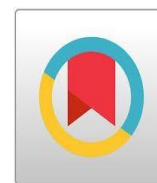


Adaptive Governance and the Complexity of Smart Tourism Policy

Tata Kelola Adaptif dan Kompleksitas Kebijakan Pariwisata Cerdas



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ABSTRACT

The purpose of this study is to analyze and optimize the implementation of smart tourism in supporting sustainable tourism development in West Nusa Tenggara through an adaptive governance approach. The research method is a qualitative comparative study. Data collection was carried out through interviews, documentation, observation, and Focus Group Discussions (FGDs). Data analysis was conducted using NVivo 12 Plus, with coding, data visualization, and source triangulation to ensure the validity and reliability of the research findings. The research findings indicate that the development of smart tourism in West Nusa Tenggara has great potential to increase regional competitiveness and economic growth. However, the effectiveness of its implementation depends heavily on integrating digital infrastructure, human resource capacity, and adaptive governance. Despite having superior destinations and government policy support, there are still gaps in the distribution of digital infrastructure and system integration. The use of data in tourism management is still partial and not optimally integrated. Furthermore, fluctuations in tourist visits underscore the need for flexible, data-driven policies. Therefore, strengthening digital architecture, increasing human resource capacity, and fostering cross-sector collaboration are key to optimizing smart tourism. In conclusion, the success of smart tourism depends on integrating technology, adaptive policies, and a systemic, sustainable collaboration. This study is limited to the context of Smart Tourism implementation in West Nusa Tenggara and does not fully capture variations in digital capacity and stakeholder experiences across different destinations. Future research should adopt a comparative or longitudinal approach across destinations with varying levels of digital readiness to further examine how Adaptive Governance operates under different institutional and technological contexts.

Kata Kunci

Adaptive Governance;
 Infrastruktur Digital;
 Kebijakan Pariwisata;
 Pariwisata Berkelanjutan;
 Smart Tourism

ABSTRAK

Tujuan penelitian ini adalah untuk menganalisis dan mengoptimalkan penerapan smart tourism dalam mendukung pengembangan pariwisata berkelanjutan di Nusa Tenggara Barat melalui pendekatan adaptive governance. Metode penelitian yang digunakan adalah pendekatan kualitatif dengan studi komparatif. Pengumpulan data dilakukan dengan wawancara, dokumentasi, observasi, dan Focus Group Discussion (FGD). Analisis data dilakukan menggunakan NVivo 12 Plus dengan teknik coding, visualisasi data, serta triangulasi sumber untuk memastikan validitas dan reliabilitas temuan penelitian. Temuan penelitian menunjukkan bahwa pengembangan smart tourism di Nusa Tenggara Barat memiliki potensi besar dalam meningkatkan daya saing dan pertumbuhan ekonomi daerah. Namun, efektivitas implementasinya sangat bergantung pada integrasi antara infrastruktur digital, kapasitas sumber daya manusia, dan tata kelola yang adaptif. Meskipun memiliki destinasi unggulan dan dukungan kebijakan

	pemerintah, masih terdapat kesenjangan dalam pemerataan infrastruktur digital dan integrasi sistem. Pemanfaatan data dalam pengelolaan pariwisata juga masih bersifat parsial dan belum terintegrasi secara optimal. Selain itu, fluktuasi kunjungan wisatawan menunjukkan perlunya kebijakan yang fleksibel dan responsif berbasis data. Oleh karena itu, penguatan arsitektur digital, peningkatan kapasitas SDM, serta kolaborasi lintas sektor menjadi faktor kunci dalam optimalisasi smart tourism. Kesimpulannya, keberhasilan smart tourism ditentukan oleh kemampuan mengintegrasikan teknologi, kebijakan adaptif, dan kolaborasi secara sistemik dan berkelanjutan. Penelitian ini terbatas pada konteks Smart Tourism di NTB dan belum mengeksplorasi secara mendalam perbedaan kapasitas digital antarwilayah serta variasi pengalaman masyarakat dan pelaku usaha lokal. Penelitian selanjutnya dapat membandingkan beberapa destinasi atau provinsi dengan tingkat kesiapan digital yang berbeda untuk mengidentifikasi pola Adaptive Governance yang lebih kontekstual dan dapat diterapkan secara lebih luas.
Article History Send 21th April 2026 Review 26^h July 2026 Accepted 20th October 2026	Copyright ©2027 Jurnal Aristo (Social, Politic, Humaniora) This is an open access article under the CC-BY-NC-SA license. Akses artikel terbuka dengan model CC-BY-NC-SA sebagai lisensinya.



Introduction

The background of this study is grounded in the growing need for sustainable tourism development based on Smart Tourism, which is increasingly becoming essential in the development of tourist destinations (De Maio et al., 2024), particularly in Indonesia (Ambarwati et al., 2024), including in the region of West Nusa Tenggara (NTB) (Ilham Zitri et al., 2024). The number of domestic tourist visits to NTB in 2024 reached more than 15,136,466 (BPS, 2024). NTB stands out with the presence of iconic destinations such as Mandalika, which is included in the national strategic project as one of the priority destinations, and is supported by more advanced infrastructure (Roni Ekha Putera et al., 2025). With the high number of tourist visits and the potential of leading destinations, the development of Smart Tourism in NTB has become a crucial strategy to enhance regional competitiveness while preserving environmental sustainability and local culture. Therefore, this study is highly relevant to explore the effective implementation of Smart Tourism concepts in supporting sustainable tourism growth in NTB.

