al (2023) provide valuable insight into the ongoing debate on the impact of tourism on the environment and local communities, with particular attention to sustainable innovation opportunities in spa-based medical tourism in a significant region of Romania. Szromek (2021) proposes the development of a sustainable business model for Polish spa towns, based on the Canvas model (Osterwalder et al, 2010).

In their study, Hojcska et al. (2022) provide a comprehensive overview of the effects of therapies based on Hungarian medicinal waters, particularly in the treatment of musculoskeletal disorders. The value of the study lies in examining the effectiveness of therapies based on natural medicinal water resources, which are central elements of the touristic appeal of Hungarian spa towns. This research contributes to making the development of medical tourism in spa towns more effective by taking into account the correlations between demographic changes, the frequency of musculoskeletal diseases, and patients' habits regarding treatments

with medicinal waters. The research can assist spa town leaders and healthcare decision-makers in developing more targeted and sustainable medical tourism development strategies, considering the characteristics of different areas and the needs of patients.

This research aims to explore the specific effectiveness of traditional and AI-driven preventive and proactive management tools in spa towns, with special attention to the differences and similarities between the international and Hungarian contexts.

We seek to answer how traditional and AI-driven management tools can be integrated, what regional differences exist and how they affect outcomes, and what social and ethical challenges arise from the application of AI-driven tools.

This study examines three research questions:

1. How can traditional and AI-driven management tools be integrated to increase the effectiveness of spa towns?
2. What regional differences can be observed between spa towns, and how do these affect management strategies?
3. What social and ethical issues are raised by the application of AI-driven tools in tourism?

The research seeks to uncover, along these three questions, the challenges facing spa towns, the effectiveness of combining traditional and AI-driven management tools, and the regional and global differences related to them.

II. MATERIALS AND METHODS

The methodological foundation of this research is a comprehensive literature review that processes relevant international and Hungarian literature related to the management of spa towns. Additionally, we examine the effectiveness of traditional and AI-driven management tools applied in various spa towns through case studies. Qualitative data are processed using thematic analysis in order to identify key trends and topics.

The literature used in the research is sourced from international and Hungarian publications issued between 2014 and 2024. The analysed sources include scientific journals, books, conference proceedings, and articles from online databases such as Web of Science and Scopus. Particular attention was paid to publications with DOI and ISBNs, thus ensuring the reliability and credibility of the sources.

The first step of the research is a comprehensive literature review, in which relevant international and Hungarian literature on the management of spa towns was examined. Special attention was given to studies on traditional and AI-driven management tools, particularly in contexts where regional differences and cultural factors play a decisive role. The literature review aims to identify existing research and unexplored areas and topics.

The challenges of global tourism in the 21st century, including sustainability requirements, demand new approaches to the management of spa towns. Traditional tools alone are no longer sufficient to meet the changing needs of modern tourism. In this study, we examine the effectiveness of combining traditional and AI-based management tools for sustainable tourism. Special attention is paid to regional characteristics, including both Hungarian and international examples.

Traditional management tools, such as tourism planning and resource management, play a key role in tourism sustainability. Spa towns, particularly in Europe, have traditionally been centres of health and cultural tourism, but changes in the second half of the 20th century have presented significant challenges to these settlements. The transition towards sustainability requires the active participation of local communities and adaptability, especially in the preservation and adaptive reuse of cultural heritage (Fabi et al, 2021).

Traditional spa towns, such as the historical spa towns of Europe, have been centres of tourism and cultural exchange for decades. However, due to changing tourism trends, global competition, and new sustainability requirements, these cities in many cases have entered a period of decline. As Fabi et al (2021) also point out, adaptive reuse practices may be key solutions for promoting sustainability, particularly through the active involvement of local communities and the preservation of cultural heritage.

Traditional management tools, such as the development of tourism infrastructure, play a significant role in spa towns, especially where the preservation of ecological and cultural values is a central task. Numerous studies emphasise that the fundamental element of sustainable management is the involvement of local communities and the effective use of local resources (Varga & Dávid, 2013).

Traditional management tools, such as the utilisation of local resources, significantly contribute to maintaining tourism. According to Karosi & Bujdosó (2019), traditional methods alone cannot keep up with modern tourism trends, as they do not integrate the possibilities offered by digital technologies and AI.

