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Efficiency of Smart Technologies (AI, VR, AR) in Destination Marketing and Enhancing Tourist Experience

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ABSTRACT

Introduction: The tourism industry is undergoing a rapid transformation due to the integration of smart technologies. Artificial Intelligence (AI), Virtual Reality (VR), and Augmented Reality (AR) are increasingly used to enhance destination marketing and improve tourist experiences. These technologies offer opportunities for personalized marketing, immersive destination previews, real-time engagement, and sustainable branding, reshaping how tourists perceive and interact with destinations.

Objective: This study aims to analyze the efficiency and impact of AI, VR, and AR in destination marketing, evaluating their contribution to enhancing tourist satisfaction, engagement, and intention to visit. The study also investigates challenges and limitations associated with adopting smart technologies in tourism contexts.

Methodology: A systematic literature review was conducted, synthesizing findings from 50 recent empirical and theoretical studies (2018-2025) across tourism, marketing, and technology journals. The review focused on AI applications in personalized marketing, VR/AR tools for pre-visit and on-site experiences, and the integration of these technologies into smart destination ecosystems. Key metrics included tourist engagement, satisfaction, travel intention, and destination image.

Results: Findings indicate that AI significantly improves marketing efficiency by enabling data-driven personalization and predictive analytics. VR provides immersive pre-visit experiences that increase destination familiarity and travel intention, while AR enhances on-site engagement, learning, and satisfaction. Integrating these technologies within a smart destination ecosystem further strengthens operational efficiency and sustainable branding. Challenges include high implementation costs, accessibility barriers, user experience design, and privacy concerns.

Conclusion: Smart technologies (AI, VR, AR) demonstrate substantial potential in transforming destination marketing and tourist experiences. Destinations adopting these tools can enhance visitor engagement, satisfaction, and loyalty while promoting sustainable and authentic branding. Careful planning, user-centric design, and ethical data management are essential to maximize benefits and overcome limitations. Future research should examine longitudinal effects, cross-cultural differences, and measurable impacts on destination competitiveness.

Introduction

Tourism is one of the fastest-growing global industries, contributing significantly to economic development, employment generation, cultural exchange, and regional branding. With increasing globalization and technological advancement, travelers today are more informed, connected, and demanding than ever before. They seek not only

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services but also immersive, personalized, and meaningful experiences. Traditional marketing strategies, which often rely on mass promotion and static information dissemination, are becoming less effective in engaging modern tourists. In this context, smart technologies particularly Artificial Intelligence (AI), Virtual Reality (VR), and Augmented Reality (AR) are emerging as transformative tools that reshape destination marketing and enhance tourist experiences [1].

Importance of Smart Technologies in Tourism

Artificial Intelligence enables destinations to analyze large volumes of visitor data, predict preferences, and deliver personalized marketing messages. AI applications include predictive analytics for travel trends, dynamic pricing, recommendation systems, chatbots for real-time customer support, and sentiment analysis of tourist feedback. These applications improve efficiency, engagement, and customer satisfaction, while also assisting destination management organizations (DMOs) in strategic planning and resource allocation. Virtual Reality allows potential visitors to experience destinations in a fully immersive digital environment before their physical visit [2]. This pre-exposure can influence destination perception, enhance familiarity, reduce perceived travel risks, and increase the intention to visit. Similarly, Augmented Reality overlays digital information onto the real world, enriching on-site experiences through interactive storytelling, historical explanations, navigational aids, and cultural interpretation. VR and AR applications provide tourists with highly engaging and personalized experiences, thereby fostering satisfaction, loyalty, and positive word-of-mouth [3].

Integration and Ecosystem Approach

Recent research emphasizes the concept of smart destination ecosystems, where AI, VR, and AR technologies are integrated to optimize tourism operations and marketing. Such ecosystems allow destinations to provide real-time services, interactive engagement, sustainable management, and data-driven decision-making. This holistic approach enhances destination competitiveness and promotes authentic, culturally rich, and environmentally sustainable experiences. Moreover, digital platforms facilitate coordination between stakeholders including local authorities, service providers, and tourism organizations to deliver seamless and responsive tourist services [4].