Connectivity and digital infrastructure play a crucial role in supporting governance systems (Rifaid, Abdurrahman, et al., 2023), including sustainable tourism (Zhao et al., 2023), particularly in improving accessibility (Mashapa & Hassen, 2024), efficiency (Lacárcel, 2025), and tourist experience (Oka & Subadra, 2024). In general, adequate digital infrastructure, such as stable internet networks (Noviarita et al., 2024), digital payment systems (Bodkhe et al., 2019), and technology-based applications (Rifaid, Hadi, et al., 2023), enables better service integration and governance (Zitri et al., 2023), especially in supporting the global marketing of destinations (Halkiopoulos et al., 2023). Moreover, strong connectivity enhances interactions among tourists, industry stakeholders, and governments in creating a more inclusive and responsive tourism ecosystem (Pencarelli, 2020). However, challenges remain in several cases, particularly in remote areas that face limitations in internet access and supporting infrastructure (Achillas et al., 2024). Therefore, investment in the development of connectivity and digital infrastructure is a strategic step to ensure sustainable tourism growth through Smart Tourism (Hidayah et al., 2022).

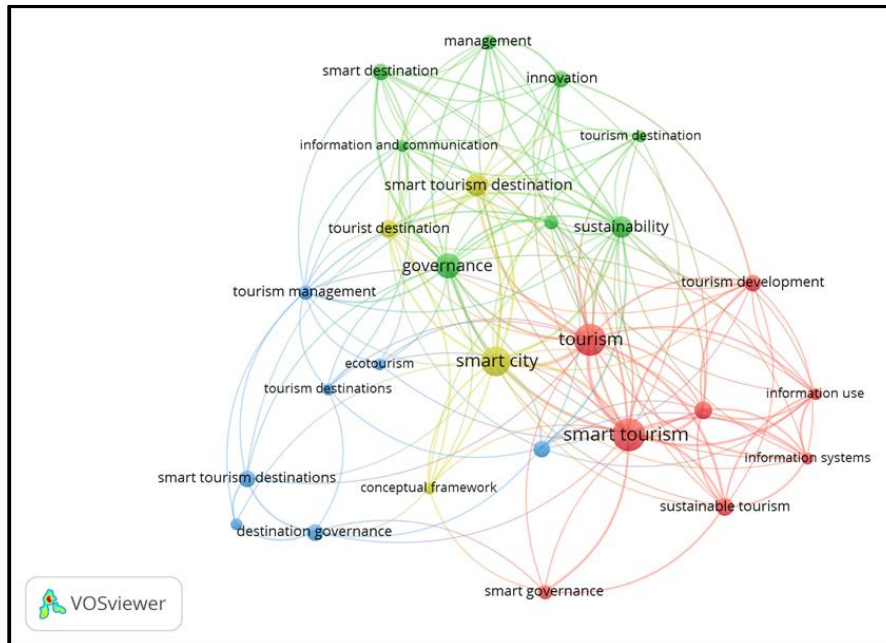
Sustainable tourism based on Smart Tourism also contributes to economic growth by optimizing destination competitiveness (Astanakulov et al., 2025), enhancing tourist experiences (Yaghmour, 2024), and improving efficiency in resource management (Feng, 2022). Technology in the tourism sector enables increased income for local businesses (Muça et al., 2022), reduces operational costs (Albahrat et al., 2024), and supports the diversification of more attractive and environmentally friendly tourism products (Samora-Arvela et al.,

2020). Studies in China indicate that the implementation of Smart Tourism based on big data improves the efficiency of destination management and extends the length of tourists' stays, which in turn contributes to increased regional revenue (Zhang & Cheng, 2024). In Italy, Smart Tourism policies that integrate artificial intelligence into tourism services have been proven to enhance tourist satisfaction (Baiocco et al., 2024). Meanwhile, in Spain, Smart Tourism strategies that rely on technology-based solutions, such as the use of data analytics to predict tourist visitation patterns, have helped increase the contribution of the tourism sector to the economy (Giménez Manuel et al., 2024).

Based on the background outlined above, this study identifies several key research questions: (a) How can the potential of Smart Tourism be optimized in West Nusa Tenggara? (b) What factors influence the effectiveness of Smart Tourism implementation in enhancing the competitiveness and sustainability of tourist destinations in the region? (c) How can adaptive policies bridge the implementation of Smart Tourism in achieving sustainable tourism and promoting regional economic growth? Therefore, this study is expected to provide strategic insights for formulating adaptive policies that support the optimization of Smart Tourism in order to enhance competitiveness, ensure destination sustainability, and foster regional economic growth in West Nusa Tenggara. The problem-solving approach in this study integrates the concept of Adaptive Governance to navigate the complexity of Smart Tourism policies in achieving sustainable tourism in West Nusa Tenggara (NTB). Adaptive Governance enables flexibility in decision-making by considering the dynamic interactions between environmental conditions, policy frameworks, and stakeholder needs in a continuous manner (Tan & Taeihagh, 2021). In the context of NTB, this approach is particularly relevant given the disparities in infrastructure capacity, technological readiness, and community participation within the tourism industry. This comparative study highlights how adaptive policies can be implemented to address challenges in Smart Tourism adoption, including digital accessibility, destination governance, and economic and environmental sustainability. Thus, the integration of Adaptive Governance into Smart Tourism policies is expected to enhance tourism competitiveness in the region while promoting inclusive and sustainable regional economic growth.

Although several studies have discussed Smart Tourism policies, bibliometric analysis indicates that as of March 2025, there are only 63 documents relevant to this topic. However, studies that specifically and simultaneously link Smart Tourism with an Adaptive Governance approach remain very limited.

Figure 1. Research gap



Source: Processed by researchers from the Scopus database with Vosviewer, 2026

Although several studies have examined *Smart Tourism* policies, bibliometric analysis indicates that, as of March 2025, only 63 documents are directly relevant to this topic. However, studies that specifically integrate *Smart Tourism* with an *Adaptive Governance* approach remain very limited, particularly those examining how adaptive governance responds to the complexity of *Smart Tourism* policies involving multiple actors, competing interests, technological changes, destination dynamics, and policy uncertainty. In this context, the present study addresses this research gap by examining adaptive governance and the complexity of smart tourism policy in West Nusa Tenggara, focusing not only on the implementation of *Smart Tourism* policies but also on adaptive capacity, multi-actor collaboration, responsiveness to change, and governance mechanisms for managing the complexity and uncertainty of smart tourism development. Thus, the principal gap lies in the limited empirical research that simultaneously integrates the *Adaptive Governance* perspective with the complexity of *Smart Tourism* policy, particularly within the regional context of West Nusa Tenggara.