AI-based management tools enable the enhancement of tourism sustainability and efficiency. For example, the concept of smart tourism is increasingly appearing in Hungarian developments, creating opportunities for the personalisation of visitor experiences and the optimisation of resources (Karosi & Bujdosó, 2019).

Traditional tourism management methods are limited in their ability to sustainably manage the impacts of tourism, especially in spa towns where the preservation of natural and cultural heritage is crucial. Szromek (2021) points out that many spa businesses do not apply sustainability-oriented business models, and there is low awareness among managers regarding the use of these tools.

A central element of the research was the analysis of case studies. We selected spa towns where we could demonstrate both the successes and challenges of applying traditional and AI-driven management tools. The comparative analysis of the case studies helped us understand the differences and similarities between regional and international contexts.

During the research, information was collected through case examples and analyses from the literature, providing insight into the practical aspects of applying management tools. We identified the most common themes and patterns that determine the use of traditional and AI-driven management tools in spa towns. Special attention was paid to regional differences and cultural factors that may influence the effectiveness of these tools.

In addition to the literature review, this material also presents partial results of a questionnaire survey (**Figures 1-2**). Structured questionnaires were completed by Hungarian professionals working in the tourism sector, with a total of 1,157 respondents.

The Role of AI in Sustainable Tourism

AI is increasingly integrated into tourism to enhance sustainability, optimise resource use, and improve visitor experiences. Key applications include real-time resource management, predictive analytics for waste and energy, personalised travel planning, and accessibility improvements for diverse tourist groups. For example, AI-powered predictive waste analytics and regenerative resource integration have been shown to improve material flow and support circular economy practices in tourism destinations, directly contributing to sustainability goals (Bang-Ning et al., 2025; Suanpang & Pothipassa, 2024; Afaq et al., 2024).

AI acts as a catalyst for tourism efficiency and smart tourism capabilities, driving both economic growth and environmental sustainability. Studies highlight AI's role in boosting GDP, attracting foreign investment, and supporting urbanisation, all while enhancing the sustainability of tourism operations (Siddik et al., 2025; Al-Romeedy & Alharethi, 2024). In small and medium-sized tourism enterprises, generative AI in digital supply chains has been found to improve innovation, collaboration, and ESG (Environmental, Social, and Governance) performance (Wang & Zhang, 2024).

The application of AI technologies offers significant opportunities to enhance the sustainability of tourism, including the management of intercommunal tourism consortia. AI tools, such as data collection and demand forecasting, contribute to the development and increased effectiveness of sustainable development strategies (Zancan et al, 2023). AI-based tools, such as predictive analytics and intelligent automation, can help optimise sustainable tourism by promoting more efficient use of resources (Majid et al, 2023).

AI-based systems provide significant advantages in the pursuit of sustainability. The example of the **Digital Local Tourism Management System (DLTMS)** demonstrates that integrating AI-based platforms improves tourism sustainability at the local level, particularly in planning, marketing, and monitoring processes (Pongsuppat et al., 2023). Thanks to intelligent automation, AI offers sustainable tourism solutions that both enhance tourist experiences and support environmental conservation (Majid et al., 2023).

The research results indicate that the combination of traditional and AI-based tools increases the sustainability and competitiveness of spa towns. The integration of adaptive reuse practices and AI-driven automation systems promotes the long-term sustainability of local communities while taking into account the specific regional challenges of tourism (Fabi et al., 2021; Zancan et al., 2023). Research shows that the combination of traditional and AI-based tools increases the competitiveness and sustainability of spa towns. The Fuzzy Multi-criteria Decision-making Model used by Mijajlović et al (2020) highlights that AI tools help optimise decision-making processes to achieve sustainability goals.

The application of AI tools raises significant social and ethical issues. The dynamics between local communities and tourists, as well as privacy concerns arising from the use of AI-based tools, present serious challenges. For sustainable tourism, it is essential that the application of AI-based tools aligns with the needs of local communities and takes into account their cultural heritage (Kantor et al, 2016).

Kashem et al. (2022) point out that the combined application of AI and blockchain technologies offers new opportunities in sustainable tourism, especially in the Middle East. These technologies contribute to achieving sustainability goals by ensuring transparency and efficient use of resources.