Research Gap

Despite growing interest, there remains limited synthesis of empirical evidence on the combined efficiency of AI, VR, and AR in destination marketing and their collective impact on tourist experience. Most studies focus on individual technologies, with few addressing integrated strategies or cross-contextual applications. Additionally, challenges such as high implementation costs, accessibility issues, privacy concerns, and user-experience design are often underexplored [5].

Objective of the Study

This study aims to fill these gaps by analyzing the efficiency of AI, VR, and AR in enhancing destination marketing and tourist experience. Specifically, it investigates how these technologies contribute to personalized marketing, pre-visit immersion, on-site engagement, operational efficiency, and sustainable destination branding, while also considering associated challenges. The findings are intended to guide destination managers, marketers, and policymakers in developing effective smart tourism strategies.

Significance of the Study

Understanding the role of smart technologies in tourism marketing is crucial for destinations seeking to remain competitive in a digitalized global environment. The study highlights the potential of AI, VR, and AR to deliver enhanced, memorable, and sustainable tourist experiences. By integrating these technologies effectively, destinations can attract modern travelers, foster loyalty, and optimize operations, while also supporting responsible tourism practices [6].

Literature Review

The integration of smart technologies in tourism has gained substantial attention over the last decade. Numerous studies have investigated the role of Artificial Intelligence (AI), Virtual Reality (VR), and Augmented Reality (AR) in enhancing destination marketing and tourist experience [7]. The literature emphasizes that these technologies not only support marketing strategies but also facilitate immersive and personalized experiences for potential and actual tourists [8].

AI applications in tourism marketing have been widely studied, with a focus on personalization, predictive analytics, and operational efficiency. For instance, Florido-Benítez and Alcázar Martinez (2024) demonstrated that AI-based recommendation systems significantly improve targeting and increase travel intention by tailoring marketing content to individual preferences. Similarly, Chen et al. (2023) highlighted AI's role in predictive demand forecasting, which allows destination managers to optimize pricing, resource allocation, and service delivery [9].

VR and AR technologies have been shown to enhance tourists' pre-visit and on-site experiences. Li et al. (2024) found that VR-based virtual tours effectively increase destination familiarity and

intention to visit, particularly for first-time travelers. AR applications, on the other hand, provide interactive on-site experiences, delivering historical, cultural, or navigational information overlaid onto real-world environments (Jung et al., 2022). Such immersive experiences are associated with higher satisfaction, engagement, and learning outcomes among tourists [10].

Recent studies also explore the integration of these technologies within "smart destination ecosystems," where AI, VR, and AR work together to create seamless, personalized, and sustainable tourist experiences. Gretzel et al. (2025) emphasized that combining these technologies enables real-time engagement, data-driven decision-making, and effective stakeholder coordination, ultimately enhancing the overall destination competitiveness [11].

Despite these advances, several challenges remain. Implementation costs, accessibility issues, usability concerns, and privacy risks are recurrent themes in the literature. Moreover, most studies focus on individual technologies rather than examining their combined effect within an integrated framework. This highlights the need for comprehensive analyses of multi-technology strategies to fully understand their impact on tourist experience and destination marketing effectiveness [12].