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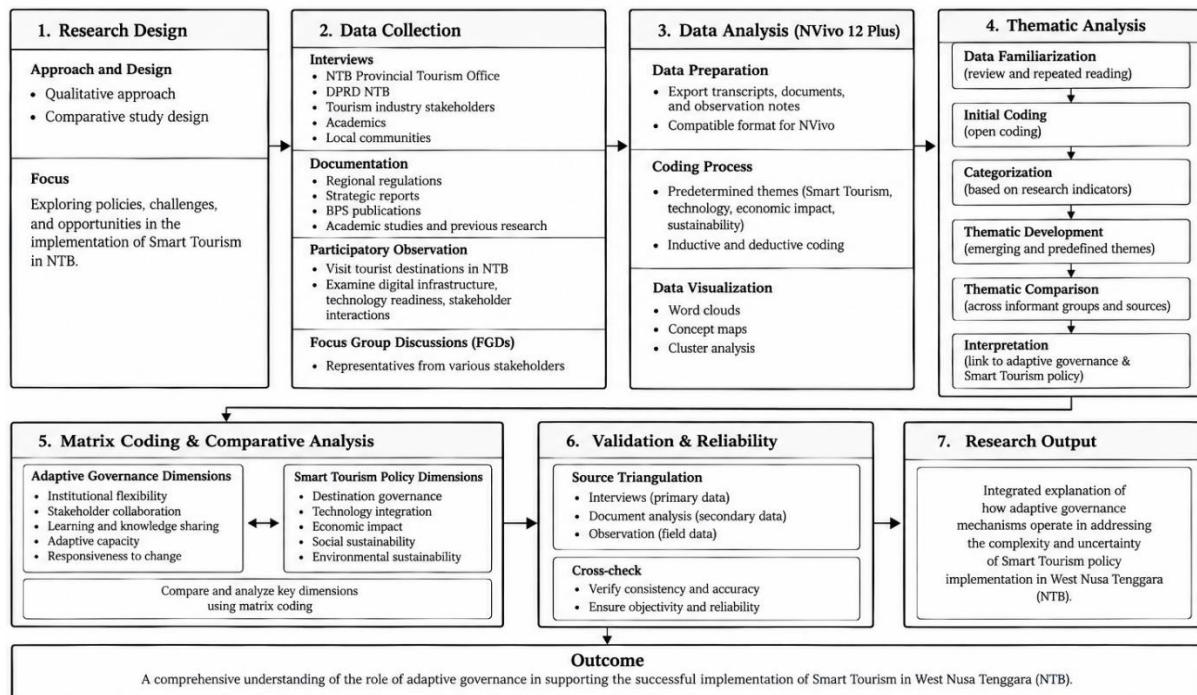
Method

This study employs a qualitative approach with a comparative study design. Data collection techniques include interviews, documentation, participatory observation, and Focus Group Discussions (FGDs). Interviews are conducted to obtain in-depth perspectives on policies, challenges, and opportunities related to the implementation of Smart Tourism in West Nusa Tenggara (NTB). Key informants in this study include officials from the NTB Provincial Tourism Office, members of the NTB Regional House of Representatives (DPRD), tourism industry stakeholders, academics, as well as local communities involved in managing digitally-based tourism destinations in the region. In addition, documentation is used to collect secondary data from various official sources, such as regional regulations related to tourism, strategic reports, publications from the Central Statistics Agency (BPS), as well as relevant academic studies and previous research reports. Observations are carried

out by visiting leading tourist destinations in NTB to directly examine digital infrastructure, technological readiness, and interactions among stakeholders. FGDs are conducted by involving representatives from various stakeholders to gather additional insights that enrich the research analysis.

In the data analysis process, this study utilizes NVivo 12 Plus, a software that facilitates systematic qualitative data analysis. The analysis begins with exporting data from interview transcripts, policy documents, and observation notes into formats compatible with NVivo. This is followed by the coding process, which involves categorizing data into predefined themes based on key research indicators, such as Smart Tourism policies, the role of technology in destination governance, economic impacts, and social and environmental sustainability. The coding process is conducted both inductively and deductively, where initial categories are developed based on the concepts of Adaptive Governance and Smart Tourism, while additional categories may emerge from field findings. After completing the coding process, data visualization is performed using features such as word clouds, concept maps, and cluster analysis to identify patterns and relationships among the research variables.

Furthermore, the analysis proceeds through several systematic stages, including data familiarization, initial coding, categorization, thematic development, thematic comparison, and interpretation. The coded data are continuously reviewed to identify similarities, differences, and connections across informant groups and documentary sources, while matrix coding is used to compare key dimensions of Adaptive Governance, including institutional flexibility, stakeholder collaboration, learning and knowledge sharing, adaptive capacity, and responsiveness to change, with the dimensions of Smart Tourism policy. The emerging themes are then interpreted in relation to the complexity of tourism governance in West Nusa Tenggara, particularly the interactions among government institutions, tourism stakeholders, local communities, technological developments, economic interests, and environmental concerns. This process enables the study to move beyond descriptive findings toward an integrated explanation of how adaptive governance mechanisms operate in addressing the complexity and uncertainty of Smart Tourism policy implementation.

Figure 2. Research Method Framework Flowchart

Source: Processed by researchers, 2026

To ensure the validity and reliability of the data, this study applies a source triangulation technique by comparing and verifying information obtained from multiple data sources. In this research, primary data are collected through in-depth interviews with key informants. These interview findings are then cross-checked with secondary data, such as regional tourism policy documents, strategic reports, publications from the Central Statistics Agency (BPS) related to the tourism sector, as well as previous studies examining the implementation of Smart Tourism in destination governance. Furthermore, findings from interviews and documentation are validated through direct field observations, which include monitoring digital infrastructure, technological readiness, and interactions among stakeholders in West Nusa Tenggara (NTB). By comparing information from these various sources, the study ensures that the data obtained are more accurate, objective, and reliable.