Overall, the combination of traditional and AI-based tools offers a promising solution for improving the sustainability and competitiveness of spa towns. The application of AI technologies promotes the efficient use of resources while considering regional characteristics and the needs of local communities.

The application of AI technologies also raises ethical issues, particularly regarding community involvement and the transparency of decision-making processes. The governance model for smart tourism destinations suggests that communities should actively participate in the development of technological solutions, thereby increasing sustainability (Errichiello & Micera, 2021).

III. ANALYSIS AND EVALUATION

Spa towns face significant challenges both globally and regionally, particularly regarding the application of traditional and AI-driven preventive and proactive management tools. These challenges include seasonal fluctuations in tourism, maintaining service quality, and ensuring sustainability. Through case studies, these challenges can be examined in detail, and it is possible to assess the extent to which various management tools help spa towns address these issues.

Traditional management tools, especially in spas managed by local governments, often face financial difficulties that limit the implementation of necessary developments. This is particularly problematic in the case of Miskolctapolca, where maintaining and developing the cave bath is a challenge due to scarce local resources (Marton et al., 2019). The example of Bath highlights that, in addition to preserving historical heritage, traditional spa towns must also meet modern tourism demands, which presents a challenge for traditional management tools (Fabi et al., 2021).

Traditional management tools, especially those used in spa towns managed by local governments, often face limited resources and financial problems. The case of Budapest reveals that traditional baths face challenges in modernising services and enhancing the visitor experience, especially in post-socialist regions (Smith et al, 2020). The lack of public funding makes infrastructure development and ensuring sustainability difficult.

In the cases of Hévíz and Karlovy Vary, traditional management tools play a fundamental role in preserving the historical and cultural heritage of these towns. These towns have a long tradition in spa-based medical tourism, and the maintenance of traditional spas is a central element of their tourism strategies. However, traditional tools alone are not sufficient to meet modern tourism demands and to remain competitive internationally. Without infrastructure development and the improvement of the visitor experience, these towns struggle to maintain their competitiveness (Fabi et al., 2021).

The example of Miskolctapolca demonstrates that regional characteristics, such as the uniqueness of the cave bath, represent significant attractions; however, preserving and developing these is a challenge for traditional management. Involving the local community and ensuring sustainability are crucial, but the lack of financial and infrastructural resources hinders development (Marton et al., 2019).

Spa towns, as tourist destinations, face particularly significant challenges in the 21st century when it comes to integrating sustainability and technological progress. The introduction of AI-driven management tools provides an opportunity to increase the efficiency and sustainability of tourism, but it is important to examine their actual effectiveness and applicability.

The application of AI technologies enables the development of sustainable tourism strategies, primarily through predictive analytical tools. Advanced technologies such as neural networks and machine learning can help manage the resources of tourist destinations more efficiently. Muminova (2022) points out that AI technologies offer opportunities to increase tourist safety and monitor environmental impacts, which is especially important for the environmental sustainability of spa towns.

AI-driven automation increases efficiency and allows tourist destinations to provide personalised experiences to visitors. Intelligent automation supports the analysis of tourist behaviour and preferences, enabling more accurate forecasts and decision-making. Zancan et al. (2023) emphasise in their research that using AI in the management of intercommunal tourism consortia can improve the quality of planning and decision-making, contributing to sustainable development.

AI tools have significant potential to address tourism sustainability problems, including reducing environmental impacts and using resources more efficiently. According to the systematic review by Majid et al. (2023), AI-based automation can improve the economic and sociocultural sustainability of tourism, although ecological aspects are less prominent.

AI-based management tools can optimise the use of resources and make tourism infrastructure more sustainable. The study by Gajdosík & Marciš (2019) points out that AI tools help analyse real-time data and customise experiences, which can contribute to sustainability in the long term.

The application of AI technologies also raises ethical issues, especially regarding the handling of tourists' data. The research conducted by Samala & Katkam (2020) highlights that while AI can increase tourism efficiency, it cannot fully replace personal interaction, which is a fundamental element of the tourism experience.

The effectiveness of AI-driven management tools is significant in increasing the sustainability of tourist destinations, particularly through predictive analytics and automation. The application of AI increases efficiency, reduces environmental impacts, and improves the tourist experience. However, attention should be paid to ethical issues, especially the management of personal data.