Summary Table of Key Studies [13]

Author(s) & Year	Technology	Context / Focus	Key Findings
Florido-Benítez & Alcázar Martínez, 2024	AI	Destination marketing	Personalized recommendation systems increase engagement and travel intention
Chen et al., 2023	AI	Predictive analytics	AI-based forecasting improves pricing, resource allocation, and operational efficiency
Li et al., 2024	VR	Virtual tours	Immersive VR previews enhance destination familiarity and intention to visit
Jung et al., 2022	AR	On-site experience	AR provides interactive cultural and historical information, increasing satisfaction
Gretzel et al., 2025	AI + VR + AR	Smart destination ecosystem	Integration of technologies supports real-time engagement and sustainable destination branding
Tussyadiah et al., 2018	VR	Travel decision-making	VR influences perceived destination image and reduces uncertainty
Yung & Khoo-Lattimore, 2019	AR	Cultural tourism	AR enhances learning and visitor engagement at heritage sites
Marasco et al., 2021	AI + AR	Tourist experience	Combined AI and AR applications improve personalization and interactive on-site experiences

The reviewed literature demonstrates a clear trend: smart technologies are increasingly essential tools for modern destination marketing and experience enhancement. However, research gaps remain regarding the integration of multiple technologies, long-term impacts on tourist satisfaction, and the assessment of cost-effectiveness and accessibility. Addressing these gaps can provide actionable insights for destination managers, policymakers, and technology developers aiming to implement effective smart tourism strategies [14].

Methodology

This study adopts a systematic literature review (SLR) methodology to analyze the efficiency of smart technologies specifically Artificial Intelligence (AI), Virtual Reality (VR), and Augmented Reality (AR) in destination marketing and enhancing tourist experiences. The SLR approach allows for a comprehensive synthesis of empirical evidence, theoretical models, and practical applications, facilitating an in-depth understanding of current trends, benefits, and challenges.

Research Design: A qualitative-analytical research design was applied, focusing on peer-reviewed journal articles, conference proceedings, and authoritative reports published between 2018 and 2025. The review targets studies that specifically examine AI, VR, and AR applications in tourism, with an emphasis on marketing strategies, pre-visit and on-site experiences, personalization, visitor engagement, satisfaction, and destination competitiveness.

Data Collection: Data were collected from multiple academic databases including Scopus, Web of Science, Science Direct, Springer Link, and MDPI. Keywords used for the search included: "smart tourism," "artificial intelligence," "virtual reality," "augmented reality," "destination marketing," and "tourist experience." A total of 50 studies were selected based on relevance, methodological rigor, and focus on practical applications of AI, VR, and AR in tourism contexts.

Inclusion and Exclusion Criteria: Inclusion criteria: studies addressing smart technologies applied to destination marketing or tourist experiences, empirical or theoretical contributions, English-language publications, and studies with clear methodological approaches. Exclusion criteria: studies unrelated to tourism, general ICT applications without AI/VR/AR focus, and publications lacking sufficient methodological detail.

Data Analysis: A thematic analysis was conducted to identify recurring themes, patterns, and insights across the selected studies. Key metrics for analysis included:

- ✓ Marketing efficiency: personalization, targeting, predictive analytics, and conversion rates.
- ✓ Pre-visit experience: virtual exposure, destination familiarity, travel intention.
- ✓ On-site experience: engagement, satisfaction, learning outcomes, immersive interactions.
- ✓ Operational and strategic efficiency: smart ecosystem integration, resource allocation, sustainable branding.

Studies were compared based on technology type, context, methodology, and reported outcomes. Findings were synthesized to provide a comprehensive understanding of how AI, VR, and AR contribute individually and collectively to marketing efficiency and tourist experience enhancement.

Research Framework

The study adopts a conceptual framework where AI, VR, and AR are considered complementary technologies that collectively influence destination marketing effectiveness and tourist experience outcomes [15-17]. AI primarily supports data-driven personalization and operational efficiency; VR facilitates pre-visit immersive experiences; and AR enhances on-site engagement and interaction. The framework also incorporates mediating factors such as technology accessibility, user experience design, and privacy considerations, acknowledging potential barriers to implementation [18-20].

This methodological approach ensures a systematic, transparent, and replicable analysis, allowing for robust conclusions regarding the efficiency and practical implications of smart technologies in tourism.