Result and Discussion

Optimizing the Potential of Smart Tourism in Sustainable Tourism Development in West Nusa Tenggara (NTB)

The development of Smart Tourism in West Nusa Tenggara (NTB) is driven not only by technological advancements but also by the region's rich potential, which includes natural

resources, cultural assets, as well as the readiness of infrastructure and institutional capacity (R E Putera et al., 2026; Wathoni et al., 2025; Widaningrum et al., 2026). NTB possesses strong tourism appeal through a combination of leading destinations, such as the Mandalika area, along with government policy support that positions the region as a priority for national tourism development. In the context of sustainable tourism, optimizing the potential of Smart Tourism becomes essential to improve service quality, expand market access, and maintain a balance between economic growth, environmental preservation, and socio-cultural sustainability. Therefore, identifying these potentials serves as a strategic initial step in formulating adaptive and effective Smart Tourism policies and implementation in NTB.

Table 1. Potential for Smart Tourism Development in Supporting Sustainable Tourism in West Nusa Tenggara (NTB)

Potential	Description	Implications for Smart Tourism
Leading Tourism Destinations	The presence of Mandalika, Gili Trawangan, Mount Rinjani, and other exotic beaches	Serve as primary attractions that can be promoted digitally on a global scale
Tourism Infrastructure	The development of roads, airports, and increasingly advanced accommodation facilities	Supports connectivity and facilitates technology-based tourist access
Digital Infrastructure	Availability of internet networks, digital platforms, and information systems	Enables the integration of tourism services such as e-ticketing, smart guides, and tourism applications
Government Policy Support	Status as a national priority destination and regulatory support	Accelerates the implementation of Smart Tourism policies and technology investment
Local Wisdom and Culture	Unique traditions, arts, and local cultural heritage	Provides engaging digital content for promotion and authentic tourism experiences
Community Participation	Involvement of SMEs and local tourism actors	Supports the local economy through digital platforms and online marketing

Digital Economic Potential	Utilization of digital payments and tourism marketplaces	Enhances transaction efficiency and increases business revenues
Environmental Sustainability	Potential for ecotourism and environmental conservation	Supports the implementation of smart monitoring systems to preserve the environment
Data and Technology	Utilization of big data, IoT, and AI in tourism management	Assists data-driven decision- making and tourism trend prediction
Transportation Connectivity	Increasingly open air and sea access	Facilitates the integration of transportation systems with digital services

Source: Researcher documentation, 2026

The presence of leading tourism destinations such as Mandalika, Gili Trawangan, Mount Rinjani, and various exotic beaches in West Nusa Tenggara (NTB) constitutes a primary structural strength that can significantly accelerate the development of Smart Tourism. However, this potential has not yet been fully optimized within an integrated digitalization framework. As a result, promotional efforts remain largely conventional and are not yet based on data-driven analysis of tourist behavior. In the context of global competition, the attractiveness of a destination is no longer determined solely by its natural beauty, but also by its ability to establish strong digital branding, provide accurate and real-time information, and create a digitally integrated tourism experience from the planning stage to the post-visit phase (R E Putera et al., 2026; Wathoni et al., 2025; Widaningrum et al., 2026).

Furthermore, the implications of these leading destination potentials in Smart Tourism should not be limited to digital promotion alone, but should be directed toward the development of a smart and integrated service ecosystem. This includes the utilization of digital platforms for reservations, location-based tourism navigation, and data-driven visitor flow management to prevent over-tourism. In practice, however, there remains a gap between potential and implementation, as not all leading destinations in NTB are supported by digital systems capable of significantly enhancing the tourist experience. Therefore, a more comprehensive and adaptive strategy is required to connect the strengths of physical

destinations with technological innovation in order to create sustainable added value and achieve global competitiveness.

The development of tourism infrastructure in West Nusa Tenggara (NTB), such as the construction and improvement of roads, airports, and accommodation facilities, reflects a strong commitment to enhancing destination accessibility. Nevertheless, this approach remains predominantly focused on physical aspects and has not been fully integrated with technological systems that support the Smart Tourism concept (Caraka et al., 2023). Consequently, although interregional connectivity has improved, the overall tourist experience has not yet been comprehensively digitalized. In the paradigm of modern tourism, accessibility is not only measured by the efficiency of physical mobility but also by the system's ability to provide real-time, integrated, and technology-based information, services, and navigation.

Furthermore, the presence of transportation infrastructure such as airports and strategic road networks provides significant opportunities to develop smart mobility systems within the tourism sector, including the integration of transportation schedules, travel applications, and data-driven visitor flow management systems (Marchesani et al., 2023). However, a key challenge lies in the lack of optimal synchronization between the management of physical transportation systems and digital platforms capable of efficiently regulating tourist distribution. This gap may lead to imbalanced visitation patterns, overcrowding in certain destinations, and the underutilization of alternative destinations that, in fact, possess considerable potential.

On the other hand, digital infrastructure, comprising internet networks, digital platforms, and tourism information systems, represents a critical element in supporting the implementation of Smart Tourism. Through such infrastructure, services such as e-ticketing, smart guides, and tourism applications can be effectively integrated (Islam, 2023). Nevertheless, the reality in West Nusa Tenggara (NTB) indicates that the quality and equitable distribution of internet access remain major challenges, particularly in destinations located outside primary growth centers. As a result, the anticipated digital transformation has not been fully inclusive, limiting tourists' access to digital services and reducing the efficiency of technology-based destination management.

Therefore, the relationship between tourism infrastructure and digital infrastructure should not be viewed as two separate entities, but rather as an integrated system within the Smart Tourism framework. Physical development must be aligned with the strengthening of digital capacity to create a smart, efficient, and sustainable tourism ecosystem. Accordingly,

more integrative and adaptive policies are required to ensure that infrastructure investments not only enhance physical connectivity but also reinforce technology-based service integration, thereby improving competitiveness and the overall quality of tourism experiences in West Nusa Tenggara in a comprehensive manner.