AI-driven management tools play an increasingly important role in spa towns, particularly in personalising the visitor experience and optimising services. The case of Zalakaros clearly illustrates that the introduction of AI-driven tools enables more accurate forecasting of visitor needs and improvement of services, which is especially important in managing seasonality (Könnyid et al., 2022).

The example of Rotorua in New Zealand indicates that AI-driven tools help maintain geothermal resources and ensure sustainable tourism. The use of AI allows for the optimisation of the visitor experience while protecting the city's natural resources. This approach can provide significant advantages in establishing sustainable tourism, especially in towns where natural assets play a key role in tourism (Horn-Simmons, 2002).

The following section provides an overview of the traditional and AI-based management tools that can be applied in tourism.

Figure 1 illustrates the distribution of traditional and AI-driven management tools in sustainable tourism. Here, we can see that 20% more respondents use AI-driven management tools compared to traditional versions.

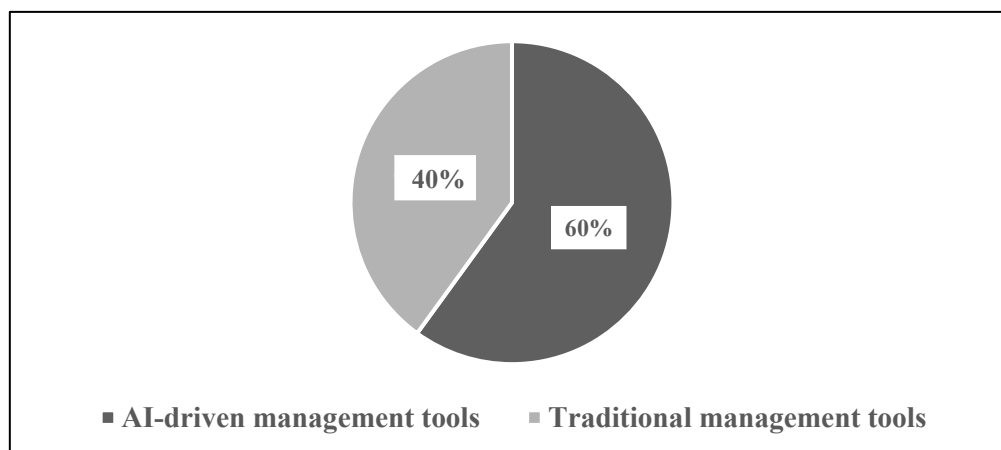


Figure 1. The Proportion of Traditional and AI-Driven Management Tools in Sustainable Tourism

Source: Own compilation, based on the Results of the Questionnaire Survey

The comparative analysis presented in **Table 1** on the application of AI in sustainable tourism is based on six academic sources. The table details the application of AI-driven management tools, their effectiveness, and the associated challenges within the context of tourism.

Table 1. Academic Sources on the Application, Effectiveness, and Challenges of AI in Tourism

Source	Application of AI in Tourism	Efficiency Improvement	Challenges
Lisi & Esposito (2015)	Application of AI techniques in integrated urban tourism planning	Service infrastructure tailored to user needs	The existence of a clear connection with local resources, activities, products, production and service sectors, and a participation-based local community
Pillai & Sivathanu (2020)	Use of AI-based chatbots in hospitality and tourism to increase customer engagement and automate services	Chatbots increase efficiency by automating travel services	AI chatbots cannot fully replace human interaction and may cause technological anxiety for users

Filieri et al. (2021)	AI-driven startups in Europe, especially in France, the UK, and Spain, are using big data, machine learning, and NLP.	AI startups increase personalisation and segmentation possibilities in tourism.	AI startups are concentrated only in large cities, limiting the spread of technology.
Ho et al. (2022)	Use of AI-based online services in Malaysian tourism to enhance service efficiency	AI technology increases customer satisfaction and improves service efficiency.	The cost and accessibility of AI-based online services can be a challenge for smaller enterprises.
Kashem et al. (2022)	A combination of AI and blockchain technologies in sustainable tourism, focusing on economic and environmental sustainability	Blockchain and AI promote more sustainable use of resources	Adapting AI and blockchain technology requires additional resources and expertise
Zancan et al. (2023)	Use of AI to manage and integrate inter-municipal tourism consortia	Better planning and decision-making, as well as project implementation	Compliance with data protection and ethical standards

Source: Own Compilation Based on the References

The analysis of the cases presented in Table 1 reveals that spa towns face various challenges – such as seasonality, sustainability, and optimising the visitor experience – depending on urban characteristics and national tourism policies. Differences between spa towns have a significant impact on the effectiveness of management strategies.