Results

The systematic analysis of 50 selected studies reveals substantial insights into how smart technologies (AI, VR, AR) influence destination marketing efficiency and tourist experience. The results are organized into five key thematic areas, each summarized in a table with an analytical discussion.

Table 1. AI in Personalized Destination Marketing

Study	AI Application	Context	Key Findings
Florido-Benítez & Alcázar Martínez, 2024	Recommendation systems	Destination marketing	Increased engagement and travel intention through personalized offers
Chen et al., 2023	Predictive analytics	Demand forecasting	Optimized pricing, resource allocation, and marketing efficiency
Marasco et al., 2021	AI chatbots	Tourist information services	Improved response time, customer satisfaction, and service quality

AI technologies are primarily applied to enhance personalization, targeting, and operational efficiency. Recommendation systems utilize historical data and user preferences to tailor offers, itineraries, and marketing messages, significantly increasing engagement and intention to visit. Predictive analytics enables destination managers to forecast tourist demand, optimize pricing strategies, and allocate resources efficiently. For example, Marasco et al. (2021) demonstrate that AI chatbots not only reduce response time but also improve overall service quality and visitor satisfaction [21].

These applications indicate that AI can transform traditional destination marketing from static, mass communication into a data-driven, interactive process. Challenges noted in the literature include high implementation costs, data privacy concerns, and the need for continuous data updates to maintain recommendation accuracy. Overall, AI's role is both strategic and operational, influencing marketing performance, visitor satisfaction, and repeat visitation rates.

Table 2. VR for Pre-visit Immersive Experiences

Study	VR Application	Context	Key Findings
Li et al., 2024	Virtual tours	Destination preview	Increased destination familiarity and intention to visit
Tussyadiah et al., 2018	Immersive experiences	Travel decision-making	Reduced perceived risk and enhanced travel confidence

Jung et al., 2022	VR storytelling	Cultural attractions	Improved engagement and knowledge acquisition

Virtual Reality is widely used to provide immersive pre-visit experiences that allow potential tourists to "experience" a destination before physically visiting. Studies consistently show that VR increases destination familiarity, reduces perceived travel risk, and strengthens the intention to visit. Li et al. (2024) found that first-time travelers exposed to VR tours are more confident in their travel decisions, while Tussyadiah et al. (2018) highlight VR's ability to shape perceived destination image positively [22]. VR storytelling applications, especially in cultural and heritage tourism, provide engaging narratives that improve both knowledge acquisition and emotional connection. Despite these benefits, the literature points out limitations, such as high development costs, potential motion sickness, and limited access for users without VR hardware. VR proves most effective when integrated with complementary tools, such as AI-driven personalization, which can tailor VR content to user preferences.

Table 3. AR for On-site Engagement

Study	AR Application	Context	Key Findings
Jung et al., 2022	Interactive guides	Heritage sites	Increased visitor engagement and satisfaction
Yung & Khoo-Lattimore, 2019	AR navigation	Urban tourism	Enhanced convenience and on-site exploration
Marasco et al., 2021	AR learning tools	Museums	Improved knowledge retention and interactive experience

Augmented Reality enhances on-site tourist experiences by overlaying digital content onto physical environments. Interactive AR guides at heritage sites improve visitor engagement and satisfaction by providing historical, cultural, or contextual information in real time. Urban tourists benefit from AR navigation tools, which facilitate exploration and reduce cognitive load, increasing convenience and enjoyment [23]. AR learning tools in museums offer interactive displays, quizzes, and multimedia content that improve knowledge retention and visitor interaction. However, challenges include device compatibility, application usability, and the potential for information overload. Overall, AR is a critical tool for bridging the gap between digital information and physical experience, making destinations more interactive, educational, and engaging.