Government policy support that designates West Nusa Tenggara (NTB) as a national priority destination provides a strong strategic foundation for accelerating the implementation of Smart Tourism, particularly through regulatory strengthening, investment facilitation, and the creation of a policy ecosystem conducive to technological innovation in the tourism sector (Ningsih et al., 2025). However, the effectiveness of such policies largely depends on the government's ability to translate macro-level frameworks into adaptive, integrated, and locally responsive implementation. Without proper synchronization between regulations, institutional capacity, and digital infrastructure readiness, even progressive policies risk becoming merely administrative instruments with limited impact on accelerating tourism digital transformation. Therefore, an Adaptive Governance approach is essential to bridge the interests of multiple stakeholders while ensuring that policies not only promote technological investment but also enhance sustainability, inclusivity, and the overall competitiveness of tourism destinations in a holistic manner.

Local wisdom and cultural heritage in West Nusa Tenggara (NTB) represent strategic assets with high differentiation value in the development of Smart Tourism. Unique traditions, arts, and cultural practices offer authentic attractions that are difficult to replicate by other destinations (Harahab et al., 2021). Nevertheless, a key challenge lies in transforming this cultural richness into digital formats without compromising its original meaning and value. This requires an approach that goes beyond cultural commodification for promotional purposes and emphasizes sustainable preservation through culturally sensitive digitalization. In the context of Smart Tourism, local wisdom should not merely serve as visual promotional content but should be developed as part of technology-based tourism experiences, such as through virtual storytelling, interactive digital tours, and the use of social media as platforms for cultural narratives. However, current realities indicate limitations in the capacity to produce high-quality and well-curated digital content, resulting in the underutilization of cultural potential as a competitive digital attraction at the global level.

Community participation, particularly involving small and medium enterprises (SMEs) and local creative industries, is a key element in ensuring that the development of Smart Tourism is not solely top-down but also inclusive and community-based. Active community engagement enables a more equitable distribution of economic benefits.

However, challenges remain in the form of digital literacy gaps and limited technological capacity among local business actors, which hinder the optimal use of digital platforms for tourism marketing and services. This necessitates policy interventions focused on the continuous development of human resource capacity. Furthermore, integrating communities into the digital tourism ecosystem can strengthen social and economic sustainability, particularly through the use of online platforms to market local products, tourism services, and community-based experiences. Yet, without integrated systems and equitable digital infrastructure support, this potential risks becoming fragmented and unable to generate significant aggregate economic impact. Therefore, a collaborative approach involving government, the private sector, and local communities is essential to build an inclusive and interconnected digital tourism ecosystem.

Meanwhile, the potential of the digital economy, through the use of digital payments and tourism marketplaces, offers significant opportunities to enhance transaction efficiency, economic transparency, and market access for business actors. However, its implementation still faces various challenges, including limited access to technology, low levels of trust in digital systems, and the need for more adaptive regulatory frameworks. As a result, although the digital economy is conceptually positioned as a key driver of tourism growth, systematic efforts are still required to ensure that digital transformation not only improves economic efficiency but also strengthens inclusivity and the sustainability of local economies in West Nusa Tenggara (NTB).

The environmental sustainability potential in NTB, particularly through the development of ecotourism and nature conservation, provides substantial opportunities to integrate Smart Tourism principles with technology-based conservation approaches. However, a fundamental challenge often overlooked is the persistent tendency to exploit destinations with a primary focus on increasing visitor numbers, without comprehensively considering environmental carrying capacity. Consequently, sustainability risks becoming merely a policy rhetoric if not supported by data-driven monitoring mechanisms and technologies capable of controlling ecological impacts in real time. In this context, the implementation of smart monitoring should serve as a key instrument in maintaining the balance between utilization and conservation, for instance through environmental sensors, water and air quality monitoring systems, and technology-based waste management. Nevertheless, implementation in practice remains constrained by limitations in budget, technical capacity, and institutional commitment, resulting in conservation efforts that are often reactive rather than preventive, thereby reducing the effectiveness of Smart Tourism in

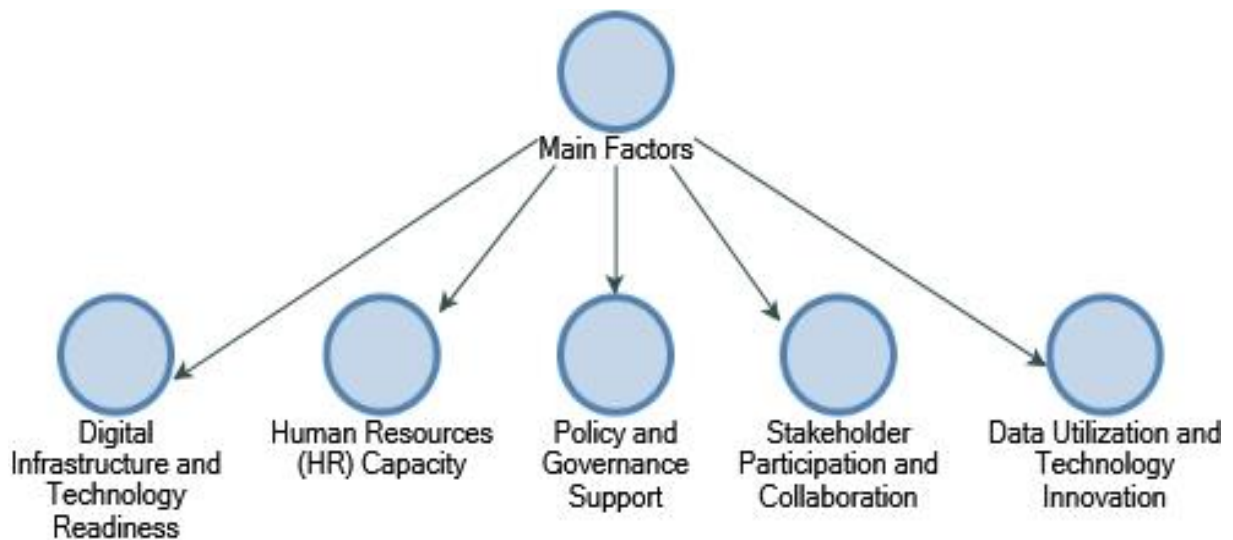
ensuring long-term sustainability. On the other hand, the utilization of data and technologies such as big data, the Internet of Things (IoT), and artificial intelligence (AI) offers transformative potential in tourism destination management, particularly in supporting more accurate, predictive, and evidence-based decision-making. However, the primary challenge lies in the readiness of systems and human resources to manage and interpret such data. Without sufficient analytical capacity, available data risks becoming merely a collection of information without delivering strategic value for tourism governance. Furthermore, the integration of technology in tourism management requires interconnected systems among stakeholders, including government, business actors, and local communities. In reality, however, data fragmentation and the lack of system interoperability remain major constraints, limiting the effective use of technology for predicting tourism trends, managing visitor flows, and improving service quality. This ultimately hampers the development of a truly data-driven and integrated Smart Tourism ecosystem. Meanwhile, increasing transportation connectivity through expanded air and sea access provides substantial opportunities to enhance tourist mobility and broaden destination reach. However, without technology-based management, such improvements may also generate new challenges, including overcrowding, environmental pressure, and uneven distribution of tourist visits across destinations. Therefore, the integration of transportation systems with digital services becomes essential to ensure that tourist mobility is managed efficiently and sustainably. In this regard, the interconnection between environmental sustainability, the utilization of data and technology, and transportation connectivity highlights that the development of Smart Tourism in NTB cannot rely solely on existing potentials. Instead, it requires a systemic transformation that integrates these three aspects within an adaptive and data-driven policy framework. Without strong integration, each potential will operate in isolation, limiting its ability to generate significant impacts on competitiveness, management efficiency, and the overall sustainability of tourism in West Nusa Tenggara.