In the case of Rotorua, geothermal resources and local culture are an integral part of the town's tourist appeal, which are successfully integrated with modern management tools (Horn & Simmons, 2002).

In the management of intercommunal tourism consortia, AI technologies are used, particularly in France, the United Kingdom, and Spain. AI supports planning and decision-making, contributing to coordination between municipalities and the achievement of sustainability goals (Zancan et al., 2023).

In the Middle East and North Africa, AI and blockchain technologies are applied in sustainable tourism. These technologies contribute to economic growth and environmental protection, improving the sustainability of local tourism (Kashem et al., 2022).

In Italy, AI technology is used for integrated tourism planning based on local resources and communities. AI supports data collection and the customisation of local tourism services (Lisi & Esposito, 2015).

AI-based chatbots are used in the hospitality and tourism industries, assisting users in accessing and interacting with travel-related information (Pillai & Sivathanu, 2020).

These AI-driven tools support tourism sustainability and enhance visitor experiences in various locations and cities, while also increasing the efficiency of tourism service management.

The mentioned areas have made significant progress in integrating AI-based technologies into tourism.

Figure 2 illustrates the extent to which AI contributes to decision-making as well as economic, environmental, and sociocultural sustainability. AI also supports the effective implementation of the ESG approach in tourism. Here, it is apparent that the advantage of economic sustainability is the most significant in tourism. The use of AI to improve decision-making is also close behind.

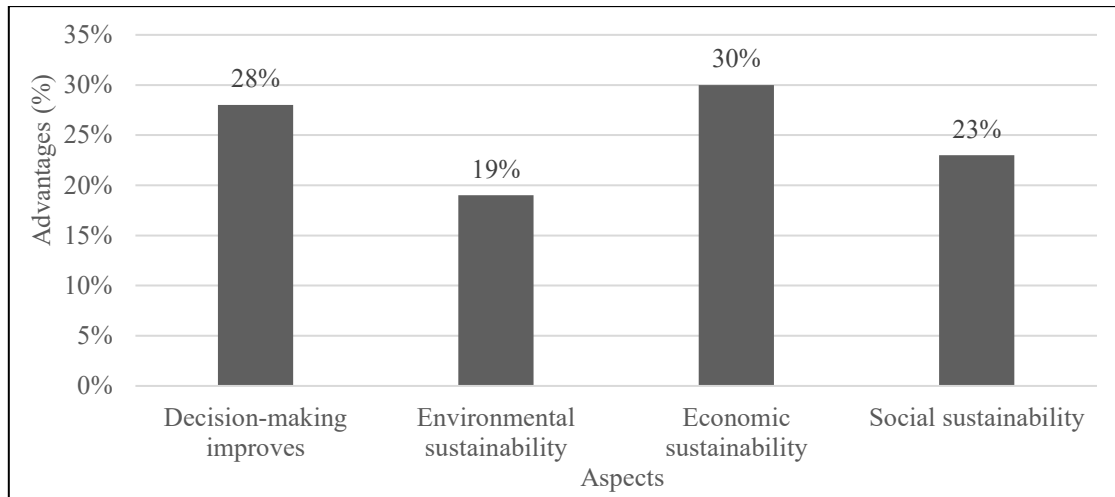


Figure 2. The Advantages of AI Applications in Sustainable Tourism
Source: Own Compilation Based on the Results of the Questionnaire Survey

Table 2 provides an overview of measuring the specific effectiveness of traditional and AI-driven preventive and proactive management tools, considering the differences and similarities of the international context, with special emphasis on regional characteristics and the unique challenges of tourism.