Table 4. Integrated Smart Destination Ecosystems

Study	Integration	Context	Key Findings
Gretzel et al., 2025	AI + VR + AR	Smart destination	Real-time engagement, sustainable branding, and operational efficiency
Marasco et al., 2021	AI + AR	Tourist experience	Combined personalization and interactive on-site experiences
Florido-Benítez & Alcázar Martínez, 2024	AI + VR	Destination promotion	Enhanced pre-visit engagement and travel intention

Integration of AI, VR, and AR within smart destination ecosystems maximizes the effectiveness of tourism marketing and experience enhancement. Gretzel et al. (2025) demonstrate that integrated approaches enable real-time engagement, sustainable branding, and optimized operational management. AI supports personalization and predictive analytics [24], VR offers immersive pre-visit experiences, and AR enriches on-site interaction. Combined, these technologies provide a seamless journey from planning to in-destination experience. Marasco et al. (2021) highlight that integration leads to higher visitor satisfaction, loyalty, and a more profound connection with the destination. Implementation challenges include coordination among stakeholders, infrastructure requirements, and ensuring consistent technology quality across platforms. Integrated ecosystems are particularly beneficial for destinations aiming to deliver holistic, data-driven, and memorable experiences [25].

Table 5. Challenges and Limitations of Smart Technologies

Study	Technology	Challenge	Context
Chen et al., 2023	AI	Data privacy	Predictive analytics and personalization
Li et al., 2024	VR	High cost	Virtual tours

Yung & Khoo-Lattimore, 2019	AR	Accessibility	Urban and heritage tourism
Marasco et al., 2021	AI + AR	Usability	Combined personalization and on-site experience

While smart technologies offer numerous benefits, several challenges affect their widespread adoption. AI applications raise privacy concerns due to data collection, storage, and usage, which can reduce tourist trust if not managed ethically. VR experiences, though immersive, often require expensive hardware, limiting accessibility for some user segments. AR applications face usability issues, device compatibility challenges, and potential information overload that can detract from the tourist experience. Combined AI + AR systems further require careful interface design, system integration, and technical support [26]. Addressing these challenges is critical for maximizing the benefits of smart technologies in tourism. Recommendations include cost-effective solutions (e.g., mobile VR/AR), clear privacy policies, user-centered design approaches, and pilot testing before full-scale implementation. Successfully overcoming these limitations enables destinations to leverage smart technologies effectively, enhancing marketing efficiency, visitor engagement, and overall satisfaction

Discussion

The present study systematically examined the efficiency of smart technologies Artificial Intelligence (AI), Virtual Reality (VR), and Augmented Reality (AR) in destination marketing and enhancing tourist experiences. The findings provide robust evidence that these technologies individually [27] and collectively contribute to improved marketing efficiency, immersive pre-visit experiences, on-site engagement, and overall tourist satisfaction. Integrating these results with previous studies reveals several key insights, implications, and research avenues [28].

AI and Personalized Marketing

AI applications consistently emerged as critical tools for personalizing destination marketing strategies. Our findings align with Florido-Benítez and Alcázar Martínez (2024) and Chen et al. (2023), who highlighted that AI-powered recommendation systems and predictive analytics significantly enhance tourist engagement and intention to visit [29]. The results demonstrate that AI enables data-driven segmentation, personalized offers, and real-time response through chatbots, ultimately improving conversion rates and service quality. Compared to traditional marketing approaches, AI provides dynamic and adaptive solutions that can adjust to traveler preferences and changing market conditions. These results reinforce previous assertions that personalization is a key determinant of tourist satisfaction and loyalty [30]. Moreover, the operational efficiency gains offered by AI such as optimized pricing, demand forecasting, and resource allocation underscore its strategic role for destination management organizations (DMOs). However, consistent with the literature, challenges such as data privacy concerns, algorithmic bias [31], and implementation costs remain significant barriers to widespread adoption. Effective AI deployment requires clear data governance policies, continuous monitoring, and user-centric design to maintain trust and engagement [32].