Factors Influencing the Effectiveness of Smart Tourism Implementation on Destination Competitiveness and Sustainability

The effectiveness of Smart Tourism implementation in enhancing destination competitiveness and sustainability is not solely determined by the presence of technology, but also by the complex interaction of various structural, institutional, and social factors. In

the context of West Nusa Tenggara (NTB), the success of Smart Tourism implementation largely depends on the region's ability to integrate technological advancements with adaptive governance, human resource capacity, and adequate infrastructure support. Without synergy among these factors, Smart Tourism initiatives risk being implemented in a fragmented manner, thereby limiting their impact on improving service quality, tourist experiences, as well as environmental and economic sustainability. Therefore, it is essential to identify key factors that directly influence the effectiveness of Smart Tourism implementation as a foundation for formulating more comprehensive and sustainable development strategies. The main factors influencing the effectiveness of Smart Tourism implementation are as follows:

Figure 3. The main factors that influence the effectiveness of smart tourism implementation



Source: Processed by researchers with Nvivo 12 Plus, 2026

The readiness of digital infrastructure and technology constitutes a fundamental prerequisite in determining the effectiveness of Smart Tourism implementation, as all digital-based services, including e-ticketing, tourism applications, and real-time information systems, depend on the availability of stable internet networks and integrated platforms. However, in practice, the development of digital infrastructure in many regions, including West Nusa Tenggara, continues to face challenges related to unequal access and service quality. This creates disparities between well-connected destinations and those that remain underserved, ultimately hindering the delivery of consistent and equitable tourism experiences. Moreover, the issue of digital infrastructure extends beyond availability to include system integration, which often remains fragmented and sectoral. Platforms developed by both government and private actors tend to operate independently without sufficient interoperability. The essence of Smart Tourism lies in the integration of services

within a unified digital ecosystem capable of connecting information, transactions, and tourist experiences holistically. Without an integrated system architecture, technological investments risk becoming inefficient and failing to deliver optimal impacts on destination competitiveness. On the other hand, human resource capacity represents an equally critical determinant. Even the most advanced technologies cannot deliver maximum benefits without users who possess the necessary skills to operate them effectively. Low levels of digital literacy among tourism actors, government officials, and local communities pose a significant barrier to the transition toward Smart Tourism. This is often reflected in resistance to change, limited technological understanding, and continued reliance on conventional work practices that are no longer compatible with digital ecosystems. Therefore, strengthening human resource capacity must be regarded as a strategic investment that progresses alongside digital infrastructure development rather than as a complementary component. This can be achieved through continuous training programs, the enhancement of digital literacy, and context-specific technical assistance tailored to local needs. Without systematic capacity-building efforts, digital transformation risks remaining symbolic rather than substantive. Hence, the integration of infrastructure readiness and human resource quality becomes a key factor in ensuring that Smart Tourism implementation is effective, inclusive, and sustainable.

Policy support and governance frameworks also play a pivotal role in shaping the direction and effectiveness of Smart Tourism implementation. In the absence of clear and adaptive regulatory frameworks, digital initiatives in the tourism sector are likely to proceed in a fragmented and uncoordinated manner, thereby limiting their overall impact on enhancing destination competitiveness. In this context, policy functions not only as an administrative instrument but also as a catalyst that directs the integration of technology, investment, and innovation within a structured and sustainable ecosystem. Nevertheless, a major governance challenge lies in weak coordination among stakeholders, often manifested in overlapping programs, sectoral egos, and insufficient alignment between central and regional policies. These issues hinder effective implementation at the operational level. In contrast, an Adaptive Governance approach requires flexibility, collaboration, and the capacity to respond rapidly to change based on data-driven insights. This implies that governance should no longer be strictly hierarchical but must evolve into a more open, participatory, and dynamic system. On the other hand, stakeholder participation and collaboration are integral elements in creating an inclusive and sustainable Smart Tourism ecosystem, as the success of digital transformation depends not only on the role of government but also on the active involvement of the private sector, local communities, and

business actors in developing and adopting technology. However, in practice, this level of collaboration remains suboptimal, as reflected in the limited involvement of communities in planning processes and the lack of synergy between business actors and government in developing digital-based services. As a consequence, insufficient collaboration may lead to service fragmentation, where various platforms and innovations operate independently without integration, thereby reducing efficiency and the overall quality of the tourist experience (Karinda et al., 2024). Therefore, a governance model is needed that can bridge the interests of diverse actors through structured, transparent, and trust-based collaborative mechanisms, ensuring optimal system integration and positioning Smart Tourism not merely as a technological agenda but as a collective movement that enhances competitiveness and sustainability in the tourism sector.