Management Tools	Traditional Tools	AI-driven Tools	International Differences	International Similarities	Regional Characteristics and Tourism Challenges
Preventive Management	Local health regulations and protocols, strict inspections	AI-based health data analysis, predictive modelling for epidemic prevention	Stricter health standards in Western Europe, more local regulations in Eastern Europe	Prevention of epidemics and health risks is important	Regional differences in the development of local health infrastructure and epidemic management
Proactive Management	Manually conducted visitor surveys, service development plans	AI-based guest experience analysis, real-time data processing, personalised offers	Stronger focus on personalised services in Western Europe, more standardised in Eastern Europe	Increasing guest experience and the number of returning visitors	Different tourism needs, e.g., luxury vs. mass tourism
Sustainability Tools	Energy-saving measures, water use optimisation	AI-based energy and water optimisation, environmental impact assessments	More advanced sustainability technologies in Western Europe, lower technological level in Eastern Europe	The key goal is sustainability and reducing the environmental footprint	Regional factors such as water source availability and differences in environmental load capacity
Addressing Tourism Challenges	Managing seasonality with traditional marketing campaigns and pricing	AI-based demand forecasting, dynamic pricing, analysis of weather and economic conditions	More advanced marketing and market research in Western Europe, lower-budget campaigns in Eastern Europe	Managing seasonality and maximising demand year-round	Regional differences in weather conditions and tourism seasons require different solutions
Risk Management and Emergencies	Traditional risk assessment methods, local crisis management plans	AI-based risk analysis, real-time crisis monitoring and response strategies	Higher-level predictive systems in Western Europe, more reactive approaches in Eastern Europe	Rapid and effective response in emergencies is critical.	Regional factors such as the risk of natural disasters and differences in local infrastructure capacities

Table 2. The Content and Characteristics of Management Tools in Tourism
Source: Own Compilation Based on World Bank Group, 2022.

The application of AI-based systems supports preventive management, as they are capable of forecasting the emergence of economic problems, thereby enabling leaders to take appropriate measures (Jie, 2004).

The goal of preventive management in organisations operating in the tourism sector is to identify and address potential problems in advance in order to avoid or minimise their adverse impacts. This approach includes developing risk management strategies, planning for crisis management, and establishing internal control systems that promote stable operation and long-term sustainability of the company (Boddy, 2019; Mintzberg, 1973). A central element of preventive management is the implementation of precautionary measures aimed at minimising risks and reducing the impacts of unforeseen events.

Proactive corporate management is a leadership and management approach in which organisations address future opportunities and challenges proactively, before they occur. In the tourism sector, proactive management aims to prepare for rapid adaptation to the changing market environment, thereby increasing the chances of gaining a competitive advantage. The proactive approach involves forecasting, strategic planning, and fostering continuous innovation and development (Robbins & Coulter, 2021; Mintzberg, 1973). This approach is particularly important in the tourism sector, including in spa towns, where leaders must anticipate market trends and changes in consumer demand.

The comparison of case studies highlights that the combination of traditional and AI-driven management tools can be more effective than either approach alone. The examples of Miskolc and Balaton show that traditional spa towns need modern technological solutions to remain competitive in the global tourism market (Fabi et al, 2021). At the same time, AI-driven solutions can only be effective if they take into account local characteristics and sustainability aspects.

IV. RESULTS AND CONCLUSIONS

This section presents the answers and solutions to the research questions following the (1) analysis, (2) case example, and (3) conclusion logic.

How can traditional and AI-driven management tools be integrated to increase the efficiency of spa towns?

(1) Traditional management tools, which ensured the sustainability of spa towns for centuries, are no longer sufficient on their own to meet the rapidly changing needs of modern tourism. Integrating AI-driven tools with traditional approaches provides an opportunity for spa towns to manage visitor needs more effectively, optimise services, and operate more sustainably. The application of AI technologies, for example, in analysing visitor preferences, managing seasonality, and resource management, can significantly contribute to enhancing competitiveness.

(2) Zalakaros, a Hungarian spa town, has successfully integrated AI-driven management tools into its traditional tourism development strategies. With the help of AI, they gained a better understanding of visitor needs, which enabled personalised services and reduced seasonality. This integration significantly contributed to the town's competitiveness and sustainability (Könnöy et al., 2022).

(3) The integration of traditional and AI-driven management tools offers a more effective solution for spa towns, as it enables sustainable development and the maintenance of competitiveness in the global tourism market.

What regional differences can be observed between spa towns, and how do these affect management strategies?