VR and Pre-Visit Experiences

VR emerged as a transformative technology for pre-visit immersion, supporting the findings of Li et al. (2024) and Tussyadiah et al. (2018). Virtual tours and immersive storytelling enable potential tourists to experience destinations virtually, reducing uncertainty, increasing destination familiarity, and strengthening travel intentions. Our analysis shows that VR is particularly effective for first-time visitors or destinations that are geographically remote or culturally unfamiliar. By providing an engaging and realistic preview [33], VR helps tourists form accurate expectations and can influence the decision-making process positively [34]. This aligns with the theoretical framework suggesting that expectation management is critical for tourist satisfaction and perceived value. Furthermore, VR can complement AI-based personalization by delivering tailored virtual experiences, enhancing the overall marketing and pre-visit engagement strategy [35]. Nevertheless, limitations such as high development costs, technical accessibility, and potential motion discomfort are recurrent challenges noted in both our results and prior studies. Addressing these limitations through mobile or web-based VR solutions can improve accessibility and broaden the user base. [36]

AR and On-site Engagement

AR technology demonstrated significant potential in enhancing on-site tourist experiences, confirming findings by Jung et al. (2022) and Yung & Khoo-Lattimore (2019). By overlaying digital information onto real-world environments, AR enriches visitor interaction with heritage, cultural, and urban tourism sites. The study shows that AR improves visitor engagement, knowledge retention, and satisfaction, providing both educational and entertainment value. Importantly, AR allows tourists to access context-specific content, such as historical narratives, cultural explanations, or navigational assistance,

enhancing the overall quality of the experience. AR's impact aligns with the experiential marketing literature, which emphasizes interactive and participatory experiences as key drivers of tourist satisfaction and loyalty. However, the study also confirms that usability issues, device compatibility, and potential information overload remain significant challenges. Careful interface design, intuitive navigation, and content moderation are critical to maximize AR's benefits [37].

Integrated Smart Destination Ecosystems

A central contribution of this study is the analysis of integrated smart destination ecosystems, where AI, VR, and AR work together to provide seamless tourist experiences. The findings corroborate Gretzel et al. (2025), indicating that integration enhances operational efficiency, real-time engagement, and sustainable destination branding. The synergy among technologies allows destinations to create personalized pre-visit experiences (VR), adaptive marketing and service delivery (AI), and interactive on-site engagement (AR) [38]. This integrated approach aligns with the smart tourism concept, emphasizing connectivity, responsiveness, and data-driven decision-making. Importantly, integration addresses some limitations of single-technology applications by leveraging complementary strengths; for instance, VR's immersive content can be personalized via AI analytics, and AR can contextualize the virtual previews in the real environment. The framework of a smart ecosystem also supports sustainable tourism by optimizing visitor flows, reducing environmental impacts, and facilitating resource-efficient management [39].

Challenges and Practical Implications

Despite the demonstrated benefits, several practical and theoretical challenges require attention. Cost, infrastructure requirements, accessibility, usability, and privacy concerns are recurring issues across AI, VR, and AR applications. Implementing integrated smart ecosystems demands collaboration among multiple stakeholders, including technology providers, local authorities, tourism operators, and marketers. As previous studies suggest, pilot projects, stakeholder training, and phased implementation can mitigate risks while enhancing adoption. From a managerial perspective, the findings imply that destinations should adopt a user-centric approach, ensuring that technology solutions align with tourist needs and expectations. Ethical considerations, particularly in AI-driven personalization, must be addressed through transparent data policies and compliance with privacy regulations [40].

Contribution to Theory and Practice

This study contributes to the literature by synthesizing empirical evidence on individual and integrated applications of AI, VR, and AR in tourism marketing and experience enhancement. It confirms that smart technologies are not merely operational tools but strategic assets that influence tourist perceptions, engagement, and loyalty. The study also extends prior research by highlighting the interactive effects of integrated smart ecosystems, offering a comprehensive framework for implementing multi-technology solutions. Practically, the results provide actionable insights for destination managers, policymakers, and technology developers aiming to enhance marketing efficiency, tourist satisfaction, and destination competitiveness [41].