The utilization of data and technological innovation constitutes a strategic element in the development of Smart Tourism, particularly through the application of big data, the Internet of Things, and artificial intelligence, which enable more intelligent, adaptive, and evidence-based destination management. Through effective data analysis, destination managers can better understand tourist behavior patterns, predict visitation trends, and optimize services in real time. Nevertheless, this potential is often not fully realized due to fragmented and insufficiently integrated data management systems. Furthermore, the primary challenge lies not only in data availability but also in the institutional capacity to manage, analyze, and interpret data as a basis for strategic decision-making. Without adequate analytical capabilities, collected data risk becoming merely digital archives without generating meaningful added value. Therefore, strengthening institutional capacity, developing interoperable systems, and investing in human resources with expertise in data analytics and digital technologies are essential steps in maximizing the benefits of technological innovation.

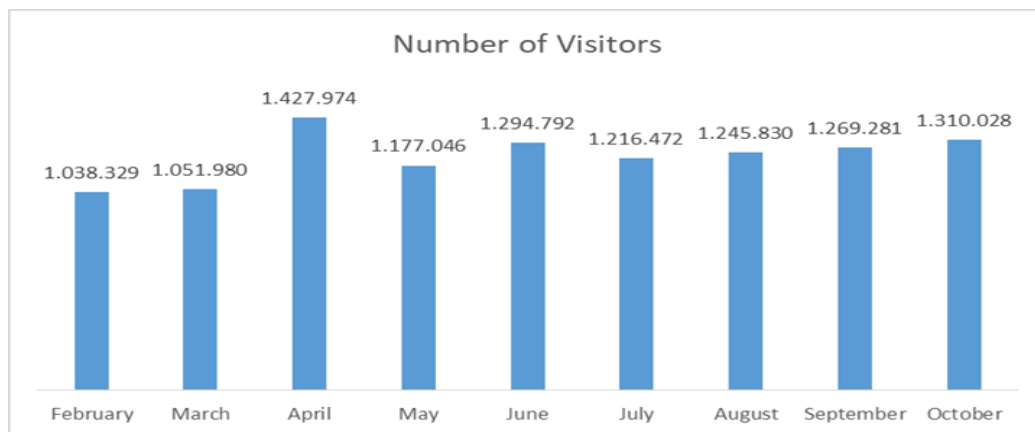
Overall, the effectiveness of Smart Tourism implementation is closely linked to the interdependence between digital infrastructure readiness, human resource capacity, policy support, and the level of stakeholder collaboration. This indicates that the transition toward technology-based tourism is not a partial process but requires a systemic and integrated approach, as the failure to optimize any single factor will directly weaken the entire ecosystem. Consequently, Smart Tourism development efforts must focus on strengthening synergy among these elements to create a system that is not only efficient but also adaptive to change and sustainable in the long term. In this regard, the enhancement of data utilization and technological innovation should be positioned as key drivers in improving decision-

making quality and destination competitiveness. However, this must be balanced with institutional readiness, system integration, and continuous human resource development to ensure that technology functions not merely as a symbol of modernization, but as a strategic instrument in delivering high-quality, inclusive, and sustainable tourism experiences, thereby contributing meaningfully to regional economic growth while maintaining a balance between economic, social, and environmental interests.

The Role of Adaptive Governance in Bridging the Implementation of Smart Tourism to Drive Regional Economic Growth

The role of adaptive governance is crucial in bridging the implementation of smart tourism because it enables flexible, responsive, and data-driven policies to address the ever-changing dynamics of the tourism sector. This approach is relevant when compared to the 2025 Domestic Tourist Trips data in West Nusa Tenggara, which shows monthly fluctuations in visits, necessitating adaptive policies to manage tourist flows efficiently and sustainably.

Figure 4. Number of Domestic Tourist Trips by Destination Regency/City (Trips), 2025



Source: Central Statistics Agency, 2025

The data from the Central Statistics Agency indicate the dynamics of domestic tourist trips in West Nusa Tenggara throughout 2025, which tend to fluctuate but remain relatively stable at over one million visits per month. February recorded the lowest figure at 1,038,329 trips, which then increased in March to 1,051,980 and peaked in April at 1,427,974 trips, suggesting a significant surge likely influenced by holiday periods or specific events. Subsequently, the number of visits declined in May to 1,177,046 before rising again in June to 1,294,792, followed by a gradual decrease in July and August to 1,216,472 and 1,245,830, respectively. The trend then showed a recovery in September with 1,269,281 visits and further increased in October to 1,310,028 (BPS, 2025). This pattern reflects a strong seasonal cycle

in tourist movement, highlighting the importance of data-driven management strategies and adaptive policies to maintain visitation stability and optimize the economic potential of the tourism sector across different periods. The role of Adaptive Governance becomes increasingly important in bridging the implementation of Smart Tourism when linked to the fluctuating dynamics of tourist visits, as reflected in the 2025 domestic tourism data in West Nusa Tenggara. Variations in monthly visitation indicate that tourism management cannot rely on static approaches but instead requires flexible, responsive, and data-driven policies capable of effectively anticipating both surges and declines in visitor numbers. In this context, Adaptive Governance serves as a strategic framework that integrates technology, policy, and stakeholder collaboration to ensure that Smart Tourism implementation not only enhances service quality but also contributes directly to sustainable regional economic growth.