(1) The efficiency of spa towns largely depends on regional characteristics such as natural resources and cultural heritage. These factors significantly influence not only the attractiveness of tourism but also the success of management strategies. There are noticeable differences between Eastern and Western European spa towns, where regional characteristics and cultural differences require different management approaches.

(2) The luxury spas of Baden-Baden in Western Europe primarily focus on premium tourism, where the combination of traditional and modern services plays an important role. In contrast, Hévíz, one of the largest spa towns in Hungary, is mainly based on medical tourism, where natural assets such as thermal water and medicinal mud play a central role in management strategies (Fabi et al., 2021).

(3) Taking regional differences into account is fundamental when developing management strategies for spa towns. Maximising efficiency requires the use of management tools tailored to the unique characteristics of natural resources and cultural heritage.

(1) Regional differences, such as natural resources and cultural heritage, play a decisive role in the success of spa towns' management strategies. Due to different priorities and characteristics, site-specific approaches are needed to maximise the

effectiveness of management tools. Regional differences influence not only the attractiveness of tourism but also the demand for sustainability.

(2) During the development of medical tourism in spa towns along the Bulgaria-Serbia border, geomedical and socio-economic factors were considered. Local resources, such as thermal springs and climate, played an outstanding role in shaping tourism services and achieving sustainability goals (Staneva, 2019).

(3) Considering regional differences is fundamental when developing management strategies for spa towns. Adaptation to natural and cultural resources is necessary to achieve sustainable and competitive tourism.

What social and ethical issues are raised by the application of AI-driven tools in tourism?

(1) The introduction of AI-driven tools brings not only technological advantages but also significant social and ethical challenges. The use of AI-based systems, for example, for analysing visitor data and predictive modelling, raises questions of data protection, user consent, and potential social inequalities. Furthermore, the use of AI can affect relationships with local communities, especially when technological solutions do not consider local needs and values.

(2) In the case of Hungarian spa towns, the application of AI-driven tools provided an opportunity to enhance the visitor experience, but also posed challenges, such as ensuring the protection of personal data. During the implementation of AI systems, it was important to involve local communities and ensure the transparency of technological solutions (Smith et al., 2020).

(3) The application of AI-driven management tools raises significant social and ethical questions, the resolution of which is critical to achieving sustainable and ethical tourism. Close cooperation with local communities and ensuring data protection are key to the successful implementation of technology.

(1) The introduction of AI-driven tools raises not only technological but also social and ethical challenges. The use of AI-based systems brings up data protection issues and challenges traditional ethical norms, especially regarding transparency, responsibility, and fairness. In addition, the application of AI can affect the dynamics of local communities and the realisation of sustainable tourism.

(2) The application of AI in the management of inter-municipal tourism consortia in Brazil has enabled improved sustainability but also posed challenges in terms of data protection and adherence to ethical standards. When using AI, it was essential to take social and ethical considerations into account to ensure local community and tourism sustainability (Zancan et al., 2023).

(3) The introduction of AI-driven management tools raises significant social and ethical questions, the resolution of which is essential for ensuring sustainable tourism. The involvement of local communities is indispensable for the responsible and successful application of AI.

The analysis of case studies makes it clear that managing sustainability and regional differences is key to the long-term success of spa towns. The examples of Hévíz and Karlovy Vary show that local characteristics and AI-based solutions play a critical role in managing seasonality and meeting tourist needs (Smith & Dryglas, 2020). Regional characteristics, such as natural resources or cultural heritage, shape tourism and management strategies.

The sustainability of spa towns is closely linked to regional characteristics such as the availability of natural resources, the local economic environment, and cultural heritage. In different regions, these factors have a significant impact on the development and implementation of management strategies, as well as on achieving sustainability goals.

It would be worth investigating the effects of AI technology application in different cultural and regional contexts, as well as addressing the challenges arising during integration. Within this, research could focus on the extent to which AI can contribute to sustainability and increase the competitiveness of tourism (Wei & Lin, 2020).

Further research on the social and ethical impacts of AI-driven management tools is essential for the sustainable development of spa towns. It would be important to examine how the transparency and data protection of AI technologies can be ensured, and how possible negative social impacts can be minimised. In addition, it would be important to explore the ethical frameworks that protect the interests of local communities while enabling innovation and technological advancement (Duan et al., 2019).