Future Research Directions

Future studies should examine longitudinal impacts of smart technologies on tourist behavior, cross-cultural differences in technology adoption, and measurable effects on destination competitiveness. Additionally, research on cost-effectiveness, accessibility, and the sustainability of integrated smart ecosystems can provide deeper insights for effective implementation [42]. Evaluating tourists' emotional and cognitive responses to multi-technology experiences may further refine strategies for personalization, engagement [43], and satisfaction. In summary, the discussion underscores that AI, VR, and AR are transformative tools for destination marketing and experience enhancement. Individually, they offer targeted marketing, immersive previews, and interactive on-site engagement. Collectively, in integrated ecosystems, they optimize operations, enhance engagement, and support sustainable branding. Addressing challenges related to cost, accessibility [44], usability, and ethics is critical for maximizing their potential. Overall, smart technologies represent a strategic pathway for modern destinations to remain competitive, attract diverse tourists, and deliver meaningful, memorable, and sustainable experiences.

Conclusion and Practical Implications

This study explored the efficiency of smart technologies Artificial Intelligence (AI), Virtual Reality (VR), and Augmented Reality (AR) in destination marketing and enhancing tourist experiences. The systematic review and thematic analysis demonstrate that these technologies offer significant benefits individually and collectively. AI facilitates personalized marketing, predictive analytics, and operational optimization; VR enables immersive pre-visit experiences that enhance destination familiarity and travel intention; AR enriches on-site engagement, learning, and satisfaction. When integrated into smart destination

ecosystems, these technologies create seamless, interactive, and data-driven tourist journeys, strengthening destination competitiveness and sustainable branding.

Key Findings

- ✓ **Enhanced Marketing Efficiency:** AI-powered recommendation systems and predictive analytics improve targeting, personalization, and resource allocation, resulting in higher engagement and conversion rates.
- ✓ **Pre-visit Immersion:** VR allows tourists to virtually explore destinations, reducing perceived risk and increasing confidence in travel decisions.
- ✓ **On-site Interaction:** AR overlays contextual information on physical environments, improving engagement, knowledge retention, and visitor satisfaction.
- ✓ **Integrated Ecosystems:** Combining AI, VR, and AR creates synergistic benefits, providing holistic, responsive, and sustainable tourism experiences.
- ✓ **Challenges:** High implementation costs, accessibility limitations, usability concerns, and privacy issues remain barriers to widespread adoption.

Practical Implications for Destination Managers and Stakeholders

- ✓ **Adopt Integrated Smart Tourism Strategies:** Destinations should implement multi-technology ecosystems rather than isolated tools, ensuring synergy among AI, VR, and AR applications.
- ✓ **Focus on User-Centric Design:** Interfaces must be intuitive, engaging, and accessible to diverse tourist segments to maximize adoption and satisfaction.
- ✓ **Address Privacy and Ethical Concerns:** Transparent data policies, informed consent, and compliance with regulations are critical for AI-based personalization and data-driven operations.
- ✓ **Invest in Pilot Projects and Training:** Phased implementation and stakeholder capacity-building can mitigate risks and ensure technology effectiveness.
- ✓ **Leverage Smart Technologies for Sustainable Tourism:** Optimized resource allocation, visitor flow management, and digital communication of environmental and cultural values contribute to responsible and sustainable tourism practices [45].

Smart technologies are no longer optional for modern destination marketing; they are strategic enablers that influence tourist behavior, satisfaction, and loyalty. AI, VR, and AR collectively transform the tourist journey from pre-visit engagement to on-site experience, creating immersive, personalized, and meaningful interactions. By addressing implementation challenges and ethical considerations, destination managers can harness these technologies to improve marketing efficiency, enhance visitor experience, and strengthen destination competitiveness. Future research should examine longitudinal impacts, cross-cultural adoption patterns, and quantitative measures of effectiveness to further inform best practices in smart tourism management

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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