Data-driven policymaking within the framework of Adaptive Governance constitutes a fundamental pillar in addressing the increasingly complex and uncertain dynamics of the tourism sector. Fluctuating visitor data demonstrate that tourism patterns are no longer linear but are influenced by multiple factors, including seasonality, events, digital trends, and external conditions. Consequently, governments are required to process data in real time and use it as a basis for formulating precise and context-sensitive policies. In this regard, data utilization should not be limited to descriptive functions but must evolve toward analytical and predictive capabilities to better anticipate increases or decreases in visitor flows. Without a data-driven approach, policies tend to be reactive and fail to address actual needs in the field. Therefore, the integration of data systems becomes crucial to ensure that decision-making is grounded in strong empirical evidence. Moreover, effective data utilization enables the identification of underdeveloped alternative destinations, which is essential for reducing pressure on main destinations experiencing overcapacity. This allows for a more balanced and sustainable distribution of tourists, improving not only the quality of tourist experiences but also the equitable distribution of economic benefits. Thus, data should be positioned as a strategic asset in tourism governance. Without it, the transformation toward Smart Tourism risks losing both direction and effectiveness.

Policy flexibility and responsiveness are essential elements in addressing the uncertainty of the highly dynamic tourism sector, as rapid changes in tourist arrivals require governments to adjust strategies in real time without being constrained by rigid bureaucratic procedures. Within the framework of Adaptive Governance, such flexibility does not imply a lack of direction but remains grounded in robust data and analysis. Adaptive policies enable timely interventions, such as adjusting ticket pricing, optimizing digital promotion, or

developing strategic events during low seasons. Without flexibility, policies risk lagging behind market dynamics, which may significantly reduce destination competitiveness. Furthermore, responsiveness reflects the institutional capacity to recognize shifts in tourist behavior, such as the growing preference for experience-based and digitally mediated tourism. Failure to respond promptly may result in missed market opportunities. Therefore, policy flexibility should be embedded as a systemic feature rather than treated as an exception, ensuring the sustained stability of the tourism sector.

The integration of technology in tourism governance is a fundamental prerequisite for realizing effective and sustainable Smart Tourism. Without integrated digital systems, tourism services tend to operate in isolation, leading to inefficiencies. In the context of Adaptive Governance, technology serves as an enabler that facilitates coordination among systems and stakeholders. The use of tourism applications, destination information systems, and data analytics plays a crucial role in enhancing service quality. However, a major challenge lies in the weak interoperability of existing systems, as many platforms operate independently without proper integration. This condition results in data duplication and operational inefficiencies. Moreover, technological integration requires clear standards; without them, systems cannot be sustainably developed. Therefore, a comprehensive digital architecture is necessary to ensure that technology functions not merely as a tool but as a strategic component of governance systems.

Strengthening multi-stakeholder collaboration is a critical aspect of implementing Adaptive Governance, given that the complexity of the tourism sector cannot be managed by a single actor alone but requires synergy among government, the private sector, and the community. Such collaboration facilitates the exchange of resources, information, and innovation. However, in practice, collaboration is often hindered by sectoral ego and a lack of trust, leading to fragmented and unintegrated programs. Within the Smart Tourism framework, this condition poses a serious obstacle. Therefore, structured and transparent collaboration mechanisms are needed. In addition, the role of local communities must be strengthened, positioning them not merely as objects but as active subjects in tourism management. This approach ensures that policy implementation becomes more inclusive. Strong collaboration will ultimately foster a resilient ecosystem, which is essential for maintaining the long-term sustainability of the tourism sector.

Data-driven policymaking also plays a significant role in improving the efficiency of resource allocation in the tourism sector. With accurate information on visitor patterns and tourist preferences, governments are better positioned to determine more targeted investment

priorities, such as developing infrastructure in destinations that have high potential but remain underutilized. Without adequate data, budget allocation risks becoming inefficient and tends to follow development patterns that are not based on actual needs. Furthermore, data can be used to measure policy impacts more objectively, which is essential in the processes of evaluation and policy improvement. Through this approach, the policy cycle becomes more dynamic, as governments not only plan but also continuously learn from implementation outcomes. Therefore, data systems must be designed in a sustainable manner, encompassing data collection, processing, and distribution. By doing so, the quality of policymaking can be continuously enhanced. Ultimately, this will contribute to strengthening the competitiveness of tourism destinations.

Conclusion

The findings of this study indicate that the development of Smart Tourism in West Nusa Tenggara (NTB) holds significant potential to enhance regional competitiveness and economic growth. However, the effectiveness of its implementation is largely determined by the integration of digital infrastructure, human resource capacity, adaptive governance, and multi-stakeholder collaboration, which remain suboptimal. The study reveals that despite NTB's strengths in leading tourism destinations and strong government policy support, there are substantial gaps in the equitable distribution of digital infrastructure, system integration, and data utilization, which remains fragmented and sectoral in nature. Furthermore, the fluctuating dynamics of tourist visits highlight the need for more flexible and data-driven policy approaches through Adaptive Governance to enable timely and effective responses to change. Based on these findings, this study recommends strengthening an integrated digital system architecture, enhancing human resource capacity through digital literacy and technology training, developing real-time data-driven policies, and reinforcing more structured and sustainable cross-sector collaboration mechanisms. In this way, the implementation of Smart Tourism will not only focus on technological innovation but also foster an inclusive, efficient, and sustainable tourism ecosystem. This study has several limitations that should be considered when interpreting its findings. First, the study focuses on the context of West Nusa Tenggara (NTB), and therefore its findings cannot be directly generalized to other regions with different tourism characteristics, institutional capacities, and digital infrastructure. Second, the qualitative approach provides an in-depth understanding of governance processes but does not quantitatively assess the extent to which *Adaptive Governance* influences *Smart Tourism* performance and regional competitiveness.

Third, the rapidly evolving dynamics of tourism policies, digital technologies, and tourist behavior mean that the findings reflect conditions within a specific period. Future research should therefore employ longitudinal and cross-regional comparative approaches to examine the development of *Adaptive Governance* over time, while incorporating quantitative indicators of digital readiness, tourism performance, stakeholder collaboration, and sustainability.

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