Differences between cities are also evident in the application of AI-driven management tools. While the integration of AI-based systems in spa towns is increasingly widespread in Western Europe, in Central and Eastern European countries, such as Hungary, these innovations are still limited, partly due to economic constraints and lower technological maturity (Fehér & Veres, 2022).

V. SUMMARY AND RECOMMENDATIONS

The new challenges facing spa towns are multifaceted and complex at both global and regional levels. Traditional management tools, which ensured the sustainability and competitiveness of these towns for centuries, are no longer sufficient to meet the rapidly changing needs of modern tourism. The introduction of AI-driven preventive and proactive management tools offers new opportunities for spa towns to better adapt to the challenges of global tourism, increase their efficiency, and achieve long-term sustainable development.

This study has demonstrated that the combination of traditional and AI-driven management tools can contribute effectively to the success of spa towns, provided that these tools are appropriately adapted to local characteristics and regional differences. For example, in Central and Eastern European regions such as Hajdúszoboszló, the success of sustainability efforts largely depends on the utilisation of local resources and the integration of AI-based innovations (Csobán et al., 2022). At the same time, Western European spa towns such as Baden-Baden are already in a more advantageous position due to their advanced technological infrastructure, which allows for the broader application of AI-driven management tools (Fabi et al., 2021).

The introduction of AI-driven tools brings not only technological advantages but also social and ethical challenges, the resolution of which is crucial for long-term sustainability and the success of tourism (Fehér & Veres, 2022). Taking regional differences and local characteristics into account is essential for spa towns to successfully adapt to the requirements of global tourism and achieve sustainable development.

The research not only examines the integration of traditional management tools and AI-based solutions but also the social and ethical issues related to the application of AI. In addition to the potential benefits of AI-driven management tools, it is important to consider their possible negative impacts, especially in light of regional differences and cultural factors. This research also contributes to the development of sustainability strategies for spa towns, which are key to ensuring future tourism competitiveness.

Based on the review of the literature and case studies, it can be concluded that the combination of traditional and AI-driven management tools offers the best opportunity for spa towns to maintain competitiveness and ensure sustainability. Traditional tools are crucial for preserving historical and cultural heritage, while AI-driven tools provide opportunities for personalised services and the development of sustainable tourism. To address regional differences, it is recommended to develop integrated management strategies tailored to local characteristics, considering both global tourism trends and the needs of local communities.

It is essential to enhance the sustainability and competitiveness of spa towns. AI technologies, such as machine learning and predictive analytics, enable more accurate and faster decision-making, optimise service delivery, and reduce operational costs. However, these new technologies can only function effectively if they are appropriately integrated into existing traditional methods, which are deeply rooted in local culture and the economy.

The success and sustainability of spa towns largely depend on regional differences, such as natural resources, cultural heritage, and local economic conditions. These factors influence the effectiveness of management tools and the attractiveness of tourism. Considering regional differences is indispensable for long-term sustainable development.

The introduction of AI-driven management tools raises significant social and ethical challenges, including data protection, ensuring equal access, and taking into account the interests of local communities. In spa towns, social acceptance and adherence to ethical standards are also essential for the successful implementation and sustainability of AI technologies.

Based on the research and conclusions, the following recommendations can be formulated. An integrated management strategy should combine the advantages of traditional and AI-driven tools. This includes applying AI-based predictive analytics and machine learning to forecast tourism demand and optimise services, while maintaining traditional, site-specific management methods that consider cultural and regional particularities.

A site-specific sustainability strategy means that each spa town should develop its sustainability strategy, which takes into account local environmental, economic, and cultural characteristics and implements sustainable development projects based on these. Therefore, the development of spa town management should consider regional differences and local resources.

When introducing AI-driven management tools, it is essential to integrate social and ethical considerations into planning and implementation processes. It is recommended to establish a comprehensive ethical framework that ensures data protection, equal access, and the protection of local community interests, while also enabling innovation and technological progress.

In summary, the study found that the combination of traditional and AI-driven management tools provides the best approach for spa towns to address modern challenges. Integrated management strategies that take into account differences between countries and regions enable these towns to preserve their historical and cultural values, while also adapting to future tourism trends, thus ensuring their long-term sustainability and competitiveness.

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